

WORLD METEOROLOGICAL ORGANIZATION.

CLOUD PHYSICS
AND
WEATHER MODIFICATION RESEARCH PROGRAMME
(WMP Report No. 10)

REGISTER
OF
NATIONAL WEATHER MODIFICATION PROJECTS
1986



Technical Document
WMO/TD - No. 208

NOTE

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WMP 10
TD 208

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Geneva, December 1988

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I. INTRODUCTION

As part of the Weather Modification Programme approved by the Seventh World Meteorological Congress (Geneva, 1975), and re-established as the Cloud Physics and Weather Modification Research Programme by the Tenth Congress (1987), the Secretary-General maintains a Register of experiments and operations in weather modification carried out within Member countries.

The present publication is the eleventh of its kind and is based on information received from Member countries on experiments and operations sponsored by governmental agencies and private concerns that took place during 1986. For various reasons, the Register does not contain information on all weather modification projects.

The first seven issues of the Register were similar in layout and in the gathered information. The eighth issue (1982) contained substantially different information and format than did the earlier Registers. With the endorsement of the EC Panel of Experts/CAS Working Group on Cloud Physics and Weather Modification (fifteenth session, 1983), the 1983 issue returned to the format and information of the first seven issues (with some modifications). This Register continues that tradition.

To assist the reader in understanding the contents of each of the 12 columns used in the tabular presentation, detailed explanations are given in Section II. The questionnaire which was sent to all Members in September 1987 is reproduced, in Appendix A to the report, in the four official languages of WMO, to ensure that the tabular information will be readily understood by all readers. Information from these questionnaires is given in Part IV. The form to be used in reporting completed programmes or for which a physical and/or statistical evaluation has been carried out is reproduced as Appendix B. Reports on completed programmes are found in Section VI.

The list of Members for which information is included in the Register is given in Section III. The Members which replied that no weather modification activities had taken place in their country during 1986 are listed in Section VII.

Requests for further information on the projects may be addressed to the reporting agency for each country which is included in Section V of the Register. The WMO Secretariat will be happy to assist if necessary.

II. DETAILED EXPLANATIONS OF COLUMNS USED IN TABULAR INFORMATION IN THE REGISTER

(The figure in brackets following the column heading title is the similar item in the questionnaire shown in Appendix A).

Column 1: WMO Register No.

This consists of country indicator letters (according to the ISO Standard 3166-1974) and a serial number for each project.

Column 2: Objective of project, type of organization carrying it out (1) and (2)

Dev. = Development	PE = Precipitation Enhancement
Ext. = Extend wet period	(E) = Emergency
Fog = Fog dissipation	(R) = Routine
Hail = Hail suppression	PR = Precipitation Redistribution
Inc. = Increase during wet period	Res. = Research
Op. = Operational	

Column 3: Approximate size of project area (3)

Given in square kilometers for target and control (if any) areas.

Column 4: Name of project (4)

Reference numbers are also quoted when supplied.

Column 5: Location of project area (5)

In some cases where co-ordinates of several points delineating the area were given, these have been replaced by a single point at approximately the centre of the area. Towns and islands may be denoted by name; A/P = Airport.

Column 6: Year project commenced and continuity (6)

Date	--	year project started
Every year	--	indicates project has operated every year
Interrupted	--	indicates project has not operated every year
No	--	indicates project will not be continued
Yes	--	indicates project will be continued
(?)	--	indicates project status is unknown

Column 7: Nature of organization sponsoring project (7)

Indicated by abbreviations as follows:

Agr.	=	Agricultural	Muni.	=	Municipal
Def.	=	Defense	(P)	=	Private
Enr.	=	Energy	Rec.	=	Recreation
For.	=	Forestry	Res.	=	Research
(G)	=	Government	Trans.	=	Transportation
Hyd.	=	Hydrological	Wea. Ser.	=	Meteorological

Column 8: Apparatus, seeding location (8)

Abbreviations are as follows:

Air	=	Airborne	G/B	=	Ground-Based
A/C	=	Aircraft	Temp.	=	Temperature

Column 9: Agents, dispersal rates (8)

Self-explanatory.

Column 10: Characteristics of clouds treated, seeding criteria (9)

LWC	=	Liquid water content	Temp.	=	Temperature
Obs.	=	Observations			

Column 11: Active period during reporting year (10)

Months of activity are inclusive.

Jan	=	January	July	=	July
Feb	=	February	Aug	=	August
Mar	=	March	Sept	=	September
Apr	=	April	Oct	=	October
May	=	May	Nov	=	November
June	=	June	Dec	=	December

Column 12: Documentation (12) and (13)

"EIS" indicates that an environmental impact study has been made;
"C/B" indicates that a costs and benefits analysis has been made.

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>ARGENTINA</u>											
AR-1	Op. Hail		Lucha Antigranizo	Province of Mendoza at foot of Andes Mountains	1970 Inter- rupted Yes	Agr. (G- Provin cial)	Air: in-cloud seeding using rockets.		Convective clouds. Generally bases warmer than +10°C; tops colder than -20°C.	Oct. 1985 through March 1986	None
<u>AUSTRIA</u>											
AU-1	Op. Hail	500 Target	HTP-Lower Austria (Hail Test Project)	48 15°-48 30°N 15 20°-15 50°E and Langenlois Districts of Krems	1981 Every year Yes	Agr. (P)	Air: 2 A/C seeding at cloud base with acetone burners	270 l acetone solution in 27 hours 18.9 kg AgI total	Convective clouds. Generally bases warmer than +10°C, summit temperature between 0 and -20°C not accurately known). Subjective decisions regarding seeding.	16 Days: May through August	Historic records, Crop damage, Hail pads. EIS, C/B
AU-2	Op. Hail	1700 Target	HTP-Styria (Hail Test Project)	46 30°-47 15°N 15 30°-16 00°E Styria, districts of Weiz, Gleisdorf and Radkersburg	1982 Every year Yes	Agr. (P)	Air: 5 A/C seeding at cloud base with acetone burners.	8000 l acetone solution in 315 hours; 80 kg AgI total	Convective clouds. Generally bases warmer than +10°C, Summit temperatures between 0 and -20°C (not accurately known). Subjective decisions regarding seeding. EIS, C/B	37 Days: May through August	Historic records, Crop damage, Hail pads.
<u>BRAZIL</u>											
BR-1	Op. PE (E)(R) Ext	148000 Target	Weather modifi- cation program in Ceará	NE Brazil, State of Ceará	1973 Inter- rupted Yes	Agr. (G), Hyd. (G), Wea. Ser. (G)	Air: 3 A/C seeding in-cloud.	10 l/km saturated solution; 45000 kg NaCl total	Convective and orographic clouds. Generally bases warmer than +10°C; tops warmer than 0°C. Visual and Satellite obs contribute to decisions on seeding.	72 Days: Jan, Feb & Apr	None
<u>CHINA</u>											
CN-1	Res.& Op. PE	1050 Target	Precipitation Enhancement and Hail Suppression	Western Inner- Mongolia	1959 Every year Yes	Agr. (G) & Res. (G).	Air: 1 A/C, artillery shells. Cloud top seeding using explosive and solid dispensing units.	30 kg/hr solid CO ₂ ; 60 kg AgI total	Convective and layer clouds. Generally bases colder than +10°C. Seeding decisions based on cloud depth and top temperature.	May - Aug	Historic records. Crop damage

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CN-2	Res.& Op. Hail PE(R)	50000 Target	Precipitation Enhancement and Hail Suppression	Middle-West Jilin Province	1958 Yes	Agr. (G) & Ener (G)	Air: 1 A/C, artillery shells. In-cloud seeding -5°C using acetone burner, explosive and solid dispensing units.	5 kg/km solid CO ₂ ; 20 kg AgI total	Convective and layer clouds. Generally bases colder than +10°C.	96 Days: Apr-Sept	Historic records, Aircraft abs.
CN-3	Res. Hail	330 Target	Hail Suppression	Min County, Ganshu Province	1960 Yes	Agr. (G)	Air: artillery shells. In-cloud seed -5°C using explosives.	10 kg AgI total	Convective clouds with tops colder than -20°C	June - Aug	Historic records, Crop damage
CN-4	Op. PE(R) & Hail		Precipitation Enhancement and Hail Suppression	Middle-East Helongjiang Province	1967 Yes	Agr. (G)	Air: artillery shells. In-cloud seeding -5°C using explosives.	25 kg AgI total	Cumulus clouds. Seed decision based radar echo (depth and top height).	May - Aug	Historic records.
CN-5	Res. Hail	4600 Target	Hail Suppression	Zhuolu Count, Hebei Province	1985 Yes	Agr. (G) Wed. Ser. (G).	Air: artillery shells. In-cloud seeding using explosives.	14 kg AgI total	Convective clouds. Seed decision based on radar reflectivity.	May - Oct	Historic records, Crop damage Hail pads.
CN-6	Res & Op. Hail	50000 Target	Hail Suppression	North Xinjiang	1974 Yes	Agr. (G)	Air: artillery shells. In-cloud seeding using explosives.	60 kg AgI total	Convective clouds. Generally bases colder than +10°C. Operations decisions based on weather forecast & 45 dbz radar echo.	May - Sept	Historic records Target/ Control
CN-7	Res.& Op. PE(R)	15000	Precipitation Enhancement	North slope of Tianshan Mountain, Xinjiang	1978 Yes	Agr. (G)	Air: 1A/C. In-cloud seeding between -5 and -15°C using acetone and solid dispensing units.	4 g/min AgI; 400 g/min solid CO ₂	Layer clouds. Generally bases colder than +10°C. Seeding criteria base on radar echo.	Nov - Jan	Historic records
CN-8	Res. PE(R)	9300 Target 3000 Control	Precipitation Enhancement	Liuyang County, Hunan Province	1983 Yes	Agr. (G) & Wea. Ser. (G)	Air: artillery shells In-cloud seeding using explosives.	50-150 g/cloud; 5.4 kg AgI total	Convective clouds. Generally bases warmer than +10°C Seeding criteria based on top of radar echo (6 km, 30 dbz).	July - Aug	Rando- mized, Historic records

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CN-9	Op. PE, Hail	5000	Precipitation Enhancement	East Qinghai	1973 Yes	Agr. (G)	Air: artillery shells In-cloud seeding with explosives.	50 kg AgI total	Convective clouds, Generally bases colder than +10°C Seeding criteria based on radar echo.	May - Oct	Historic records
CN-10	Op. PE(R) and Hail	33000	Precipitation Enhancement and Hail Suppression	Central Sichuan Province	1959 Yes	Agr. (G)	Air: 1 A/C. artillery shells. In-cloud and cloud top seeding using explosives and solid dispensing units.	10-15 kg/min NaCl; 100 kg AgI total	Convective and layer clouds. Generally bases warmer than +10°C; generally tops between 0°C and -20°C Cloud depth 1500 for rainmaking.	Apr - Aug	Historic records Target/ Control
CN-11	Op. PE, Hail	7500	Precipitation Enhancement and Hail Suppression	South Guizhou	1980 Yes	Agr. (G)	Air: artillery shells. In-cloud seeding using explosives.	15 kg AgI total	Convective clouds. Generally bases colder than +10°C. Seeding criteria based on radar echo.	May - Aug	Historic records
CN-12	Op. Hail	176 Target	Hail Suppression	North Tianjin	1984 Yes	Agr. (G)	Air: artillery shells. In-cloud seeding using explosives.	16 kg AgI total	Convective clouds. Generally bases colder than +10°C Seeding criteria based on radar echo.	May - Aug	Historic records Crop damage.
CN-13	Res. PE (Inc. Wet)	1500 Target 1500 Control	Precipitation Enhancement	Gutian Reservior (North of Gutian County, Fujian	1975 Yes	Hyd. (G)	Air: artillery shells. In-cloud seeding using explosives.	4 kg AgI total	Convective and layer clouds. Generally cloud tops between 0°C and -20°C. Decisions based on forecast, radar and radiosonde data.	Apr - June	Rando- mized Historic records
CN-14	Op. PE & Hail	14000 Target	Precipitation Enhancement and Hail Suppression	West of Hubei Province	 Yes	Agr. (G)	Air: artillery shells. In-cloud seeding using explosives.	10 kg AgI total	Convective clouds	May - Aug	Historic records
<u>FRANCE</u>											
FR-1	Res. Ops. Hail	470000 Target	Hail Prevention National Association for the study and fight against Atmospheric Disturbances.	SW France, Departments 09, 11,16,17,31,33 40,64,65,66,81	1952 Every year Yes	Agr. (P) type 1901 inter- depart mental asso- ciation	Ground: 462 acetone burning generators	8 g/hr/generator; 397 kg AgI total	Orographic clouds. Generally bases warmer than +10°C tops colder than -20°C. Criterion for operations: prediction of hail larger than 15 mm diameter.	4 to 22 Days depending in Dept: Apr - Oct	Historic records Crop damage EIS C/B

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
FR-2	Op. Fog	0.6 Target 0.6 Control	Turboclair for dissipation	Charles de Gaulle Airport runway 09/27 - 0FU 09	1974 Every year Yes	Trans. (G)	Ground: 13 aircraft engines type ATAR 103 placed in housings along the border of the runway.			12 Days: 9 Jan	
<u>GERMANY, FEDERAL REPUBLIC OF</u>											
DE-1	Ops. Hail.	200 Target 400 Control	Hail Suppression Muchldorf/ Altoetting	Bavaria	1983 Every year Yes	Agr. (local G.)	Air: 1 A/C seeding at cloud base with AgI.	Seeding rate 4 l/hr 105 l AgI solution total	Convectives clouds. Generally bases warmer than +10°C Op. decisions make use of information from Munich met. office.	20 Days	No evalua- tion
DE-2	Ops. Hail.	2500 Target 7000 Control	Hail Suppression Project Stuttgart Area	SW Germany 48°5'N, 10°E	1980 Every year Yes	Agr. G & P Wea. Ser. (G)	Air: 1 A/C seeding at cloud base using pyrotechnic flares.	75 g AgI per flare; 82 flares (through 4 Sept.)	Convective clouds. Generally base warmer than +10°C and tops colder than -20°C. Ops criteria based on forecast of atmos. instability and 25 dbz radar intensity (PPI) with core above -5°C isotherm and echo top 25000 ft.	22 Days: May - Oct	Historic records Hail pads. EIS, C/B
DE-3	Ops. Hail	2800 Target 2800 Control	Weather Modification Project South Bavaria, Rosenheim- Miesbach	Country District Rosenheim- Miesbach FRG	1957 AgI rocket 1974 (air- craft) Yes	Agr. (G)	Ground and Air. Six ground based acetone burning generators and 2 A/C seeding at cloud base and in- cloud (+8 to +3°C) using acetone burners.	about 300 kg AgI solution total	Cumulus and orographic clouds. Generally bases colder than +10°C and tops colder than -20°C.	1 May to 30 Sept.	Historic records Crop damage C/B
<u>GREECE</u>											
GR-1	Res. Op. Hail	1000 Target 1000 Control	National Hail Suppression Programme (NHSP) of Greece	Northern Greece	1984. Every year Yes	Agr. (G)	Air: 5 A/C seeding at cloud base, top and in-cloud (-5°C to -10°C) using pyrotechnic flares.	70 g/km; 54 kg AgI total	Convective clouds with bases generally colder than +10°C and tops generally colder than -20°C. Seeding criteria based on radar echo of 35 dbz above the -5°C level.	168 Days: 15 Apr - 30 Sept.	Rando- mized Experi- ment Crop damage Hail pads C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>HUNGARY</u>											
HU-I	Ops. Hail	1200 Target	Hail Suppression Project of Baranya County	Southern Hungary 45°48' 46°03'N; 17°54'-18°37' E	1976 Every year Yes	Ins. Co.(G)	Air: in-cloud seeding at -6 to -12°C using rockets.	0,5 kg/rocket; 595 kg AgI total	Convective clouds. Generally bases colder than +10°C and tops colder than -20°C. Seeding criteria based on ht of 40 dbz 5 band radar reflectivity and tendency parameter of cell development.	27 Days: Apr - Oct	Historic records Crop damage Hail pads C/B
HU-2	Ops. Hail	1600 Target	Hail Suppression Project of Bacs-Kiskum county	Southern Hungary 46°00' 46°27'N; 18°50'-19°25' E	1985 Every year Yes	Ins. Co.(G)	Air: in-cloud seeding at -6 to -12°C using rockets.	0,5 kg/rocket; 880 kg AgI total	Convective clouds. Generally bases colder than +10°C and tops colder than -20°C. Seeding criteria based on ht of 40 dbz 5 band radar reflectivity and tendency parameter of cell development.	26 Days: Apr - Sept	Historic records Crop damage Hail pads C/B
<u>INDIA</u>											
IN-1	Res. PE	1600 Target 1600 Control	Warm Cloud Modification Experiment, Maharashtra	Maharashtra State, 18°N- 16°06'N; 74°16'E- 74°38'E	1973 Every year No	Res. Inst (G)	Air: A/C seeding in- cloud about 300 m above cloud base using solid dispensing units	1000 kg/day; 24000 kg NaCl total	Convective clouds. Generally bases warmer than +10°C and tops warmer than 0°C Ops. Criteria based on aerological sounding, synoptic conditions, low cloud amount, cloud depth.	24 Days: July-Sept	Rando- mized Observa- tions of physical proper- ties of seeded and not seeded clouds. EIS, C/B
<u>INDONESIA</u>											
ID 1	Res. PE (E) Ext. INC	400 Target 460 Control	Rain making (rain enhancement)	West Java	1985 Every year Yes	Agr. (G), Enr. (G), For. (G), Hyd, (G).	Air and Gnd: 6 ground based liquid spray generators, 5 A/C with spray generators. Seeding at ground, cloud base and in-cloud.	3000 kg/day NaCl 60 tons for 21 days (by aircraft). 300 kg/day urea solution (1 part urea, 3 parts water); 10000 kg for 30 days by ground generator.	Convective clouds. Generally bases warmer than + 10°C. Tops warmer than 0°C. Seeding criteria: (a) surface tel. hum. greater than 65%, (b) average tel. hum. from surface (830 mb) to 700 mb is equal or greater than 50%, (c) wind speed at 700 mb 8-12 knots.	45 days June, July Oct.	Rando- mized also historic records, EIS.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>ITALY</u>											
IT-1	Res. Dev. PR (E)(R) Ext, Inc.	3000 Target	Progetto Pioggia (Rain Project)	Puglia	1986 Every year Yes	Agr. (P); Ener. (P); Wea. Ser. (G&P)	Project in pre-seeding phase. In-cloud measurements by airborne instrumentation			20 Days	Env. C/B
IT-2	Res. Dev Hail	160 Target	Colli Albani	Central Italy (Latium)	1986 Yes	Agr. (G) & For (G)	Ground: 2 Kerosene burners.	100 g/hr (each of 2 generators), 4 kg AgI total	Convective clouds. Generally bases warmer than +10°C, tops between 0°C and -20°C. Ops criteria based on aerological and synoptic data, surface wind and radar reflectivity.	77 Days: July-Sept Exploratory studies.	Airborne measurements of ice nuclei C/B
<u>JORDAN</u>											
JO-1	Ops. PE (E)(R) Ext. Inc.	40000	Jordan Rain Enhancement Programme	Mainly northern half and western half of country	1986 Yes	Wea. Ser. (G)	Air and ground: 6 ground based acetone burning generators, 1 a/c carrying acetone burners. Seeding at ground and in-cloud -8°C.	3.5 to 4.5 gallons/hr 56 kg AgI (by aircraft only) 0.5 gallons/hr; 21.5 kg AgI (by ground based generators)	Convective orographic and layer clouds. Generally bases colder than +10°C tops between 0°C and -20°C. Criteria for operations, cloud tops colder than -8°C, liquid water content greater than 0.5 g/m ³ , ice particles less than 10/l.	17 Days (aircraft) 31 Days (ground) Nov - Dec 1986 Jan - Apr 1987	
<u>MADAGASCAR</u>											
MG-1	Ops. PE(E)	400 Target		Region of Vohemar	1986	Wea. Ser. (G) & Defense	Air: 1 A/C using solid dispersing units seeding at cloud base and top.	250 g/min NaCl powder finer than 50 micrometers, 100 kg total	Convective and orographic clouds. Generally bases warmer than +10°C and tops warmer than 0°C. Criteria for operations based on atmospheric in stability	7 Days Jan - Apr	Historic records measurement of precipitation in nearby localities C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>MALAYSIA</u>											
MY-1	Ops. Dev. PE (E) (R)	1139 Target	MADA Cloud Seeding	Kedah, Malaysia (6°N, 101°E)	1977 Every year Yes	Agr. (G) & Wea. Ser. (G)	Air: 2 A/C using liquid spray and solid dispersing units. In-cloud seeding at 11 to 15°C (6000-8000 ft).	50-100 kg/min (solid); 40-80 l/min (liquid) 140 metric tons NaCl total also 50-100 kg/min (solid); 40-80 l/min (liquid) 60 metric tons urea total.	Convective clouds. Generally base warmer than +10°C, tops variable from 0°C to -20°C.	105 Days: May - June Oct - Dec	Historic records
<u>MOROCCO</u>											
MA-1	Res Ops. PE (E) (R) augm ent snow pack	15000 Target	A1-Ghait	High and Central Atlas Mountains	Every year Yes	Wea. Ser. (G)	Air and ground using acetone burners. In- cloud seeding between -5° and 18°C using 3 A/C and 7 ground- based generators.	20 g/hr AgI	Convective and orographic clouds. Generally bases colder than +10°C and tops between 0 and -20°C.	1 Day, 1985, 22 Days 1986 1 Nov 1985 - 30 Apr 1986	Historic records
<u>NORWAY</u>											
NO-1	Ops. Fog	5-10 Target		Oslo Airport, Fornebu and Oslo Airport Gardermoen	1964 Every year Yes	Trans (G)	Air: 1 A/C seeding at cloud top and in -cloud (-1°C) using solid dispersing units.	100 to 150 kg solid CO ₂ per seeding CO ₂	Layer clouds. Generally cloud bases between -3° and -10°C with tops between 0 and -20°C. Operations depend mainly on temperature.	Jan - Mar Nov - Dec	C/B
<u>SPAIN</u>											
ES-1	Ops. Hail	500 Target	Hail Suppres- sion in the Rice Producing bordering the Lower Jucar.	Valencia, lower basin of the Jucar River	1975 Every year ?	Agr. (G & P)	Seeding with rockets dispersing solid material	Capsule of chloro sulfuric acid	Convective clouds. Generally bases warmer than +10°C and tops colder than -20°C. Daily ops. depend on hail forecast by meteoro- logical service.	May - Oct	
ES-2	Res. PE	300 Target	Precipitation Stimulation on Grand Cannary	Grand Cannary Island		Agr. (G) & Hydr. (G)	Ground				

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ES-3	Ops. Hail	6000 Target	Hail Suppression	Northern Spain, Provinces of Alava, La Rioja and Navarra	1983 Every year Yes	Agr. (G & P)	Ground based generators of the Dessens design	AgI	Convective clouds. Generally bases warmer than +10°C and tops generally colder than -20°C.		
<u>SWITZERLAND</u>											
Some people use hail cannons in an attempt to suppress hail but there is no control or collection of information concerning these activities.											
<u>THAILAND</u>											
TH-1	Res. Dev. Ops. PE (E) (R) Inc. PR, Fog.	30000 Target 30000 Control	The Royal Rain-making Research and Development Programme, Kingdom of Thailand	Requesting Provinces in Thailand	1969 Every year Yes	Agr. Forst, Hydro, Res, Wea. Ser. Water resou- rces (all G)	Ground and air, 1 liquid spray ground generator located on mountain top seeding cloud base, 20 A/C using solid dispensing units seeding at cloud base, in cloud and cloud top also rockets.	Seeding material: CaCl, CaC ₂ , CO ₂ , NaCl, solid CaO, urea NH ₄ NO ₃ , T1	Convective and orographic clouds. Generally bases warmer than +10°C tops warmer than 0°C (for cumuli), between 0° and -20°C for cumulonimbi.	210 Days Apr through Oct.	Rando- mized Historic records Crop damage. EIS C/B
<u>UNION OF SOVIET SOCIALIST REPUBLICS</u>											
SU-1	Op. Hail	8600 Target	Hail Suppression	Uzbek SSR	1967 Every year Yes	Agr. (G), Wea- Serv. (G).	Air: in cloud seeding between -6 and -8°C using rockets and artillery shells carrying explosive and/or pyrotechnic flare generators.	AgI	Convective clouds, predominant cloud base temp. generally warmer than +10°C. Tops generally colder than -20°C. Operational alert based on probability of hail 0.4; seeding criteria based on radar reflectivity at 3.2 cm being less than that at 10 cm wave length.	51 Days: Apr-Aug	Historic records Crop damage. EIS C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (Contd.)											
SU-2	Op. Hail	7000 Target	Hail Suppression	Tajik SSR	1964 Every year Yes	Agr. (G), Wea- Serv. (G).	Air: in-cloud seeding between -6 and -10°C using rockets and artillery shells carrying explosive and/or pyrotechnic flare generators.	AgI	Convective clouds, predominant cloud base temp. generally warmer than +10°C. Tops generally colder than -20°C. Operations alert based on forecast hail probability 0.4; seeding criteria based on radar reflectivity at 3.2 cm being less than that at 10 cm wave length.	34 Days: Apr-Aug	Historic records, Crop damage, EIS, C/B
SU-3	Res. and Op. Fog	3500 500 100 m Target volume	Artificial Dissipation of Supercooled fog	Airport at Kishinev, Moldavia.	1985 Every year Yes	Res. (G). Wea. Serv. (G)	G/B: liquid propane spray	Propane	Seeding criteria based on temp. conditions, wind speed & presence of supercooled liquid water.	10 Days: Nov-Dec	Yes/ Physical evalua- tion based on observa- tions of visibili- ty in the target & surround- ing area EIS, C/B
SU-4	Op. PE(R)	5000 Target 10000 Control	Seeding of Clouds to Enhance Winter Precipitation	Dnepropetrovsky Region Ukrainian SSR	1985 Every year Yes	Agr. (G). Wea. Serv. (G).	Air: seeding in-cloud at temperatures less than -4°C in presence of liquid water using 4 A/C and solid dispensing units.	Dry ice (solid CO ₂)	Frontal, layer clouds with cloud base temp. generally colder than +10°C. Tops generally warmer than -20°C. Criteria for seeding includes cloud thickness greater than 500 m.	25 Days: Jan-Feb Nov-Dec	Compar- ison of precipi- tation in target & control for 12-hr periods EIS, C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (Contd.)											
SU-5	Res. Op. PE(R)	1000 Target 1000 Control	Seeding of Clouds to Enhance Precipitation	Uzbek SSR, Kashkadarins- kaya Region	1985 Every year Yes	Agr. (G). Wea. Serv. (G).	Air: seeding in-cloud between -4 and -18°C using rockets and 1 A/C carrying pyro- technic flare generators and solid dispensing units.	AgI and Dry ice (solid CO ₂)	Layer and orographic clouds, cloud base temp generally colder than +10°C. Tops warmer than -20°C. Seeding criteria cloud base temp. -4 to -20°C, cloud thickness ≥ 300 m, base ≤ 1000 m, changes in absolute moisture saturation, speed of cloud glaciation.	14 Days: Feb-Apr	Instru- mental evalua- tion EIS, C/B
SU-6	Res. Op. PE(R)	3000 Target	Precipitation Enhancement	Georgian SSR	1985 Every year Yes	Agr. (G). Wea. Serv. (G).	Air: pyrotechnic flares carried by rockets seeding in-cloud at temp. between -4 and -18°C.	AgI	Convective clouds, cloud base temp. generally colder than +10°C. Tops warmer than -20°C. Seeding criteria requires clouds thicker than 2 km.	25 Days: May-Sept	Yes Yes (H) Hydro- logical evalua- tion EIS, C/B
SU-7	Op. Hail	12350 Target	Hail Suppression	Georgian SSR	1964 Every year Yes	Agr. (G). Wea. Serv. (G)	Air: explosive and pyrotechnic flare generators carried by rockets & artillery shells. Seeding at cloud base and in- cloud at temp. between -3 and -9°C	AgI	Convective clouds, cloud base temp. generally warmer than +10°C. Tops colder than -20°C. Seeding criteria based on forecast probability of hail greater than 0.4 & ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	72 Days: Apr-Oct	Historic records, Crop damage, EIS, C/B
SU-8	Op. Hail	22600 Target	Hail Suppression	Moldavian SSR	1964 Every year Yes	Agr. (G). Wea. Serv. (G)	Air: seeding in-cloud between -6 and -15°C and at cloud base using rockets carry- ing pyrotechnic flare and explosive generators	AgI	Convective clouds, predominant cloud base temp. generally colder than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding criteria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	53 Days: May-Sept	Historic records, Crop damage, EIS, C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>UNION OF SOVIET SOCIALIST REPUBLICS (Contd.)</u>											
SU-9	Op. Hail	3050 Target	Hail Suppression	Ukranian SSR Odessa Region	1980 Every year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud between -6 and -10°C and at cloud base using rockets carrying pyrotechnic flare generators	AgI	Convective clouds, cloud base temp. generally warmer than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding cri- teria based on ratio of radar reflectivity at 3.3 cm to that at 10 cm wave length being <1.	26 Days: May-Sept	Historic records, Crop damage, EIS, C/B
SU-10	Op. Hail	11300 Target	Hail Suppression	Armenian SSR	1964 Every year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud between -6 and -8°C and at cloud base using rockets and artillery shells carrying pyrotechnic flare and explosive generators	AgI	Convective clouds, cloud base temp gener- ally colder than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding criteria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	83 Days: Apr-Oct	Historic records, Crop damage, EIS, C/B
SU-11	Op. Hail	4950 Target	Hail Suppression	Ukranian SSR, Crimea Region	1968 Every Year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud at -6 and at cloud base using rockets carrying pyrotechnic flare generators	AgI	Convective clouds, cloud base temp generally warmer than +10°C. Tops colder than -20°C. Opera- tions alert based on forecast of 0.4 or greater probability of hail; seeding cri- teria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	28 Days: May-Sept	Historic records, Crop damage, EIS, C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (Contd.)											
SU-12 Op. Hail	7700 Target	Hail Suppression	Krasnodar Region	1967 Every year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud at -6 and at cloud base using rockets and artillery shells carrying pyrotechnic flare and explosive generators	AgI		Convective clouds, cloud base temp. generally warmer than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding criteria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	52 Days: May-Sept	Historic records, Crop damage, EIS, C/B
SU-13 Op. Hail	12400 Target	Hail Suppression	Azerbaijan SSR	1967 Every Year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud between -3 and -12°C and at cloud base using rockets and artillery shells carrying pyrotechnic flare and explosive generators	AgI		Convective clouds, cloud base temp. gener- ally colder than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding criteria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	58 Days: Apr-Oct	Historic records, Crop damage, EIS, C/B
SU-14 Op. Hail	8700 Target	Hail Suppression	Northern Caucasus	1967 Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud between -3 and -15°C and at cloud base using rockets and artillery shells carrying pyrotechnic flare explosive generators	AgI		Convective clouds, cloud base temp. gener- ally warmer than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail & seeding cri- teria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	55 Days: May-Sept	Historic records, Crop damage, EIS, C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>UNION OF SOVIET SOCIALIST REPUBLICS (Contd.)</u>											
SU-15	Res. Op. PE	3000 Target	Precipitation Enhancement	Modavian SSR	1985 Every year Yes	Agr. (G), Wea. Serv. (G)	Air: 1 airplane plus rockets carrying pyrotechnic flare generators. In-cloud seeding -4 to -18°C	AgI	Convective and layer clouds, cloud base temp. generally colder than -10°C. Tops generally between 0 and -20°C. Seeding criteria cloud thickness and water content.	60 Days: Nov. 1985 to March 1986 May-Sept 1986	Random- ized Experi- ment Instru- ment and hydro- logical evalua- tion Eval. EIS, C/B
<u>UNITED STATES OF AMERICA</u>											
US 1	Res. PE	7200 Target 7200 Control	86-585 Precip- itation Augmen- tation for Crops Experi- ment	Central Illinois	1986 ?	Wea. Serv. (G)	Air: aircraft using droppable pyro- technic flares	20 g.AgI per flare	Convective clouds	3 Days: July-Aug	
US 2	Op. PE(R)	1350 Target 988 Control	86-172 KDWDC Project	Kaweah River Watershed, California	1976 NR Yes	Hyd., (P)	G/B and Air: 5 G/B generators, cloud top seeding by 1 A/C, acetone burning generators and pyrotechnic flares	2-20 g/min/pyro- technic flare generator, 10-20 g/hr/acetone burning generator, 5.2 kg AgI total	Orographic clouds	17 Days: Nov, Dec	
US 3	Op. PE	-	Tahoe-Truckee Project	Lake Tahoe - Truckee River Watershed, Nevada and California	1977 NR Yes	Hyd. (G- State)	G/B: 6 acetone, isopropylamine and kerosene burning generators	42 g/hr/generator (isopropylamine), 22 g/hr/generator (acetone), 10.5 kg AgI total	Orographic clouds	22 Days: Jan, Feb, Nov, Dec	
US 4	Ops. PE(R)	13000 Target	Walker River Project	Walker River Watershed, California and Nevada	1977 NR Yes	Hyd. (G- State)	Air: 2 A/C seeding at cloud top using acetone burning and pyrotechnic flare generators	2 g/min/pyrotech- nic flare, 0.5 to 3.0 gal/hr (27 AgI/acetone), 6.8 kg AgI total	Orographic clouds	30 Days: Jan, Feb, Dec	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>UNITED STATES OF AMERICA (Contd.)</u>											
US 5	Op. PE	614 Target 2600 Control	Upper American River Project	Sacramento, California	1979 NR Yes	Hyd., Energy (G- Muni.)	G/B: 8 acetone burn- ing generators	20 g/hr/generator, 15.3 kg AgI total	Orographic clouds	26 Days: Jan, Apr, May, Nov, Dec	
US 6	Op. PE(R)	1196 Target	Ruby Mountains Project	Nevada	1981 NR Yes	Res. (G- State)	G/B: 6 G/B aerosol generators	50 g/hr, 2.0 kg AgI total	Orographic clouds	10 Days: Jan, Feb, Dec	
US 7	Op. PE(R)	3120 Target 15600 Control	86-491 Kern River Project	Kern River Watershed, California	1982 NR Yes	Hyd. (P)	Air: 1 A/C using pyrotechnic flares seeding AgI at cloud top and in-cloud	60 to 30,000 g/hr, 6.4 kg AgI total	Orographic clouds	18 Days: Jan-Mar Nov, Dec	
US 8	Op. PE(R)	2600 Target	86-507 T-18	Texas portion of the water- shed of the Red Bluff Lake	1983 NR Yes	Energy and Hyd. (P)	G/B: 13 arc-type AgI generators	0.5 to 2.0 g AgI/ hr/generator, 7.0 kg AgI	Convective clouds & synoptic scale disturbances.	169 Days: Jan-Dec	
US 9	Op. PE(R)	9100 Target	86.590 Santa Barbara County Cloud Seeding	Santa Barbara County, California	1982 Yes	Agr. (P) Hyd. (P)	G/B and Air: 1 G/B generator 1 A/C seeding in-cloud	5 g/min, 0.4 kg AgI total	Bands organized on mesoscale.	3 Days: Dec	
US 10	Op. PE(R)	6240 Target 26000 Control	Utah Snowpack Augmentation Program	Southern Utah Washington County	1985 every year Yes	Hyd. (G- local)	G/B: 12 propane burning AgI generators	6 g/hr, 14.4 kg AgI total	Orographic clouds	26 Days: Jan-Apr Dec	
US 11	Ops. PE(R)	3120 Target 835 Control	86-589 Big Creek Project, San Joaquin River	Upper San Joaquin River, California	1972 NR Yes	For- estry (P) Hyd. (P)	G/B and Air: acetone burning & pyrotech- nic flare generators. Airborne seeding is in-cloud	8.8 kg AgI total	Orographic clouds	36 Days: Jan-Oct Dec	
US 12	Op. PE(R) and Op. Hail	31200 Target	86-573 Western Kansas Weather Modification	West Central and Southwest Kansas	1975 NR Yes	Hyd. (G- local)	Air: 4 A/C, acetone burning & solid dispensing gen- erators, seeding at cloud base & top	0.126 l/min, 64-4 kg AgI total; 1 or 2 lbs/ min, 946 kg dry ice (solid CO ₂) total	Convective clouds	66 Days: Apr-Sept	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNITED STATES OF AMERICA (Contd.)											
US 13	Ops. Fog	26 Target	85-545 Fog Dispersal Project	Medford, Oregon	1972 NR Yes	Trans (P)	Air: 1 A/C, cloud top seeding using solid dispensing unit	678 kg dry ice (solid CO ₂) total	Layer clouds. Criteria for seeding is the occurrence of super- cooled fog.	2 Days: Jan-Feb	
US 14	Ops. Fog	52 Target	85-546 Airport Fog Dispersal Project	Spokane, Washington	1979 NR Yes	Trans (P)	Air: 1 A/C, cloud top seeding using solid dispensing unit	6 lbs/mile, 5500 kg dry ice (solid CO ₂) total	Layer clouds, predominant cloud base temp. 0°C. Seeding criteria based on occurrence of supercooled fog.	8 Days: Jan-Nov	
US 15	Op. PE(R)	11700 Target	86-575 City of San Angelo	San Angelo, Texas	1985 every year Yes	Hyd. (G- City)	Air: 1 A/C seeding at cloud base and in- cloud using acetone burning & pyrotech- nic flare generators	150-225 g/hr/ generator (acetone), 2 g/s/generator (pyrotechnic), 24.5 kg AgI total	Convective clouds	36 Days: Apr-Oct	
US 16	Op. PE(R)	9178 Target	85-549 North Dakota Weather Modification Project District I	West Central North Dakota	1977 NR Yes	Energy (G- State)	Air: in-cloud (-2°C -12.5°C) and cloud base seeding using acetone burning, solid dispensing & pyrotechnic flare generators carried by A/C	59.1 kg AgI total; 740.8 dry ice (solid CO ₂) total	Convective clouds. Seeding criteria based on cloud base height, cloud base diameter, temp., & liquid water content.	25 Days: June-Aug	
US 17	Op. Hail and PE(R)	17711 Target	85-550 North Dakota Weather Modification Project District II	Northwestern North Dakota	1977 NR Yes	Agr. (G- State)	Air: in-cloud (-2 to -12.5°C) and cloud base seeding using acetone burning, solid dispensing & pyrotechnic flare generators carried by A/C	32.9 kg AgI total; 302.7 kg dry ice (solid CO ₂) total	Convective clouds. Seeding criteria based on cloud base height, cloud base diameter, temp., & liquid water content.	32 Days: June-Aug	
US 18	Op. PE(R)	20280 Target	85-552 Edwards Underground Water District	West of San Antonio, Texas	NR Yes	Hyd. (G- local)	Air: 2 A/C seeding at cloud top and in- cloud using acetone burning and pyrotech- nic flare generators	150-225 g/hr/gen- erator (acetone), 2 g/sec/hr per pyrotechnic flare, 19.4 kg AgI total	Convective clouds	7 Days: July-Sept	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>UNITED STATES OF AMERICA (Contd.)</u>											
US 19	Op. PE(R)	2829 Target	86-576 OC-16	Comanche County, Oklahoma	1985 every year Yes	Agr. G- local) Hyd. (G- local)	G/B: 22 arc type generators	0.5 or 2.0 g/hr, 2.2 kg AgI total	Convective clouds	28 Days: July-Sept	
US 20	Ops. PE(R)	468 Target	85-558 Wind River Weather Modification Project	Big Sandy River Drainage, Wyoming	1972 NR Yes	Agr. (P) & Hyd. (P)	G/B: AgI-NH ₄ I propane fueled generators	10 to 15 g/hr, 7.4 kg AgI total	Orographic & layer clouds, predominant cloud base temp. less than 0°C.	24 Days: Jan-Mar	
US 21	Op. PE(R)	650 Target	86-588 Mokelumne Project	Central Sierra Nevada Mountains, California	1974 NR Yes	Agr. (P) Energy (P)	G/B: 5 acetone burning generators	25 g/hr, 11.3 kg AgI total	Orographic clouds, bands organized on mesoscale. Seeding criteria based on height of freezing level, height of -10°C isotherm, cloud top temp., average wind speed & direction.	13 Days: Jan, Feb, Nov, Dec	Random- ized experi- ment
US 22	Op. PE(R)	1300 Target	85-562 Lake Almanor Project	Northern Sierra Nevada Mountains, California	1972 NR Yes	Agr. (P), Energy (P)	G/B: 5 acetone burning generators	25 g/hr, 15 kg AgI total	Orographic clouds. Seeding criteria based on height of freezing level, height of -10°C isotherm, cloud top temp., average wind speed & direction	15 Days: Jan, Feb, Nov, Dec	Random- ized Experi- ment
US 23	Ops. Fog	5.2 Target	85-563 Ground-based Cold Fog Dissipation System	Elmendorf AFB, Alaska	1971 NR Yes	Def. (G)	G/B: 24 tanks (dispensers) spraying liquid propane	12 gal/hr/dispenser, 110 gal propane total	Layer clouds, predominant cloud base temp. <0°C. Seeding criteria is the occurrence of supercooled fog.	1 Day: Jan	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>UNITED STATES OF AMERICA (Contd.)</u>											
US 24	Ops. Fog	130 Target	86-578 Cold Fog Dispersal System	Fairchild AFB, Washington	1971 NR Yes	Def. (G)	G/B: 23 liquid propane spraying units	10 gal/hr, 10856 gal propane total	Layer clouds, predom- inant cloud base temp. <0°C. Seeding crite- rion is the occurrence of supercooled fog.	35 Days: Jan-Mar Nov, Dec	C/B
US 25	Ops. PE(R) snow for ski area	260 Target	85-566 Sun Valley Ski Area	Sun Valley, Idaho	1980 NR Yes	Rec. (P)	G/B and Air: 1 to 2 generators, in-cloud seeding using 1 A/C, acetone and pyrotechnic burning generators	100 to 300 g/hr, 1.7 kg AgI total	Orographic clouds, predominant cloud base temp. <0°C.	8 Days: Nov-Dec	
US 26	Ops. PE(R)	3900 Target 2072 Control	85-568 San Juan Program	Southwest Colorado	1977 NR Yes	Agr. (P), Hyd. (P)	G/B: 6 acetone burning generators	5 to 40 g/hr, 1.1 kg AgI total	Orographic clouds, bands organized on mesoscale.	5 Days: Jan-Feb	C/B
US 27	Ops. PE(R)	260 Target 2072 Control	85-567 Central Colorado Project	Vail and Beaver Creek, Colorado	1978 NR Yes	Agr. (P), For- estry Rec. (P)	G/B: 8 acetone burning generators	5-40 g/hr, 3.4 kg AgI total	Orographic clouds, bands organized on mesoscale.	11 Days: Jan-Feb	C/B
<u>YUGOSLAVIA</u>											
YU-1	Res. Dev. Ops. Hail & Fog	85904 Target	Hail Suppression	SR Slovenia SR Croatia, SR Bosnia & Herzegovina SR Serbia and SR Macedonia	1967 Every year Yes	Agr. (G & P), Energy (G) Wea. Ser. (G)	Air: in-cloud seeding between -5°C and -15°C using rockets.	40 g/km ³ ; 1469 kg AgI total	Convective clouds. Gene- rally bases warmer than +10°C tops colder than -20°C. Criteria for seeding at least 40dbz at ht/0°C + 1.4 km and ht dbz max greater than ht 0°C; ht top greater than ht -28°C; ht 45 dbz greater than ht -14°C; log Z max greater than 4.5.	42 Days: 15 Apr - 15 Oct	Historic records Crop damage Hail pads C/B
YU-2	Res. Dev. Op.Fog	15 Target	Seeding at Open Coal Mine "Kolubara"		1986	Energy (G)	Ground: 15 liquid spray generators.	25 kg/hr; 2500 kg propane total	Seeding criteria: colder than -1°C and visibility less than 200m.	20 Days: 1 Dec - 1 Mar	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>ZIMBABWE</u>											
ZM-1	OP. PE(R)	390500 Target	National Cloud Seeding Operation (NACSO) ZIMBABWE	ZIMBABWE	1973 Every year Yes	Wea. Ser.	Air: 2 A/C seeding with pyrothnic flares at cloud top and in- cloud at -10°C or below.	1505 Cartridges type TB 2 consumed (AgI) to seed 1106 clouds	Convective clouds. Generally bases warmer than +10°C tops between 0°C and -20°C. Developing CU with tops at or below -10°C (about 21000 ft above mean sea level) are seeded.	63 Days 17 Nov 1986 10 Apr 1987	C/B

V-ADDRESSES OF REPORTING AGENCIES

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ZIMBABWE

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VI-REPORTS ON COMPLETED WEATHER MODIFICATION PROJECTS

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WORLD METEOROLOGICAL ORGANIZATION
=====

REPORT ON COMPLETED WEATHER MODIFICATION PROJECT

(Please mark X in box or boxes which apply)

MEMBER OF WMO: ...Federal Republic of Germany.....

1. DESCRIPTION OF PROJECT

1.1 Project identification (name/location/organization)

DE/3 Stuttgart Area

Universität Hohenheim, Institut f. Landeskultur und Pflanzenökologie

... (320), Postfach 700562, 7000 Stuttgart 70, Germany

.....

.....

.....

1.2 Purpose(s) of project

Precipitation augmentation - rainfall ☐ snow ☐

Hail suppression ☒

Lightning suppression ☐

Other (please specify) :

.....

1.3 Major cloud type involved :

Orographic ☐ Cumulus ☒ Stratiform ☐ Frontal ☐

2. DURATION OF PROJECT

2.1 Project duration in years: since 1979. (operational since 1980 Juli) ...
= 8 seasons

2.2 Operational period within each year :

From: ..21.. April To: 10..Oct. inclusive. 173 days

3. SEEDING OPERATION

3.1 Seeding agent : AgI ☒ CO₂ ☐ NaCl ☐

Other (please specify) :

3.2 Generator(s) : On ground ☐ Airborne ☒

If on ground, please give number of generators :

3.3 Procedure for airborne seeding :

Altitude of seeding (m) ..cloud base.(~1000-1500 m).....

Length of seeding track (m or km) 2000 m

Seeding rate (Kg h⁻¹) 0:150-0.600 kg/hail call.....

4. PROJECT DESIGN

4.1 Basic design :

Target only ☐ Target + control ☒ Cross-over ☐

4.2 Distance between areas (km) : 100 and adjacent.....

4.3 Area definition :

Fixed ☒ Variable ☐

If variable, give basis for definition :

4.4 Area subdivisions, if any (give number and nature)

...5 control areas (4 adjacent, same surface than target).....
1 distant control area

5. PROJECT SITE

5.1 Project terrain :

Mountainous ☐ Hilly ☒ Flat ☐

5.2 Size of target area (km²) .. 2500 km².....

5.3 Size of control area (km²) , 4 every ~ 2500 km² , 1 further ~ 1000 km² .

5.4 Number of precipitation gauges :

5.4.1 All types of precipitation gauges in target area :

All types of precipitation gauges in control area :

5.4.2 Recording precipitation gauges in target area :

Recording precipitation gauges in control area :

5.5 Other verification quantities (e.g., radar reflectivity ~~aircraft~~
cloud measurements ~~hailpads~~, :

6. EXPERIMENTAL UNIT

6.1 Duration of unit in hours or days : ..173.days.(09-20^h).every.season..

6.2 Conditions determining whether unit is seedable or not :

-Pre criteria: aerological conditions at 0°UTC and for convection
- Criteria: radar: PPJ: ≥ 25 dbz core intensity if between -5° C isotherme
- 20° C isotherme. RHJ > 25000 ft tops

6.3 total number of units seeded and not seeded (in case of cross-over
design this applies to each area) :
.....

6.4 Randomization of experimental units : No-randomisation, due to economical
purposes

Unrestricted ☐ Restricted ☐

If restricted, give nature of restriction :

6.5 Standard seeding period (hours) :

7. OVERALL PROJECT RESULTS (no stratification or partitioning) (under way)

7.1 Name of statistical test(s) and/or analysis (analyses) :

a) Precipitation, b) testing of differences frequency distributions of echo
intensities, treated cells/untreated cells, c) hail stone diameter (hailpads): gau
bivariate function

7.2 Transformation(s) for each test :

7.3 Results for each test and/or analysis :

7.3.1 Qualitative : (tendency to:)

No	More	Less	Less
Differ-	Precipi-	Precipi-	Hail
ence <input type="checkbox"/>	tation <input checked="" type="checkbox"/>	tation <input type="checkbox"/>	Mass <input checked="" type="checkbox"/>

Other qualitative results : not yet sufficient cases!

7.3.2 Quantitative :

Seed/no-seed ratio: Statistical significance: ..sec. 7.3.1

8. BASIS FOR ASSESSMENT OF RESULTS

8.1 Analytical specifications fixed BEFORE the project began

8.1.1 Nature of stratification(s), if any : duration > .45 DBZ ... 3). mean-max. hail
diamet. 4) hail total energy

8.1.2 Sample size for each stratification (No. of seed/no-seed units) :

Seed: ... > 30 cases

No seed:7.....

8.1.3 Test(s) and/or analysis (analyses) for each stratification :

..... to 3) in 8.11. gauss bivariate function

8.1.4 Transformation(s) for each stratification and each test :

.....

8.1.5 Results for each stratification, test and transformation :

Qualitative :

Quantitative :

8.2 Analytical specifications chosen AFTER the project began

8.2.1 Nature of partitioning(s) :

8.2.2 Sample size for each partition (No. of seed/no-seed units) :

Seed:

No seed:

8.2.3 Test(s) and/or analysis (analyses) for each partition :

.....

8.2.4 Transformation(s) for each partition and each test :

.....

8.2.5 Results for each partition, test and transformation :

Qualitative :

Quantitative :

9. EXTENDED AREA EFFECTS (i.e., outside the target area)

9.1 Sign of effect : lee precipitation amount on seeding days (no significant)
trend to increase

9.2 Maximum distance observed :

9.3 Statistical significance (size of area and probability) :

.....

10. COMMENTS

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11. PRINCIPAL REFERENCES TO PUBLISHED RESULTS (where details of above may be found) :

1) Müller, W. (1982): Hagelklimatologische Kennzeichnung des Stuttgarter Gebietes, Arch. Met. Geophys. Bioklim. 1982, Ser. B 31 151-157

2) Müller, W. (1985): Preliminary results of a non-randomized hail suppression project. WMO Weather Modif. Prog. WMP Rep. 2, WMO/TD No. 53, vol. II 571-574

3) Müller, W. (1985): Hagelbekämpfung in Baden-Württemberg in: Hagelbekämpfung Hagelforschung Bayr. Staatsministerium f. Wasserwirtschaft und Verkehr, München 1985, pp. 21-31

4) Müller, W. (1986): Reliable methods in hail prevention. - J. of Weather Modif. vol. 18
in press: a) Hail climatology in Stuttgart area
b) Influence of hail suppression experiment by AgJ on the precipitation amount?
c) Zur räumlichen und zeitlichen Verteilung von Radarechos ≥ 45 dbz (potentiellen "Hagelzellen") in Südwestdeutschland (Stuttgarter Gebiet)

WORLD METEOROLOGICAL ORGANIZATION
=====

REPORT ON COMPLETED WEATHER MODIFICATION PROJECT

(Please mark X in box or boxes which apply)

MEMBER OF WMO: Federal Republic of Germany.....

1. DESCRIPTION OF PROJECT

1.1 Project identification (name/location/organization)

.....
Hail Suppression
.....
Muehldorf - Altoetting
.....
.....
.....
.....

1.2 Purpose(s) of project

Precipitation augmentation - rainfall ☐ snow ☐
Hail suppression ☒
Lightning suppression ☐
Other (please specify) :
.....

1.3 Major cloud type involved :

Orographic ☐ Cumulus ☐ Stratiform ☒ Frontal ☒

2. DURATION OF PROJECT

2.1 Project duration in years: from 1983 - 1987

2.2 Operational period within each year :

From: 01.7.05 To: inclusive.
May September

3. SEEDING OPERATION

3.1 Seeding agent : AgI ☒ CO₂ ☐ NaCl ☐

Other (please specify) :

3.2 Generator(s) : On ground ☐ Airborne ☒

If on ground, please give number of generators :

3.3 Procedure for airborne seeding :

Altitude of seeding (m) 500 m - 3000 m

Length of seeding track (m or km) 15 km

Seeding rate (Kg h⁻¹) 4.1 tr. per hour

4. PROJECT DESIGN

4.1 Basic design :

Target only ☐ Target + control ☒ Cross-over ☐

4.2 Distance between areas (km) : 200

4.3 Area definition :

Fixed ☐ Variable ☒

If variable, give basis for definition :

4.4 Area subdivisions, if any (give number and nature)

.....

5. PROJECT SITE

5.1 Project terrain :

Mountainous ☐ Hilly ☒ Flat ☒

5.2 Size of target area (km²) 200

5.3 Size of control area (km²) 400

5.4 Number of precipitation gauges :

5.4.1 All types of precipitation gauges in target area : 1

All types of precipitation gauges in control area : 1

5.4.2 Recording precipitation gauges in target area :

Recording precipitation gauges in control area :

5.5 Other verification quantities (e.g., radar reflectivity, aircraft cloud measurements, hailpads, etc.) :

.....

6. EXPERIMENTAL UNIT

6.1 Duration of unit in hours or days :

6.2 Conditions determining whether unit is seedable or not :

.....

6.3 Total number of units seeded and not seeded (in case of cross-over design this applies to each area) :

.....

6.4 Randomization of experimental units :

Unrestricted ☐ Restricted ☐

If restricted, give nature of restriction :

.....

6.5 Standard seeding period (hours) :

7. OVERALL PROJECT RESULTS (no stratification or partitioning)

7.1 Name of statistical test(s) and/or analysis (analyses) :

.....

7.2 Transformation(s) for each test :

7.3 Results for each test and/or analysis :

7.3.1 Qualitative :

No	More	Less	Less
Differ-	Precipi-	Precipi-	Hail
ence <input type="checkbox"/>	tation <input type="checkbox"/>	tation <input type="checkbox"/>	Mass <input type="checkbox"/>

Other qualitative results :

.....

7.3.2 Quantitative :

.....

Seed/no-seed ratio: Statistical significance:

8. BASIS FOR ASSESSMENT OF RESULTS

8.1 Analytical specifications fixed BEFORE the project began

8.1.1 Nature of stratification(s), if any :

8.1.2 Sample size for each stratification (No. of seed/no-seed units) :

Seed: No seed:

8.1.3 Test(s) and/or analysis (analyses) for each stratification :

.....

8.1.4 Transformation(s) for each stratification and each test :

.....

8.1.5 Results for each stratification, test and transformation :

Qualitative :

Quantitative :

8.2 Analytical specifications chosen AFTER the project began

8.2.1 Nature of partitioning(s) :

8.2.2 Sample size for each partition (No. of seed/no-seed units) :

Seed: No seed:

8.2.3 Test(s) and/or analysis (analyses) for each partition :

.....

8.2.4 Transformation(s) for each partition and each test :

.....

8.2.5 Results for each partition, test and transformation :

Qualitative :

Quantitative :

9. EXTENDED AREA EFFECTS (i.e., outside the target area)

9.1 Sign of effect :

9.2 Maximum distance observed :

9.3 Statistical significance (size of area and probability) :

.....

10. COMMENTS

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11. PRINCIPAL REFERENCES TO PUBLISHED RESULTS (where details of above may be found) :

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WORLD METEOROLOGICAL ORGANIZATION
=====

REPORT ON COMPLETED WEATHER MODIFICATION PROJECT

(Please mark X in box or boxes which apply)

MEMBER OF WMO: GREECE

1. DESCRIPTION OF PROJECT

1.1 Project identification (name/location/organization)

.- National Hail Suppression Programme of Greece (NHSP)

- Northern Greece

.- National Crop and Social Insurance Agency (OGA)

.....

.....

.....

1.2 Purpose(s) of project

Precipitation augmentation - rainfall ☐ snow ☐

Hail suppression ☒

Lightning suppression ☐

Other (please specify) :

.....

1.3 Major cloud type involved :

Orographic ☐ Cumulus ☒ Stratiform ☐ Frontal ☐

2. DURATION OF PROJECT

2.1 Project duration in years: 5 years (1984-1988)

2.2 Operational period within each year :

From: 15 April To: 30 September inclusive.

3. SEEDING OPERATION

3.1 Seeding agent : AgI ☒ CO₂ ☐ NaCl ☐

Other (please specify) :

3.2 Generator(s) : On ground ☐ Airborne ☒

If on ground, please give number of generators :

3.3 Procedure for airborne seeding :

Altitude of seeding (m) 5000 m. (-10° C)

Length of seeding track (m or km) 5000 m

Seeding rate (Kg h⁻¹) 14,4 Kg

4. PROJECT DESIGN

4.1 Basic design :

Target only ☐ Target + control ☒ Cross-over ☒

4.2 Distance between areas (km) : Zero

4.3 Area definition :

Fixed ☒ Variable ☐

If variable, give basis for definition :

4.4 Area subdivisions, if any (give number and nature)

5. PROJECT SITE

5.1 Project terrain :

Mountainous ☒ Hilly ☒ Flat ☒

5.2 Size of target area (km²) 1000

5.3 Size of control area (km²) 1000

5.4 Number of precipitation gauges :

5.4.1 All types of ^{Hailpads}~~precipitation gauges~~ in target area : ...130.....

All types of ^{Hailpads}~~precipitation gauges~~ in control area : ..130.....

5.4.2 Recording precipitation gauges in target area :None.....

Recording precipitation gauges in control area :None.....

5.5 Other verification quantities (e.g., radar reflectivity, aircraft cloud measurements, hailpads, :

.....Hailpads.....

6. EXPERIMENTAL UNIT

6.1 Duration of unit in hours or days : 24 hours

6.2 Conditions determining whether unit is seedable or not :

35 dbz about - 5°C

6.3 Total number of units seeded and not seeded (in case of cross-over design this applies to each area) :

15 days each area

6.4 Randomization of experimental units :

Unrestricted ☒ Restricted ☐

If restricted, give nature of restriction :

.....

6.5 Standard seeding period (hours) : ...24. hours.....

7. OVERALL PROJECT RESULTS (no stratification or partitioning)
Preliminary results

7.1 Name of statistical test(s) and/or analysis (analyses) :

Mann Whitney U Test

7.2 Transformation(s) for each test : ..None.....

7.3 Results for each test and/or analysis :

7.3.1 Qualitative : (tendency to:)

No	More	Less	Less
Differ-	Precipi-	Precipi-	Hail
ence <input type="checkbox"/>	tation <input type="checkbox"/>	tation <input type="checkbox"/>	Mass <input checked="" type="checkbox"/>

Other qualitative results :

.....

7.3.2 Quantitative :

Seed/no-seed ratio: ...70 %.... Statistical significance:95 %....

8. BASIS FOR ASSESSMENT OF RESULTS

8.1 Analytical specifications fixed BEFORE the project began (not applied)

8.1.1 Nature of stratification(s), if any : None

8.1.2 Sample size for each stratification (No. of seed/no-seed units) :

Seed: No seed:

8.1.3 Test(s) and/or analysis (analyses) for each stratification :

.....

8.1.4 Transformation(s) for each stratification and each test :

.....

8.1.5 Results for each stratification, test and transformation :

Qualitative :

Quantitative :

8.2 Analytical specifications chosen AFTER the project began

8.2.1 Nature of partitioning(s) :None.....

8.2.2 Sample size for each partition (No. of seed/no-seed units) : 1984 - 86

Seed: ...39..... No seed:39.....

8.2.3 Test(s) and/or analysis (analyses) for each partition :

.....Mann Whitney U Test.....

8.2.4 Transformation(s) for each partition and each test :

None

.....

8.2.5 Results for each partition, test and transformation :

Qualitative :

Quantitative :70% reduction.....

9. EXTENDED AREA EFFECTS (i.e., outside the target area)

9.1 Sign of effect :

9.2 Maximum distance observed :

9.3 Statistical significance (size of area and probability) :

.....95%.....

10. COMMENTS

.....
.....
.....
.....
.....

11. PRINCIPAL REFERENCES TO PUBLISHED RESULTS (where details of above may be found) :

Results are in OGA reports.....
.....
.....
.....
.....

WORLD METEOROLOGICAL ORGANIZATION
=====

REPORT ON COMPLETED WEATHER MODIFICATION PROJECT

(Please mark X in box or boxes which apply)

MEMBER OF WMO: ..Jordan..Meteorological..Department.....

1. DESCRIPTION OF PROJECT

1.1 Project identification (name/location/organization)

.....Jordan..Rain..Enhancement..Programmc.....

.....Jordan.....

.....Meteorological Department.....

.....

.....

.....

.....

.....

1.2 Purpose(s) of project

Precipitation augmentation - rainfall ☒ snow ☐

Hail suppression ☐

Lightning suppression ☐

Other (please specify) :

.....

1.3 Major cloud type involved :

Orographic ☒ Cumulus ☒ Stratiform ☒ Frontal ☒

2. DURATION OF PROJECT

2.1 Project duration in years: 1987/1988 is the second year

2.2 Operational period within each year :

From: 1st.....Nov. To: 15th.....Apr.inclusive.

3. SEEDING OPERATION

3.1 Seeding agent : AgI ☒ CO₂ ☐ NaCl ☐

Other (please specify) :

3.2 Generator(s) : On ground ☒ Airborne ☒

If on ground, please give number of generators :¹².....

3.3 Procedure for airborne seeding :

Altitude of seeding (m) 0°C To -10°C

Length of seeding track (m or km)Variable.....

Seeding rate (Kg h⁻¹)2.1 gm/min. Per Generator.....

4. PROJECT DESIGN

4.1 Basic design :

Target only ☒ Target + control ☐ Cross-over ☐

4.2 Distance between areas (km) :

4.3 Area definition :

Fixed ☐ Variable ☒

If variable, give basis for definition :

4.4 Area subdivisions, if any (give number and nature)

5. PROJECT SITE

5.1 Project terrain :

Mountainous ☒ Hilly ☒ Flat ☐

5.2 Size of target area (km²)60,000.....

5.3 Size of control area (km²)

5.4 Number of precipitation gauges :

5.4.1 All types of precipitation gauges in target area :

All types of precipitation gauges in control area :

5.4.2 Recording precipitation gauges in target area :3.4.....

Recording precipitation gauges in control area :

5.5 Other verification quantities (e.g., radar reflectivity, aircraft cloud measurements, hailpads, etc.) : .Radar..Step.Scans,..Aircraft....
data - Temp., press., Liq. water, Ice particle concentrations
.....

6. EXPERIMENTAL UNIT

6.1 Duration of unit in hours or days :

6.2 Conditions determining whether unit is seedable or not :

.....

6.3 Total number of units seeded and not seeded (in case of cross-over design this applies to each area) :

.....

6.4 Randomization of experimental units :

Unrestricted ☐ Restricted ☐

If restricted, give nature of restriction :

.....

6.5 Standard seeding period (hours) : ... 3 hrs.

7. OVERALL PROJECT RESULTS (no stratification or partitioning)

7.1 Name of statistical test(s) and/or analysis (analyses) :

... None Performed to Date

7.2 Transformation(s) for each test :

7.3 Results for each test and/or analysis :

7.3.1 Qualitative :

No	More	Less	Less
Differ-	Precipi-	Precipi-	Hail
ence <input type="checkbox"/>	tation <input type="checkbox"/>	tation <input type="checkbox"/>	Mass <input type="checkbox"/>

Other qualitative results :

.....

7.3.2 Quantitative :

Seed/no-seed ratio: Statistical significance:

8. BASIS FOR ASSESSMENT OF RESULTS

8.1 Analytical specifications fixed BEFORE the project began

8.1.1 Nature of stratification(s), if any :

8.1.2 Sample size for each stratification (No. of seed/no-seed units) :

Seed: No seed:

8.1.3 Test(s) and/or analysis (analyses) for each stratification :
.....

8.1.4 Transformation(s) for each stratification and each test :
.....

8.1.5 Results for each stratification, test and transformation :
Qualitative :
Quantitative :

8.2 Analytical specifications chosen AFTER the project began

8.2.1 Nature of partitioning(s) :

8.2.2 Sample size for each partition (No. of seed/no-seed units) :

Seed: No seed:

8.2.3 Test(s) and/or analysis (analyses) for each partition :
.....

8.2.4 Transformation(s) for each partition and each test :
.....

8.2.5 Results for each partition, test and transformation :
Qualitative :
Quantitative :

9. EXTENDED AREA EFFECTS (i.e., outside the target area)

9.1 Sign of effect :

9.2 Maximum distance observed :

9.3 Statistical significance (size of area and probability) :

.....

10. COMMENTS

.....To date we have been conducting an operational.....
programme. In the near future however, its our intension
.....
to conduct a research effort to better understand the precip
.....
process and benifits of cloud seeding in Jordan .
.....

.....

11. PRINCIPAL REFERENCES TO PUBLISHED RESULTS (where details of above may be found) :

.....

.....

.....

.....

.....

ORGANISATION METEOROLOGIQUE MONDIALE
=====

RAPPORT SUR UN PROJET DE MODIFICATION ARTIFICIELLE
DU TEMPS DEJA REALISE

[veuillez cocher (x) dans la ou les cases appropriées]

MEMBRE DE L'OMM :MADAGASCAR..AR.I.....

1. DESCRIPTION DU PROJET

1.1 Identification du projet (titre/zone d'exécution/organisation)

Region de Vohémar.....
.....
.....
.....
.....
.....

1.2 But(s) du projet

Augmentation des précipitations Pluie /+ / Neige / /
Suppression de la grêle / /
Suppression de la foudre / /
Autres modifications (veuillez préciser) : ..Sécheresse...../+ /....
.....

1.3 Principaux types de nuages traités :

Orographiques /+ / Cumulus /+ / Stratiformes / / Système frontal / /

2. DUREE DU PROJET

2.1 Durée du projet, en années : ...1986

2.2 Période opérationnelle au cours de chaque année :
du ...mois de Janvier..... au ...mois d'Avril..... (inclusivement)

3. OPERATIONS D'ENSEMENCEMENT

3.1 Agents d'ensemencement : AgI ☐ CO₂ ☐ NaCl ☒
Autres (veuillez préciser) :

3.2 Générateur(s) : Au sol ☐ Aéroporté(s) ☒
Dans le cas de générateurs au sol, veuillez indiquer le nombre de
générateurs utilisés :
.....

3.3 Méthode d'ensemencement par appareil aéroporté
Altitude de l'ensemencement (m) ...2.000 à 3.000 Mètres
Longueur de la trajectoire suivie
pour l'ensemencement (m ou km)5 km.....
Taux d'ensemencement (Kg h⁻¹)15 Kg par heure.....

4. CONCEPTION DU PROJET

4.1 Conception de base :

Zone cible ☒ Zone cible et ☐ Zone cible et/ou zone
seulement ☒ zone témoin ☐ témoin sans distinction ☐

4.2 Distance entre les zones (km) :

4.3 Définition d'une zone :

Fixe ☒ Variable ☐

Si elle est variable, veuillez indiquer les critères de définition :

.....
.....

4.4 Subdivisions des zones, le cas échéant (indiquer le nombre et la nature)

.....

.....

5. SITE DU PROJET

5.1 Terrain

Peu
Montagneux / / Accidenté / + / Plat / /

5.2 Superficie de la zone cible (km²) : 400.....

5.3 Superficie de la zone témoin (km²) :

5.4 Nombre de pluviomètres : deux

5.4.1 Tous types de pluviomètres dans la zone cible : ...Oui.....

Tous types de pluviomètres dans la zone témoin :

5.4.2 Pluviographes dans la zone cible :un.....

Pluviographes dans la zone témoin :

5.5 Autres mesures de vérification (par exemple, réflectivité radar, mesure des nuages par aéronefs, coussins à grêle, etc.) :

Néant

6. UNITE EXPERIMENTALE : non traitée

6.1 Durée de l'unité en heures ou en jours :

6.2 Conditions permettant de déterminer si une unité est ensemencable ou pas :

.....

6.3 Nombre total d'unités ensemencées et non ensemencées (dans le cas de la conception avec zone cible et/ou zone témoin, sans distinction, ceci s'applique à chaque zone) :

.....

.....

6.4 Répartition aléatoire des unités expérimentales :

Illimitée ☐ Limitée ☐

Dans ce dernier cas, indiquer la nature des limites fixées :

.....

6.5 Période standard d'ensemencement (heures) :

7. RESULTATS D'ENSEMBLE DU PROJET (pas de stratification ni de division)

7.1 Test(s) statistique(s) et/ou analyse(s) : comparaison des
résultats obtenus avec les données statistiques

7.2 Transformation(s) pour chaque test :

7.3 Résultats de chaque test et/ou analyse :

7.3.1 Qualitatifs :

Pas de diffé- Augmentation + Diminution Diminution
rence ☐ des précipi- ☐ des préci- ☐ de la masse ☐
tations pitations de grêle

Autres résultats qualitatifs : ..Néant.....

.....

7.3.2 Quantitatifs :

Rapport ensemencement/pas d'ensemencement : ...positif.....

Signification statistique : . + 120 à 180 % par rapport à la normale

8. CRITERES CHOISIS POUR L'EVALUATION DES RESULTATS non traité

8.1 Spécifications analytiques fixées AVANT le projet

8.1.1 Nature de la ou des stratification(s), le cas échéant :

.....

8.1.2 Dimension de l'échantillon pour chaque stratification (nombre d'unités
ensemencement/pas d'ensemencement) :

Ensemencement : Pas d'ensemencement :

8.1.3 Test(s) et/ou analyse(s) pour chaque stratification :

.....

8.1.4 Transformation(s) pour chaque stratification et pour chaque test :

.....

8.1.5 Résultats pour chaque stratification, test et transformation :

Qualitatifs :

Quantitatifs :

8.2 Spécifications analytiques choisies APRES le projet

8.2.1 Nature de la ou des subdivision(s) :

.....

8.2.2 Dimension de l'échantillon pour chaque subdivision (nombre d'unité
ensemencement/pas d'ensemencement) :

Ensemencement : Pas d'ensemencement :

8.2.3 Test(s) et/ou analyse(s) pour chaque subdivision :

.....

8.2.4 Transformation(s) pour chaque subdivision et chaque test :

.....

8.2.5 Résultats pour chaque subdivision, test et transformation :

Qualitatifs :

Quantitatifs :

9. EFFETS OBSERVES (c'est-à-dire à l'extérieur de la zone cible)

9.1 Indice de l'effet : développement nuageux et pluie fine au début des
opérations

9.2 Distance maximale observée : ... 15 à 20 km

9.3 Signification statistique (superficie de la zone et probabilité) :

.....

10. COMMENTAIRES

Opérations très rares effectuées dans cette zone.....
.....
.....
.....
.....

11. PRINCIPALES REFERENCES A DES RESULTATS PUBLIES (dans lesquels sont indiqués les détails des procédures ci-dessus) :

.....Néant.....
.....
.....
.....
.....

ORGANISATION METEOROLOGIQUE MONDIALE
=====

RAPPORT SUR UN PROJET DE MODIFICATION ARTIFICIELLE
DU TEMPS DEJA REALISE

[veuillez cocher (x) dans la ou les cases appropriées]

MEMBRE DE L'OMM : .. Directeur de la Météorologie Nationale .. ROYAUME DU MAROC ..

1. DESCRIPTION DU PROJET

1.1 Identification du projet (titre/zone d'exécution/organisation)

..... Le Programme consiste à l'augmentation

..... Titre: AL GHAI T

..... Zone d'exécution: HAUT ATLAS et CENTRAL; ATLAS

..... Organisation: Direction de la Météorologie

Nationale

1.2 But(s) du projet

Augmentation des précipitations Pluie ☒ Neige ☒

Suppression de la grêle ☐

Suppression de la foudre ☐

Autres modifications (veuillez préciser) :

1.3 Principaux types de nuages traités :

Orographiques ☒ Cumulus ☒ Stratiformes ☒ Système frontal ☒

2. DUREE DU PROJET

2.1 Durée du projet, en années : 5. pour une première période.....

2.2 Période opérationnelle au cours de chaque année :

du 01. Novembre au 30. Avril (inclusivement)

3. OPERATIONS D'ENSEMENCEMENT

3.1 Agents d'ensemencement : AgI ☒ CO₂ ☐ NaCl ☐

Autres (veuillez préciser) :

3.2 Générateur(s) : Au sol ☒ Aéroporté(s) ☒

Dans le cas de générateurs au sol, veuillez indiquer le nombre de générateurs utilisés :

7 pour le moment 11 prochainement

3.3 Méthode d'ensemencement par appareil aéroporté

Altitude de l'ensemencement (m) ..AU NIVEAU.T. = < - 8°C.....

Longueur de la trajectoire suivie
pour l'ensemencement (m ou km) 40. Km.....

Taux d'ensemencement (Kg h⁻¹) 0,36. Kg / h.....

4. CONCEPTION DU PROJET

4.1 Conception de base :

Zone cible Zone cible et Zone cible et/ou zone
seulement ☐ zone témoin ☒ témoin sans distinction ☐

4.2 Distance entre les zones (km) : 100 km

4.3 Définition d'une zone :

Fixe ☒ Variable ☐

Si elle est variable, veuillez indiquer les critères de définition :

.....

.....

4.4 Subdivisions des zones, le cas échéant (indiquer le nombre et la nature)

.....
.....

5. SITE DU PROJET

5.1 Terrain

Montagneux / X / Accidenté / / Plat / /

5.2 Superficie de la zone cible (km²) : 15000 Km²

5.3 Superficie de la zone témoin (km²) :

5.4 Nombre de pluviomètres :

5.4.1 Tous types de pluviomètres dans la zone cible : .3.....

Tous types de pluviomètres dans la zone témoin : 15.....

5.4.2 Pluviographes dans la zone cible :4.....

Pluviographes dans la zone témoin :

5.5 Autres mesures de vérification (par exemple, réflectivité radar, mesure des nuages par aéronefs, coussins à grêle, etc.) :

.....réflectivité radar, paramètre microphysique par avion.....

.....laboratoire tel que concentration en eau liquide et.....
cristaux de glace

6. UNITE EXPERIMENTALE

6.1 Durée de l'unité en heures ou en jours :

6.2 Conditions permettant de déterminer si une unité est ensemençable ou pas :

... Analyse mesoechelle et résultats des modèles microphysiques...
telque "Guide" "Atlas modèle"

6.3 Nombre total d'unités ensemençées et non ensemençées (dans le cas de la conception avec zone cible et/ou zone témoin, sans distinction. ceci s'applique à chaque zone) :

.....
.....

6.4 Répartition aléatoire des unités expérimentales:

Illimitée ☐ limitée ☐

Dans ce dernier cas, indiquer la nature des limites fixées :

.....

6.5 Période standard d'ensemencement (heures) :

7. RESULTATS D'ENSEMBLE DU PROJET (pas de stratification ni de division)

7.1 Test(s) statistique(s) et/ou analyse(s) :

.....

7.2 Transformation(s) pour chaque test :

7.3 Résultats de chaque test et/ou analyse :

7.3.1 Qualitatifs :

Pas de diffé- Augmentation Diminution Diminution
rence ☐ des précipi- ☐ des préci- ☐ de la masse ☐
 tations pitations de grêle

Autres résultats qualitatifs :

.....

7.3.2 Quantitatifs :

Rapport ensemencement/pas d'ensemencement :

Signification statistique :

8. CRITERES CHOISIS POUR L'EVALUATION DES RESULTATS

8.1 Spécifications analytiques fixées AVANT le projet

8.1.1 Nature de la ou des stratification(s), le cas échéant :

.....

8.1.2 Dimension de l'échantillon pour chaque stratification (nombre d'unités ensemencement/pas d'ensemencement) :

Ensemencement : Pas d'ensemencement :

8.1.3 Test(s) et/ou analyse(s) pour chaque stratification :

.....

- 8.1.4 Transformation(s) pour chaque stratification et pour chaque test :
.....
- 8.1.5 Résultats pour chaque stratification, test et transformation :
Qualitatifs :
Quantitatifs :
- 8.2 Spécifications analytiques choisies APRES le projet
- 8.2.1 Nature de la ou des subdivision(s) :
.....
- 8.2.2 Dimension de l'échantillon pour chaque subdivision (nombre d'unité
ensemencement/pas d'ensemencement) :
Ensemencement : Pas d'ensemencement :
- 8.2.3 Test(s) et/ou analyse(s) pour chaque subdivision :
.....
- 8.2.4 Transformation(s) pour chaque subdivision et chaque test :
.....
- 8.2.5 Résultats pour chaque subdivision, test et transformation :
Qualitatifs :
Quantitatifs :
- 9. EFFETS OBSERVES (c'est-à-dire à l'extérieur de la zone cible)
- 9.1 Indice de l'effet :
- 9.2 Distance maximale observée :
- 9.3 Signification statistique (superficie de la zone et probabilité) :
.....

10. COMMENTAIRES

.....
.....
.....
.....
.....

11. PRINCIPALES REFERENCES A DES RESULTATS PUBLIES (dans lesquels sont indiqués les détails des procédures ci-dessus) :

.....
.....
.....
.....
.....

ORGANISATION METEOROLOGIQUE MONDIALE
=====

RAPPORT SUR UN PROJET DE MODIFICATION ARTIFICIELLE
DU TEMPS DEJA REALISE

[veuillez cocher (x) dans la ou les cases appropriées]

MEMBRE DE L'OMM :SUISSE.....

1. DESCRIPTION DU PROJET

1.1 Identification du projet (titre/zone d'exécution/organisation)

GROSSVERSUCH IV.....
We have given all information about this project in the last questionnaire.
In the meantime the final report appeared in: Federer, B. et al., 1986:
.....
Main Results of Grossversuch IV. J. Climate Appl. Meteor., 25, 917-957.
.....
.....
.....

1.2 But(s) du projet

Augmentation des précipitations Pluie ☐ Neige ☐
Suppression de la grêle ☐
Suppression de la foudre ☐

Autres modifications (veuillez préciser) :
.....

1.3 Principaux types de nuages traités :

Orographiques ☐ Cumulus ☐ Stratiformes ☐ Système frontal ☐

2. DUREE DU PROJET

2.1 Durée du projet, en années :

2.2 Période opérationnelle au cours de chaque année :

du au (inclusivement)

3. OPERATIONS D'ENSEMENCEMENT

3.1 Agents d'ensemencement : AgI ☐ CO₂ ☐ NaCl ☐

Autres (veuillez préciser) :

3.2 Générateur(s) : Au sol ☐ Aéroporté(s) ☐

Dans le cas de générateurs au sol, veuillez indiquer le nombre de
générateurs utilisés :

.....

3.3 Méthode d'ensemencement par appareil aéroporté

Altitude de l'ensemencement (m)

Longueur de la trajectoire suivie
pour l'ensemencement (m ou km)

Taux d'ensemencement (Kg h⁻¹)

4. CONCEPTION DU PROJET

4.1 Conception de base :

Zone cible ☐ Zone cible et ☐ Zone cible et/ou zone
seulement ☐ zone témoin ☐ témoin sans distinction ☐

4.2 Distance entre les zones (km) :

4.3 Définition d'une zone :

Fixe ☐ Variable ☐

Si elle est variable, veuillez indiquer les critères de définition :

.....

.....

4.4 Subdivisions des zones, le cas échéant (indiquer le nombre et la nature)

.....
.....

5. SITE DU PROJET

5.1 Terrain

Montagneux Accidenté Plat

5.2 Superficie de la zone cible (km²) :

5.3 Superficie de la zone témoin (km²) :

5.4 Nombre de pluviomètres :

5.4.1 Tous types de pluviomètres dans la zone cible :

Tous types de pluviomètres dans la zone témoin :

5.4.2 Pluviographes dans la zone cible :

Pluviographes dans la zone témoin :

5.5 Autres mesures de vérification (par exemple, réflectivité radar, mesure des nuages par aéronefs, coussins à grêle, etc.) :

.....
.....

6. UNITE EXPERIMENTALE

6.1 Durée de l'unité en heures ou en jours :

6.2 Conditions permettant de déterminer si une unité est ensemencable ou pas :

.....

6.3 Nombre total d'unités ensemencées et non ensemencées (dans le cas de la conception avec zone cible et/ou zone témoin, sans distinction, ceci s'applique à chaque zone) :

.....
.....

6.4 Répartition aléatoire des unités expérimentales :

Illimitée ☐ Limitée ☐

Dans ce dernier cas, indiquer la nature des limites fixées :

.....

6.5 Période standard d'ensemencement (heures) :

7. RESULTATS D'ENSEMBLE DU PROJET (pas de stratification ni de division)

7.1 Test(s) statistique(s) et/ou analyse(s) :

.....

7.2 Transformation(s) pour chaque test :

7.3 Résultats de chaque test et/ou analyse :

7.3.1 Qualitatifs :

Pas de diffé- Augmentation Diminution Diminution
rence ☐ des précipi- ☐ des préci- ☐ de la masse ☐
tations tations de grêle

Autres résultats qualitatifs :

.....

7.3.2 Quantitatifs :

Rapport ensemencement/pas d'ensemencement :

Signification statistique :

8. CRITERES CHOISIS POUR L'EVALUATION DES RESULTATS

8.1 Spécifications analytiques fixées AVANT le projet

8.1.1 Nature de la ou des stratification(s), le cas échéant :

.....

8.1.2 Dimension de l'échantillon pour chaque stratification (nombre d'unités ensemencement/pas d'ensemencement) :

Ensemencement : Pas d'ensemencement :

8.1.3 Test(s) et/ou analyse(s) pour chaque stratification :

.....

8.1.4 Transformation(s) pour chaque stratification et pour chaque test :

.....

8.1.5 Résultats pour chaque stratification, test et transformation :

Qualitatifs :

Quantitatifs :

8.2 Spécifications analytiques choisies APRES le projet

8.2.1 Nature de la ou des subdivision(s) :

.....

8.2.2 Dimension de l'échantillon pour chaque subdivision (nombre d'unité
ensemencement/pas d'ensemencement) :

Ensemencement : Pas d'ensemencement :

8.2.3 Test(s) et/ou analyse(s) pour chaque subdivision :

.....

8.2.4 Transformation(s) pour chaque subdivision et chaque test :

.....

8.2.5 Résultats pour chaque subdivision, test et transformation :

Qualitatifs :

Quantitatifs :

9. EFFETS OBSERVES (c'est-à-dire à l'extérieur de la zone cible)

9.1 Indice de l'effet :

9.2 Distance maximale observée :

9.3 Signification statistique (superficie de la zone et probabilité) :

.....

ANNEXE B, p. 6

10. COMMENTAIRES

.....
.....
.....
.....
.....

11. PRINCIPALES REFERENCES A DES RESULTATS PUBLIES (dans lesquels sont indiqués les détails des procédures ci-dessus) :

.....
.....
.....
.....
.....

VII-REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

List of Members reporting NO weather modification projects in 1986

AUSTRALIA	STATE OF KUWAIT
BAHAMAS	LEBANON
BAHRAIN	LUXEMBOURG
BARBADOS	MALAWI
BELGIQUE	MALTA
BOTSWANA	MAURITIUS
BRUNEI	MOZAMBIQUE
CANADA	THE NETHERLANDS
CHILE	NOUVELLE-CALEDONIE
COLOMBIA	PAKISTAN
DENMARK	POLAND
FIJI	STATE OF QATAR
FINLAND	RWANDA
GABON	SAUDI ARABIA
GERMAN DEMOCRATIC REPUBLIC	SEYCHELLES
GHANA	SINGAPORE
GUINE-BISSAU	SUDAN
GUYANA	SYRIAN ARAB REPUBLIC
HAITI	TOGO
ICELAND	TRINIDAD AND TOBAGO
IRAQ	TUNISIE
IRELAND	TURKEY
KENYA	UNITED KINGDOM
REPUBLIC OF KOREA	VANUATU

WORLD METEOROLOGICAL ORGANIZATION

APPENDIX A, ANNEX A

CLOUD PHYSICS AND WEATHER MODIFICATION RESEARCH PROGRAMME

QUESTIONNAIRE
TO GATHER DATA FOR THE 1986
REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

PLEASE MARK APPROPRIATE BOXES

MEMBER OF WMO

No weather modification activities in 1986 ☐

(Please return this form even if no weather modification activities have taken place this year).

1. TYPE (PURPOSE) OF WEATHER MODIFICATION ACTIVITY OR PROJECT:

- (a) Precipitation enhancement ☐
Activity is response to emergency (e.g., droughts) ☐
Activity is for routine water supply augmentation ☐
Goal is to extend wet period ☐
Goal is to increase precipitation during wet period ☐

(b) Precipitation redistribution ☐
(c) Hail suppression ☐
(d) Fog dispersal ☐
(e) Other (please specify) :

2. THIS IS PRIMARILY A
(Research ☐)
(Development ... ☐) ACTIVITY
(Operational ... ☐)

3. PROJECT AREA

- (a) Approximate size of the project target area (km²) :
(b) Approximate size of the control area (if used) (km²) :

APPENDIX A, ANNEX A, p.2

4. NAME AND/OR REFERENCE OF PROJECT :
-
5. LOCATION OF AREA IN WHICH PROJECT IS CARRIED OUT :
-
6. PROJECT HISTORY
- (a) Year project started :
- (b) Has project been implemented each year since it was started ?
- Yes ☐ No ☐ Not known ☐
- (c) Is it expected to continue during the coming year ?
- Yes ☐ No ☐ Not known ☐
7. NATURE OF ORGANIZATION SPONSORING PROJECT
(Please place X in appropriate box)

=====		
ACTIVITY OF ORGANIZATION	GOVERNMENT	PRIVATE
=====		
Agriculture		
Energy		
Forestry		
Hydrology		
Research Foundation		
Transportation		
Weather Service		
Other (please specify)		

8. PROJECT ACTIVITY THIS YEAR

- (a) During the current reporting year, what months did seeding or other weather modification activity take place ?

.....

(Note: if reporting period extends over two years, as it might if a project spanning December and January is being reported, please indicate the years being reported, one example might be: December 1985, January-February 1986; another might be: January-February 1986, December 1986).

- (b) On how many days did this activity take place ?

9. DESCRIPTION OF WEATHER MODIFICATION APPARATUS, MODIFICATION AGENT AND THEIR DISPERSAL RATES, TECHNIQUES EMPLOYED, ETC. (see instructions)

- (a) Seeding delivery system :

Ground ☐ How many generators ? ☐

Aircraft ☐ How many aircrafts ? ☐

Rockets ☐ Artillery shells ☐

Other (please specify) :

- (b) Type of Generator :

Acetone burner ☐ Pyrotechnic flare ☐

Explosive ☐ Liquid spray ☐

Solid dispersal ☐ Other :

- (c) Location of release of seeding material :

Ground ☐ Cloud base ☐

Cloud top ☐ In-cloud ☐

If release is in-cloud, at what temperature or other criterion ?

.....

.....

APPENDIX A, ANNEX A, p.4

Seeding Material	Rate of Consumption (give units)	Total Consumption during this year (kg)
AgI
PbI ₂
Dry Ice
NaCl
Propane
.....
.....
.....

10. CHARACTERISTICS OF CLOUDS TREATED :

(a) Convective (cumulus) Orographic Layer (stratiform)

(b) Generally, the cloud base temperatures (°C) are :

Warmer than +10°C Colder than +10°C

(c) Generally, the cloud top temperatures are :

Warmer than 0°C

Colder than 0°C but warmer than -20°C

Colder than -20°C

(d) Criteria used to select days or clouds for treatment :

.....

11. PROVISIONS FOR EVALUATION

- (a) None ☐
- (b) Randomized experiment ☐
- (c) Comparison with historical records ☐
- (d) Crop damage ☐ Hail pads ☐
- (e) Other :
- (f) Is a document on the evaluation
available or planned? YES ☐ NO ☐
- (g) If so, is it available to WMO ? YES ☐ NO ☐

12. MISCELLANEOUS

- (a) Was an environmental impact
study prepared for this
project YES ☐ NO ☐
- (b) Has an analysis been made of the
expected (or actual) costs and
benefits ? YES ☐ NO ☐

13. ORGANIZATION IN CHARGE OF PROJECT :

- (a) Name of key technical person :
- (b) Organization :
- (c) Postal address :
.....
.....

14. OPTIONAL REMARKS :

.....
.....
.....
.....

APPENDIX A, ANNEX A, p.6

15. REPORTING AGENCY :

(a) Name of reporting agency :

(b) Official title of responsible office :

.....

(c) Postal address :

.....

.....

.....

.....

.....
(Signature)

.....
(Date)

Please complete and return this questionnaire as soon as possible, and
in any case not later than 31 December 1987 to :

The Secretary-General
World Meteorological Organization
Case Postale No. 5
CH-1211-GENEVA-20
Switzerland

NOTES FOR COMPLETING REPORT ON WEATHER MODIFICATION ACTIVITIES

Weather modification activities which should be included in the Register

The seeding or dispersing into clouds or fog of any substance with the object of altering drop-size distribution, producing ice crystals or the coagulation of droplets, altering the development of hail or lightning, or influencing in any way the natural development cycle of clouds or their environment.

Any other activity performed with the intention of producing artificial changes in the composition, behaviour or dynamics of the atmosphere.

For example :

- (a) The use of fires or heat sources to influence convective circulation or to evaporate fog;
- (b) The modification of the solar radiation exchange of the earth or clouds, through the release of gases, dusts, liquids or aerosols into the atmosphere;
- (c) The modification of the characteristics of land or water surfaces by dusting or treating with powders, liquid sprays, dyes, or other materials;
- (d) The releasing of electrically charged or radioactive particles, or ions, into the atmosphere;
- (e) The application of shock waves, sonic energy sources, or other explosive or acoustic sources to the atmosphere;
- (f) The use of aircraft and helicopters to produce downwash for fog dispersal as well as the use of jet engines and other sources of artificial wind generation;
- (g) The use of lasers or other sources of electromagnetic radiation;

Weather modification activities which need not be included in the Register

Activities of a purely local nature, such as the use of lightning deflection or static discharge devices in aircraft, boats, or buildings, or the use of small heat sources, fans, fogging devices, aircraft downwash, or sprays to prevent the occurrence of frost in tracts or fields planted with crops susceptible to frost or freeze damage.

Note: One completed copy of this form is requested for each weather modification activity (hereafter referred to as the project).

APPENDIX A, ANNEX A, p.8

ADDITIONAL EXPLANATION
OF QUESTIONS FOR THE
REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

-
- ITEM 1 - Mark (X) in the box that corresponds to purpose of activity. By project is meant a related series of weather modification activities having a common objective and conducted at a particular location.
- ITEM 2 - Mark (X) in the box corresponding to goal of the activity:
- Research - investigating scientific questions;
 - Development - field work to optimize procedures;
 - Operational - field work intended directly for economic benefits.
- ITEM 3 - The Target Area is the area over which an effect is sought. The Control Area (or Areas) are areas that are chosen so as to be unaffected by the seeding material and used to evaluate results within the Target Area.
- ITEM 4 - Enter the name and/or reference of projects used by operator. If the project was reported in the previous Register, please quote the WMO Register number which appears in column 1.
- ITEM 5 - Indicate the location of the weather modification project by geographical co-ordinates and name of the region.
- ITEM 6 - (a) Enter the year in which the first activities under the present project took place;
- (b) Indicate if there were breaks in activities or if activities took place each year since it was started;
- (c) Indicate whether the project is expected to continue by marking (X) in the appropriate box.
- ITEM 7 - Indicate the principal interests of the organization that funds the project by marking (X) in the appropriate box (use multiple marks if appropriate).
- ITEM 8 - During what months did the project operate in the field and on how many days did operations take place ? Any other information related to the scope of the activity would be helpful. In some cases projects span two years. It is desirable that the portion conducted only within the reporting year be included in the Register for a particular year. If this is not practical, please indicate the years in which the activities took place, for example, December 1985, January-February 1986.

- ITEM 9 - By weather modification apparatus is meant any apparatus used with the intention of producing artificial changes in the composition, behaviour or dynamics of the atmosphere. For example: AgI smoke generators, propane devices, flares, rockets, artillery projectiles, jet engines, etc.
- (a) Seeding delivery system. Indicate, by marking (X) in the appropriate box, the nature of the delivery system, ground based, airborne, etc.;
 - (b) Indicate the way the seeding material is prepared for dispersal (e.g., by burning an acetone solution of silver iodide complex). Solid dispersal refers to the release of pellets (e.g., dry ice), powder (e.g., NaCl), etc.;
 - (c) Indicate the location at which seeding material is dispersed.
 - (d) Indicate what seeding material is used and the rate of dissemination (mass per unit of time, mass per cloud, etc.). Indicate total amount of material dispensed during the reporting period in kilograms.
- ITEM 10 -
- (a) Indicate, by marking (X) in the box, the general characteristics of the clouds that are selected for treatment;
 - (b) Indicate the predominate range of cloud base temperatures;
 - (c) Indicate the predominate range of cloud top temperatures;
 - (d) What are the characteristics that distinguish days or clouds that are treated from those that are not treated ?
- ITEM 11 - This question relates to the evaluation of the effectiveness of the project. More information on the means used to judge the merit of the project are welcomed and can be described under Item 14 or on a separate page.
- ITEM 12 - This question relates to any analysis that has been made to predict and/or measure the total change in the environment that is affected by the activity and, separately, the economic benefits expected or achieved.
- ITEM 13 - Please supply the name and address of agency to which any request for further information should be directed.
- ITEM 14 - This item is to permit the reporting person to include any information not covered by items 1 through 13 but which he feels is significant or of interest such as references to published reports describing results of the weather modification operation or experiment. Any information not previously reported, definite plans for a new project, information that is sought, etc. may be outlined under Item 14.
- ITEM 15 - Please supply the name and address of the agency that is transmitting this information to WMO.

ORGANISATION METEOROLOGIQUE MONDIALE

APPENDIX A, ANNEX B
(FRENCH)

PROGRAMME DE RECHERCHE SUR LA PHYSIQUE DES NUAGES ET
LA MODIFICATION ARTIFICIELLE DU TEMPS

QUESTIONNAIRE A REMPLIR

AFIN DE FOURNIR DES DONNEES POUR
L'INVENTAIRE 1986 DES PROJETS NATIONAUX DE MODIFICATION ARTIFICIELLE DU TEMPS

COCHER LA CASE CORRESPONDANTE

MEMBRE DE L'OMM

Le Membre n'a pas déployé d'activité de modification
artificielle du temps en 1986 ☐

(Veuillez renvoyer ce formulaire, même si aucune activité de
modification artificielle du temps n'a eu lieu cette année)

1. TYPE (OBJECTIF) D'ACTIVITE OU DE PROJET DE MODIFICATION ARTIFICIELLE
DU TEMPS :

(a) Augmentation des précipitations ☐

Activité déployée à la suite d'une situation
d'exception (par exemple, sécheresse) ☐

Activité déployée en prévision d'une augmentation
régulière de l'approvisionnement en eau ☐

Il s'agit de prolonger la période humide ☐

Il s'agit d'augmenter les précipitations
pendant la période humide ☐

(b) Redistribution des précipitations ☐

(c) Suppression de la grêle ☐

(d) Dispersion du brouillard ☐

(e) Divers (veuillez préciser)

2. IL S'AGIT PRINCIPALEMENT D'UNE ACTIVITE (de recherche ☐
(de développement .. ☐
(d'exploitation ☐
3. ZONE COUVERTE PAR LE PROJET
(a) Superficie approximative de la zone cible du projet (km²) :
(b) Superficie approximative de la zone témoin
(le cas échéant) (km²) :
4. TITRE ET/OU NUMERO DE REFERENCE DU PROJET :
.....
5. REPERAGE DE LA ZONE DANS LAQUELLE LE PROJET EST EXECUTE :
.....
6. HISTORIQUE DU PROJET
(a) Année durant laquelle le projet a été entrepris :
(b) Les activités d'exécution du projet ont-elles eu lieu chaque
année depuis le début des travaux ?
Oui ☐ Non ☐ Indéterminé ☐
(c) Est-il prévu de poursuivre le projet au cours de l'année
prochaine ?
Oui ☐ Non ☐ Indéterminé ☐

APPENDIX A, ANNEX B, p.3

7. CARACTERE DE L'ORGANISME QUI PATRONNE LE PROJET (veuillez cocher la case appropriée) :

=====		
ACTIVITE DE L'ORGANISME	ORGANISME GOUVERNEMENTAL	ORGANISME PRIVE
=====		
Agriculture		
Energie		
Sylviculture		
Hydrologie		
Fondation de recherche		
Transports		
Service météorologique		
Divers (veuillez préciser)		

8. ACTIVITES RELATIVES AU PROJET EN 1986

- (a) Quels sont les mois de l'année considérée pendant lesquels ont eu lieu des opérations d'ensemencement ou d'autres activités de modification artificielle du temps ?

.....

(Note : Si la période considérée porte sur deux ans, comme ce pourrait être le cas pour un projet s'étendant sur les mois de décembre et de janvier, veuillez indiquer les années faisant l'objet du rapport; exemples possibles : décembre 1985, janvier-février 1986, ou janvier-février 1986, décembre 1986).

- (b) Nombre de jours de l'année durant lesquels ont eu lieu ces activités ?

.....

9. DESCRIPTION DES APPAREILS UTILISES POUR LA MODIFICATION DU TEMPS, DES AGENTS DE MODIFICATION ET DE LEUR VITESSE DE DISPERSION, DES METHODES EMPLOYEES, ETC. (voir les instructions)

(a) Système de dispersion de la substance d'ensemencement :

Au sol	<input type="checkbox"/>	Nombre de générateurs	<input type="checkbox"/>
Aéronef	<input type="checkbox"/>	Nombre d'appareils	<input type="checkbox"/>
Fusées	<input type="checkbox"/>	Projectiles d'artillerie	<input type="checkbox"/>

Divers (veuillez préciser)

(b) Type de générateur :

Brûleur à acétone	<input type="checkbox"/>	Fusée pyrotechnique	<input type="checkbox"/>
Explosif	<input type="checkbox"/>	Vaporisation de liquide	<input type="checkbox"/>
Dispersion de solide	<input type="checkbox"/>	Divers	

(c) Lieu de dispersion de la substance d'ensemencement :

Au sol	<input type="checkbox"/>	A la base du nuage	<input type="checkbox"/>
Au sommet du nuage	<input type="checkbox"/>	Dans le nuage	<input type="checkbox"/>

Si la dispersion est effectuée dans le nuage, à quelle température ou en fonction de quel autre critère ?

.....

.....

SUBSTANCE D'ENSEMENCEMENT	VITESSE DE CONSOMMATION (indiquer les unités)	CONSOMMATION TOTALE DURANT L'ANNEE (kg)
AgI
PbI ₂
Neige carbonique
NaCl
Propane
.....
.....
.....

APPENDIX A, ANNEX B, p.5

10. CARACTERISTIQUES DES NUAGES ENSEMENCES :

- (a) Convectifs ☐ Orographiques ☐ Couche (stratiforme) ☐
- (b) En règle générale, les températures à la base des nuages (°C) sont :
supérieures à +10°C ☐ inférieures à +10°C ☐
- (c) En règle générale, les températures au sommet des nuages sont :
supérieures à 0°C ☐
inférieures à 0°C mais supérieures à -20°C ☐
inférieures à -20°C ☐
- (d) Critères de sélection des jours d'ensemencement ou des nuages ensemencés :
.....
.....
.....

11. DISPOSITIONS PRISES EN VUE D'UNE EVALUATION

- (a) Aucune ☐
- (b) Expérience aléatoire ☐
- (c) Comparaison avec des relevés anciens ☐
- (d) Dégâts aux récoltes ☐ Coussins à grêle ☐
- (e) Divers :
- (f) Existe-t-il ou est-il prévu d'élaborer un document sur l'évaluation de l'activité ? Oui ☐ Non ☐
- (g) Le cas échéant, est-il possible de le mettre à la disposition de l'OMM ? Oui ☐ Non ☐

12. DIVERS

- (a) Une étude concernant les effets de ce projet sur l'environnement a-t-elle été préparée ? Oui ☐ Non ☐

(b) Les coûts et les avantages
escomptés (ou réels) ont-ils
été analysés ?

Oui ☐

Non ☐

13. ORGANISME RESPONSABLE DU PROJET :

(a) Nom du responsable technique :

(b) Organisme :

(c) Adresse :

.....

.....

14. REMARQUES FACULTATIVES :

.....

.....

.....

15. ORGANISME QUI FOURNIT LES RENSEIGNEMENTS

(a) Nom de l'organisme :

(b) Titre officiel du bureau responsable :

.....

(c) Adresse :

.....

.....

.....

(Signature)

.....

(Date)

Veillez remplir ce questionnaire et le renvoyer dès que possible, et
dans tous les cas avant le 31 décembre 1987, à l'adresse suivante :

Monsieur le Secrétaire général
Organisation météorologique mondiale
Case postale N° 5
CH-1211 GENEVE 20

APPENDIX A, ANNEX B, p.7

NOTES EXPLICATIVES POUR REMPLIR LE QUESTIONNAIRE SUR LES
ACTIVITES DE MODIFICATION ARTIFICIELLE DU TEMPS

Activités de modification artificielle du temps qui devraient figurer dans l'inventaire

L'ensemencement ou la dispersion dans les nuages ou dans le brouillard de toute substance visant à modifier la distribution de la dimension des gouttes, à produire des cristaux de glace ou à coaguler les gouttelettes, à modifier l'évolution de la grêle ou de la foudre ou à influencer d'une manière ou d'une autre le cycle naturel de l'évolution des nuages ou leur environnement.

Toute autre activité déployée dans l'intention de produire des modifications artificielles de la composition, du comportement ou de la dynamique de l'atmosphère.

Par exemple :

- (a) L'utilisation de feux ou de sources de chaleur pour influencer la circulation convective ou pour évaporer le brouillard.
- (b) La modification du bilan du rayonnement solaire de la Terre et des nuages par la libération, dans l'atmosphère, de gaz, de poussières, de liquides ou d'aérosols.
- (c) La modification des caractéristiques des surfaces terrestres ou aquatiques par poudrage ou par des traitements ayant recours à des poudres, des arrosages, des colorants ou d'autres substances.
- (d) La libération dans l'atmosphère de particules radioactives ou électriquement chargées ou bien d'ions.
- (e) L'application à l'atmosphère d'ondes de choc, de sources d'énergie acoustique ou d'autres sources explosives ou acoustiques.
- (f) L'utilisation du souffle des avions et des hélicoptères pour dissiper le brouillard, ainsi que l'utilisation de réacteurs et d'autres sources de vent artificiel.
- (g) L'utilisation de laser ou d'autres sources de rayonnement électromagnétique.

Activités de modification artificielle du temps qu'il n'est pas nécessaire d'inclure dans l'inventaire

Activités de caractère purement local, par exemple, l'utilisation de parafoudres et de dispositifs de décharge statique sur des aéronefs, des bateaux ou des bâtiments, ou bien l'utilisation de petites sources de chaleur, de ventilateurs, de dispositifs fumigènes, de souffles d'aéronefs ou d'arrosages pour éviter les gelées dans les régions ou les champs plantés de cultures que le gel risque d'endommager.

Note : Il convient de fournir un exemplaire dûment rempli de de formulaire pour chaque activité de modification artificielle du temps (dénommée ci-après le projet)

EXPLICATIONS COMPLEMENTAIRES
CONCERNANT LE QUESTIONNAIRE A REMPLIR POUR
L'INVENTAIRE DES PROJETS NATIONAUX DE MODIFICATION ARTIFICIELLE DU TEMPS

-
- QUESTION 1 - Marquer d'une croix (x) la case qui correspond à l'objectif de l'activité. Par projet on entend une suite d'activités de modification du temps ayant un objectif commun et se déroulant à un endroit donné.
- QUESTION 2 - Marquer d'une croix (x) la case correspondant au but de l'activité :
- o recherche - portant sur des questions scientifiques;
 - o développement - activités pratiques déployées à des fins d'optimisation des procédures;
 - o exploitation - activités pratiques directement axées sur des avantages économiques.
- QUESTION 3 - La zone cible est la zone dans laquelle on cherche à obtenir une réaction. La ou les zones témoins sont choisies de manière à ne pas être touchées par la substance d'ensemencement et utilisées pour évaluer les résultats obtenus dans la zone cible.
- QUESTION 4 - Inscrire le titre et/ou le numéro de référence du projet utilisé par l'exécutant. Si le projet a été mentionné dans l'inventaire précédent, veuillez indiquer le numéro d'inventaire de l'OMM qui figure dans la colonne 1.
- QUESTION 5 - Repérer l'emplacement où est exécuté le projet de modification du temps en indiquant les coordonnées géographiques et le nom de la région.
- QUESTION 6 -
- (a) Indiquer l'année au cours de laquelle ont été déployées les premières activités du projet;
 - (b) Indiquer si les activités ont subi des interruptions ou si elles ont eu lieu chaque année depuis le début du projet;
 - (c) Indiquer s'il est prévu de poursuivre le projet en marquant une croix (x) dans la case appropriée.
- QUESTION 7 - Indiquer les principales activités de l'organisme qui finance le projet en marquant une croix (x) dans la case appropriée (marquer plusieurs croix, le cas échéant).

- QUESTION 8 - Indiquer les mois de l'année pendant lesquels les activités ont été déployées sur le terrain dans le cadre du projet et le nombre de jours d'activité. Tout autre renseignement sur le champ d'application de l'activité serait utile. Dans certains cas, le projet peut s'étendre sur deux ans. Il est souhaitable que seule la partie du projet exécutée pendant l'année considérée figure dans l'inventaire pour l'année en question. Si cela n'était pas possible, veuillez préciser les années pendant lesquelles les activités ont été déployées (par exemple, décembre 1985, janvier-février 1986).
- QUESTION 9 - L'expression "appareil utilisé pour la modification artificielle du temps" désigne ici tout appareil utilisé dans l'intention de produire des modifications artificielles de la composition du comportement ou de la dynamique de l'atmosphère. Par exemple, générateurs de fumées d'AgI, dispositifs à propane, torches, fusées, projectiles d'artillerie, moteurs à réaction, etc.
- (a) Système de dispersion de la substance d'ensemencement. Indiquer en marquant une croix (x) dans la case appropriée, la nature du système de dispersion au sol ou aéroporté, etc.
 - (b) Indiquer comment la substance d'ensemencement est préparée en vue de sa dispersion (par exemple, par combustion d'une solution d'iodure d'argent dans l'acétone). Par dispersion solide, on entend le dégagement de granulés (par exemple de neige carbonique), de poudre (par exemple de NaCl), etc.
 - (c) Indiquer le lieu de dispersion de la substance d'ensemencement.
 - (d) Indiquer la substance d'ensemencement qui est utilisée et la vitesse de dispersion (masse par unité de temps, masse par nuage, etc.). Indiquer, en kilogrammes, la quantité totale de substance dispersée durant toute la période à l'étude.
- QUESTION 10 -
- (a) Indiquer, en marquant une croix (x) dans la case appropriée les caractéristiques générales des nuages qui ont été choisis pour traitement.
 - (b) Indiquer l'intervalle prédominant de températures à la base des nuages.
 - (c) Indiquer l'intervalle prédominant de températures au sommet des nuages.
 - (d) Quelles sont les caractéristiques qui permettent de distinguer les jours d'ensemencement ou les nuages ensemencés des autres ?

APPENDIX A, ANNEX B, p.11

- QUESTION 11 - Cette question se rapporte à l'évaluation de l'efficacité du projet. Il sera fait grand cas de tous les renseignements portant sur les moyens utilisés pour juger les avantages et les inconvénients du projet qui pourraient être donnés en liaison avec la question 14 ou sur une feuille distincte.
- QUESTION 12 - Cette question se rapporte à toute analyse effectuée pour prévoir et/ou mesurer l'ensemble des modifications subies par l'environnement du fait de cette activité, ainsi que toute analyse distincte concernant les avantages économiques escomptés ou obtenus.
- QUESTION 13 - Veuillez indiquer le nom et l'adresse de l'organisme auquel il faut adresser toute demande de renseignements complémentaires.
- QUESTION 14 - Cette question doit permettre à la personne qui remplit le questionnaire de fournir tous les renseignements qui ne sont pas couverts par les questions 1 à 13 comprise et qu'elle juge significatifs ou intéressants, notamment les références à des publications sur les résultats de l'opération ou de l'expérience de modification artificielle du temps. Tout renseignement qui ne figure pas dans les questions qui précèdent, plans définitifs concernant un nouveau projet, renseignement recherché, etc. peut être exposé en liaison avec la question 14.
- QUESTION 15 - Veuillez indiquer le nom et l'adresse de l'organisme qui fournit ces renseignements à l'OMM.
-

ВСЕМИРНАЯ МЕТЕОРОЛОГИЧЕСКАЯ ОРГАНИЗАЦИЯ

APPENDIX A, ANNEX C
(RUSSIAN)

ПРОГРАММА ПО АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА ПОГОДУ

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ВОПРОСНИК

ПО СБОРУ ДАННЫХ ДЛЯ РЕЕСТРА ПРОЕКТОВ НА АКТИВНЫМ
ВОЗДЕЙСТВИЯМ НА ПОГОДУ - 1986 г.

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ПРОСЬБА ЗАПОЛНИТЬ СООТВЕТСТВУЮЩИЕ КВАДРАТЫ

ЧЛЕН ВМО

Деятельность по активному воздействию на погоду не проводилась в
1986 г. ☐

(Просьба прислать эту форму, даже если деятельность по актив-
ному воздействию на погоду в этом году не проводилась).

1. ВИД (ЦЕЛЬ) ДЕЯТЕЛЬНОСТИ ИЛИ ПРОЕКТА ПО АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА
ПОГОДУ:

а) Увеличение осадков ☐

Деятельность вызвана чрезвычайными обстоятель-
ствами (например, засухи) ☐

Деятельность осуществляется в целях обычного
увеличения водоснабжения ☐

С целью продления влажного периода ☐

С целью увеличения осадков в течение влажного
периода ☐

б) Перераспределение осадков ☐

APPENDIX A, ANNEX C, p.2

- с) Предотвращение града ☐
- б) Рассеивание тумана ☐
- е) Другие виды (просьба указать)
2. ЭТА ДЕЯТЕЛЬНОСТЬ НОСИТ ☐ (Исследований ☐)
ГЛАВНЫМ ОБРАЗОМ ХАРАКТЕР ☐ (..... ☐)
..... ☐ (Развития ☐)
..... ☐ (..... ☐)
..... ☐ (Оперативного ☐)
..... ☐ (свойства ☐)
3. РАЙОН ПРОЕКТА
- а) Приблизительный размер района цели проекта (км²):
- б) Приблизительный размер контрольного района (если используется) (км²):
4. НАЗВАНИЕ И/ИЛИ ОБОЗНАЧЕНИЕ ПРОЕКТА:
.....
5. МЕСТОНАХОЖДЕНИЕ РАЙОНА, ГДЕ ОСУЩЕСТВЛЯЕТСЯ ПРОЕКТ:
.....
6. ИСТОРИЯ ПРОЕКТА
- а) Год начала проекта:
- б) Осуществлялся ли проект каждый год после его начала?
- Да ☐ Нет ☐ Не известно ☐

с) Предполагается ли продолжение проекта в течение следующего года?

Да

☐

Нет

☐

Не известно

☐

7. ХАРАКТЕР ОРГАНИЗАЦИИ, ЗАКАЗАВШЕЙ ПРОЕКТ
(просьба поставить X в соответствующем месте)

ДЕЯТЕЛЬНОСТЬ ОРГАНИЗАЦИИ	ПРАВительСТВЕННАЯ	ЧАСТНАЯ
Сельское хозяйство		
Энергетика		
Лесное хозяйство		
Гидрология		
Научно-исследовательская		
Транспорт		
Служба погоды		
Прочие (просьба указать)		

8. ДЕЯТЕЛЬНОСТЬ ПО ПРОЕКТУ В ЭТОМ ГОДУ

а) В какие месяцы текущего отчетного года производился засев или проводилась другая деятельность по активному воздействию на погоду?

.....

(Примечание. Если отчетный период охватывает два года, например, при сообщении информации о проекте, осуществляемом в период декабря и января, то просьба указать годы. Пример: декабрь 1985 г., январь-февраль 1986 г.; другой пример: январь-февраль 1986 г., декабрь 1986 г.).

APPENDIX A, ANNEX C, p.4

b) Сколько дней проводилась эта деятельность?

9. ОПИСАНИЕ УСТРОЙСТВА АКТИВНОГО ВОЗДЕЙСТВИЯ НА ПОГОДУ, РЕАГЕНТОВ АКТИВНОГО ВОЗДЕЙСТВИЯ И СКОРОСТИ ИХ РАСПЫЛЕНИЯ, ИСПОЛЗУЕМЫХ МЕТОДОВ И Т.Д. (см. указания)

a) Система доставки материала для засева:

Наземная ☐ Сколько генераторов? ☐

Самолет ☐ Сколько самолетов? ☐

Ракеты ☐ Артиллерийские снаряды ☐

Прочая (просьба указать).....

b) Тип генератора:

Ацетоновая горелка ☐ Пиротехническая ракета ☐

Взрывчатое вещество ☐ Разбрызгиватель жидкости ☐

Распылитель твердых частиц ☐ Прочее:

c) Расположение выпуска засеивающего вещества:

Наземное ☐ Нижняя граница облаков ☐

Верхняя граница облаков ☐ В облаках ☐

Если выпуск осуществляется в облаке, то при какой температуре или другом критерии?

.....

.....

Реагент засева	Расход (указать единицы измерения)	Общий расход в в течение года (кг)
AgI
PbI ₂
Суход лед
NaCl
Пропан
.....
.....
.....

10. ХАРАКТЕРИСТИКИ ОБРАБАТЫВАЕМЫХ ОБЛАКОВ:

а) Конвективные (кучевые) ☐ Орографические ☐ Слои (слоистообразные) ☐

б) Преобладающая температура в нижней части облака (°C):

Выше +10°C ☐ Ниже +10°C ☐

с) Преобладающая температура в верхней части облака:

Выше 0°C ☐

Ниже 0°C, но выше -20°C ☐

Ниже -20°C ☐

д) Критерии, используемые при выборе дней или облаков для работы:

.....

.....

.....

APPENDIX A, ANNEX C, p.6

11. ОБОСНОВАНИЯ ДЛЯ ОЦЕНКИ

- a) Не имеется ☐
- b) Рандомизированный эксперимент ☐
- c) Сравнение с историческими данными ☐
- d) Ущерб урожаю ☐ Градомеры ☐
- e) Прочие:
- f) Имеется ли документ по оценке
или планируется таковой? ДА ☐ НЕТ ☐
- g) Если да, то можно ли его
направить в ВМО? ДА ☐ НЕТ ☐

12. РАЗНОЕ

- a) Была ли подготовлена для этого
проекта оценка влияния на
окружающую среду? ДА ☐ НЕТ ☐
- b) Проведен ли анализ предполагаемых
(или фактических) затрат и выгод? ДА ☐ НЕТ ☐

13. НАЗВАНИЕ ОРГАНИЗАЦИИ, ОТВЕТСТВЕННОЙ ЗА ПРОЕКТ:

- a) Фамилия главного технического лица:
- b) Организация:
- c) Почтовый адрес:
.....
.....

14. ЛЮБЫЕ ЗАМЕЧАНИЯ:

.....

.....

.....

.....

15. ОРГАНИЗАЦИЯ, НАПРАВЛЯЮЩАЯ ОТЧЕТ:

а) Название организации, направляющей отчет:

б) Официальное название ответственного подразделения:

.....

с) Почтовый адрес:

.....

.....

.....

.....

.....

(Подпись)

.....

(Дата)

Просьба заполнить и вернуть этот вопросник по возможности скорее
и в любом случае не позднее, чем 31 декабря 1987 г. по адресу:

The Secretary-General
World Meteorological Organization
Case Postale No. 5
CH-1211-GENEVA-20
Switzerland

ПРИМЕЧАНИЯ ПО СОСТАВЛЕНИЮ ОТЧЕТА О ДЕЯТЕЛЬНОСТИ
ПО АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА ПОГОДУ

Деятельность по активным воздействиям на погоду, которую следует включить в Реестр

Засеивание или распространение в облачности или тумане какого-либо вещества с целью изменения распределения размера капель, образования кристаллов льда или коагуляции капелек, изменение развития града или молний или осуществление какого-либо воздействия на естественное развитие цикла облаков или их окружение.

Любая другая деятельность, осуществляемая с целью вызывания искусственных изменений в составе, поведении или динамике атмосферы.

Например:

- a) Использование огня или источников тепла для оказания влияния на конвективную циркуляцию или для испарения тумана;
- b) Активное воздействие на обмен солнечной радиации земли или облаков посредством выделения в атмосферу газов, пыли, жидкостей или аэрозолей;
- c) Активное воздействие на характеристики поверхностей земли или воды при помощи опыления или обработки порошками, жидкими распылителями, красителями или другими веществами;
- d) Выделение в атмосферу электрически заряженных или радиоактивных частиц, или ионов;
- e) Применение в атмосфере ударных волн, источников звуковой энергии или других взрывных или акустических источников;
- f) Использование самолетов и вертолетов для создания нисходящих потоков в целях рассеивания тумана, а также использование реактивных двигателей и других источников создания искусственного ветра;

- g) Использование лазеров или других источников электромагнитной радиации.

Деятельность по активным воздействиям на погоду, которую не следует включать в Реестр

Деятельность, носящую чисто локальный характер, такую как использование отражателей молний или статистических разрядников на самолетах, судах или зданиях, или использование небольших источников тепла, вентиляторов, противотуманных устройств, создание нисходящего воздушного потока воздушными судами или распылителями для предотвращения заморозков на участках или полях с посевом культур, которым наносят ущерб заморозки или морозы.

Примечание. Просьба заполнить один экземпляр этой формы для каждого вида деятельности по активным воздействиям на погоду (в дальнейшем именуемого как проект).

ДОПОЛНИТЕЛЬНЫЕ ПОЯСНЕНИЯ
К ВОПРОСАМ ДЛЯ
РЕЕСТРА НАЦИОНАЛЬНЫХ ПРОЕКТОВ ПО АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА ПОГОДУ

- ПУНКТ 1 - Укажите значком (X) ячейку, которая соответствует целям деятельности. Под проектом подразумевается связанная серия действий по активным воздействиям на погоду, имеющих общую цель и проводимых в конкретном месте.
- ПУНКТ 2 - Укажите значком (X) ячейку, соответствующую цели деятельности:
- Исследовательская - вопросы научных исследований;
 - развитие - полевая работа по оптимизации процедур
 - оперативная - полевая работа, направленная непосредственно на достижение экономических выгод.
- ПУНКТ 3 - Под районом цели подразумевается район, в пределах которого предполагается обнаружить последствия деятельности по активному воздействию на погоду. Под контрольным районом (или районами) понимаются районы, которые выбраны так, чтобы они не подвергались воздействиям засевающих веществ; они используются для оценки результатов в пределах района цели.
- ПУНКТ 4 - Впишите название и/или обозначение проектов, используемых оператором. Если проект был зарегистрирован в предыдущем Реестре, просьба указать номер Реестра ВМО, который стоит в колонке 1.
- ПУНКТ 5 - С помощью географических координат и названия районов укажите место осуществления проекта по активным воздействиям на погоду.
- ПУНКТ 6 - а) Укажите год осуществления первоначальной деятельности по настоящему проекту;

- б) Укажите, были ли перерывы в деятельности или же она проводилась каждый год со времени начала;
- с) Укажите, предполагается ли продолжить проект в будущем, поставив значок (X) в соответствующей ячейке.

ПУНКТ 7 - Укажите основной род занятий организации, которая финансирует проект, обозначив значком (X) соответствующую ячейку (при необходимости используйте несколько значков).

ПУНКТ 8 - В какие месяцы и сколько дней осуществлялась оперативная полевая фаза проекта? Была бы полезна любая информация, касающаяся целей деятельности. В некоторых случаях проекты охватывают два года. Желательно включить в Реестр за конкретный год только ту часть, которая проводилась в отчетный период. Если это невозможно, просьба указать годы, в которые проводилась деятельность, например, декабрь 1985 г., январь-февраль 1986 г.

ПУНКТ 9 - Под устройством активного воздействия на погоду подразумеваются любые устройства, используемые с целью намеренного вызывания искусственных изменений в составе, поведении или динамике атмосферы. Например: генераторы засеивания йодистым серебром, пропановые устройства, пиротехнические устройства, ракеты, артиллерийские снаряды, реактивных двигатели и т.д.

- а) Система доставки засеивающих веществ. Укажите, обозначив значком (X) соответствующую ячейку, характер системы доставки - наземная, воздушная и т.д.;
- б) Укажите способ подготовки засеивающего вещества для распыления (например, путем сжигания ацетонового раствора соединения йодистого серебра). Распыление твердых частиц относится к рассеиванию ледяных крупинки (например, сухой лед), порошка (например, NaCl) и т.д.;
- с) Укажите, обозначив значком (X), соответствующую ячейку, место рассеивания засеивающего реагента;

APPENDIX A, ANNEX C, p.12

- d) Укажите, какие засеивающие реагенты используются и скорость рассеивания (масса на единицу времени, масса на облако и т.д.). Укажите в килограммах общее количество реагента, рассеянного в течение отчетного периода.

- ПУНКТ 10 -
- a) Укажите, обозначив значком (X), ячейку, общую характеристику облаков, которые выбраны для обработки;
 - b) Укажите преобладающий диапазон температур на нижней границе облака;
 - c) Укажите преобладающий диапазон температур на верхней границе облака;
 - d) По каким характеристикам отличают дни или облака, подвергнутые воздействию, от тех, которые не были подвергнуты воздействию?

- ПУНКТ 11 - Этот вопрос относится к оценке эффективности проекта. Предоставление большего объема информации по средствам, используемым для оценки положительных сторон проекта, только приветствуется, и эта информация может быть представлена под пунктом 14 или на отдельной странице.

- ПУНКТ 12 - Этот вопрос относится к любому анализу, проведенному с целью расчета и/или измерения общего изменения окружающей среды, подвергнутой воздействию, и отдельный вопрос касается предполагаемых или полученных экономических выгод.

- ПУНКТ 13 - Сообщите название и адрес организации, в которую можно направлять запросы о последующей информации.

- ПУНКТ 14 - Этот пункт позволит лицу, представляющему отчет, включить любую информацию, которая не вошла в пункты с 1 по 13, но которую он считает важной или представляющей интерес, такую, например, как ссылку на опубликованные отчеты, представляющие результаты осуществления активного воздействия на погоду или эксперимента. Любая не сообщавшаяся ранее информация, определенные планы на новый проект, поиск информации и т.д. могут быть отражены под пунктом 14.

ПУНКТ 15 - Просьба сообщить название и адрес учреждения, которое передает эту информацию ВМО.

ORGANIZACION METEOROLOGICA MUNDIAL

APPENDIX A, ANNEX D
(SPANISH))

PROGRAMA DE INVESTIGACION SOBRE LA FISICA DE NUBES
Y LA MODIFICACION ARTIFICIAL DEL TIEMPO

CUESTIONARIO

PARA RECOPIAR DATOS DESTINADOS AL INVENTARIO DE 1986
DE PROYECTOS NACIONALES DE MODIFICACION ARTIFICIAL DEL TIEMPO

SEÑALAR EN LA CASILLA CORRESPONDIENTE

MIEMBRO DE LA OMM

El Miembro no ha llevado a cabo actividades de modificación ☐ en 1986

(Sírvase devolver este formulario aunque no se haya llevado a cabo ninguna actividad de modificación artificial del tiempo este año.)

1. TIPO (FINALIDAD) DE LA ACTIVIDAD O DEL PROYECTO DE MODIFICACION ARTIFICIAL DEL TIEMPO:

a) Intensificación de la precipitación ☐

Esta actividad es la respuesta a una situación de urgencia (por ejemplo sequías) ☐

Esta actividad tiene por objeto lograr un aumento del abastecimiento normal de agua ☐

Se trata de prolongar el período húmedo ☐

Se trata de aumentar la precipitación durante el período húmedo ☐

b) Redistribución de la precipitación ☐

c) Supresión del granizo ☐

d) Dispersión de la niebla ☐

e) Otros (especifíquense):

2. SE TRATA PRINCIPALMENTE DE UNA ACTIVIDAD (de investigación ☐/ ((de desarrollo ☐/ ((operativa ☐/
3. ZONA QUE CUBRE EL PROYECTO
- a) Superficie aproximada de la zona del blanco (km²):
- b) Superficie aproximada de la zona de control (si procede) (km²):
4. NOMBRE Y/O REFERENCIA DEL PROYECTO:
.....
5. SITUACION DE LA ZONA EN LA QUE SE EJECUTA EL PROYECTO:
.....
6. HISTORIAL DEL PROYECTO
- a) Año del comienzo del proyecto:
- b) Indique si el proyecto se ha realizado cada año desde el principio de los trabajos
Sí ☐/ No ☐/ No se sabe ☐/
- c) ¿Se ha previsto que continúe el proyecto durante el año próximo?
Sí ☐/ No ☐/ No se sabe ☐/

APPENDIX A, ANNEX D, p.3

7. NATURALEZA DE LA ORGANIZACION QUE PATROCINA EL PROYECTO
(colóquese una X en la casilla que corresponda)

ACTIVIDAD DE LA ORGANIZACION	GUBERNAMENTAL	PRIVADA
Agricultura		
Energía		
Silvicultura		
Hidrología		
Fundación de investigación		
Transporte		
Servicio Meteorológico		
Otras actividades (especifíquense)		

8. ACTIVIDADES RELATIVAS AL PROYECTO EN 1986

- a) ¿Cuáles son los meses del año durante los cuales se han realizado operaciones de siembra u otras actividades de modificación artificial del tiempo?

.....

(Nota: Si el período abarca más de dos años, como podría ocurrir si un proyecto se realiza durante los meses de diciembre y enero, sírvase indicar los años de que trata el informe; ejemplos posibles: diciembre de 1985, enero-febrero de 1986 o enero-febrero de 1986, diciembre de 1986).

- b) Número de días durante los cuales se han llevado a cabo estas actividades

9. DESCRIPCION DE LOS APARATOS DE MODIFICACION ARTIFICIAL DEL TIEMPO, E INDICACION DE LOS AGENTES DE MODIFICACION Y SUS INDICES DE DISPERSION, TECNICAS EMPLEADAS, ETC. (véanse instrucciones)

- a) Procedimiento de siembra:

Desde tierra / / ¿Cuántos generadores? / /

Desde aeronaves ☐ ¿Cuántas aeronaves? ☐
 Mediante cohetes ☐ Projectiles de artillería ☐
 Otros (especifíquense):

b) Tipo de generador:

Quemador de acetona ☐ Fulguración pirotécnica ☐
 Explosivo ☐ Neutralizador líquido ☐
 Dispersión de sus- ☐ Otros:
 tancias sólidas

c) Lugar de lanzamiento del material de siembra:

En tierra ☐ Base de las nubes ☐
 Cima de las nubes ☐ Interior de las nubes ☐

Si el lanzamiento se hace en el interior de una nube, ¿a que temperatura o cuál criterio?

.....

=====

Material de siembra	Cantidad de material consumido (dar unidades)	Consumo total durante este año (kg)
------------------------	---	--

=====

AgI
PbI ₂
Hielo Seco
NaCl
Propano
.....
.....
.....

APPENDIX A, ANNEX D, p.5

10. CARACTERISTICAS DE LAS NUBES TRATADAS:

- a) Convectivas (cúmulos) ☐ Orográficas ☐ Capa de nubes (estratiforme) ☐
- b) En general las temperaturas de la base de las nubes (°C) son:
Superiores a +10°C ☐ Inferiores a +10°C ☐
- c) En general, las temperaturas en la cima de las nubes son:
Superiores a 0°C ☐
Inferiores a 0°C pero superiores a -20°C ☐
Inferiores a -20°C ☐
- d) Criterios de selección de los días de siembra o de las nubes sembradas:

.....
.....
.....

11. DISPOSICIONES QUE SE HAN TOMADO PARA REALIZAR LA EVALUACION

- a) Ninguna ☐
- b) Experimento aleatorio ☐
- c) Comparación con registros históricos ☐
- d) Daños causados a las cosechas ☐ Paquetes de granizo ☐
- e) Demás:
- f) Indique si existe o si se ha previsto preparar un documento sobre la evaluación de la actividad SI ☐ NO ☐
- g) Si procede indique si es posible facilitarlo a la OMM SI ☐ NO ☐

12. DIVERSOS

- a) Indique si se ha preparado un estudio sobre los efectos de este proyecto para el medio ambiente SI ☐ NO ☐

- b) Indique si se han analizado los costos y las ventajas previstos SI ☐ NO ☐

13. ORGANIZACION ENCARGADA DEL PROYECTO

- a) Nombre de la persona encargada de los aspectos técnicos
.....
- b) organización
.....
- c) dirección
.....
.....

14. DEMAS OBSERVACIONES:

.....
.....
.....
.....

15. ORGANISMO QUE PRESENTA LA INFORMACION:

- a) Nombre del organismo:.....
- b) Título oficial de la dependencia responsable:
.....
- c) Dirección:
.....
.....
.....

.....
(Firmado)

.....
(Fecha)

APPENDIX A, ANNEX D, p.7

Sírvase rellenar el presente cuestionario y devolverlo lo antes posible, y en todo caso antes del 31 de diciembre de 1987 a la dirección siguiente:

Señor Secretario General
Organización Meteorológica Mundial
Case Postale No. 5
CH-1211-GINEBRA-20
Suiza

NOTAS ACLARATORIAS PARA RELLENAR EL INFORME SOBRE ACTIVIDADES
DE MODIFICACION ARTIFICIAL DEL TIEMPO

Actividades de modificación artificial del tiempo que deberán consignarse en el inventario

La siembra o dispersión, en las nubes o en la niebla, de cualquier sustancia inyectada con objeto de alterar la distribución de las dimensiones de las gotas, que produzcan cristales de hielo o la coagulación de gotas minúsculas, que altere el proceso de formación de granizo o de descargas eléctricas, o que incluya de un modo u otro en el desarrollo natural del ciclo de formación de nubes o en el medio que las rodea.

Cualquier otra actividad, realizada con intención de producir por medios artificiales cambios en la composición, el comportamiento o la dinámica de la atmósfera.

Por ejemplo:

- a) la utilización de fuegos o de focos de calor con miras a influir en la circulación convectiva o a provocar la evaporación de la niebla;
- b) la modificación del intercambio de la radiación solar de la tierra o de las nubes, mediante la emisión de gases, polvos, líquidos o aerosoles en la atmósfera;
- c) la modificación de las características de las superficies terrestres o líquidas espolvoreándolas o tratándolas con sustancias pulverizadas, o con líquidos nebulizados, materias colorantes u otros materiales;
- d) la emisión en la atmósfera de partículas cargadas eléctricamente o de partículas radiativas, o bien de iones;
- e) la aplicación a la atmósfera de ondas de choque, fuentes de energía sónica u otras fuentes explosivas o acústicas;
- f) la utilización de aviones y helicópteros para la dispersión de la niebla mediante la corriente de aire provocada por las palas o hélices de los mismos, así como la utilización de reactores y de otros generadores artificiales de viento;
- g) la utilización de lasers u otras fuentes de radiación eletromagnética.

Actividades de modificación artificial del tiempo que no deberán consignarse en el inventario

Actividades de índole puramente local, tales como la utilización de pararrayos o dispositivos de descargas estáticas a bordo de los aviones, buques o edificios; o la utilización de pequeños focos caloríferos, de

APPENDIX A, ANNEX D, p.9

ventiladores, de generadores de humo; o el empleo de aeronaves con miras a aprovechar la corriente de aire provocada por las palas de los rotores o las hélices, o de riesgos para evitar la formación de hielo en zonas o terrenos en los que los cultivos son susceptibles de sufrir daños por causa de las heladas.

Nota: Se solicita el envío de un ejemplar relleno de este formulario para cada actividad de modificación artificial de tiempo (en adelante denominado proyecto).

EXPLICACION ADICIONAL
DE LAS PREGUNTAS QUE FIGURAN EN EL FORMULARIO PARA EL
INVENTARIO DE PROYECTOS NACIONALES DE MODIFICACION ARTIFICIAL DEL TIEMPO

- PREGUNTA 1 - Escribáse una (X) en la casilla que corresponda a la finalidad de la actividad. Se entiende por proyecto una serie relacionada de actividades de modificación artificial del tiempo que tiene un objetivo común y que se realiza en un lugar determinado.
- PREGUNTA 2 - Escribáse una (X) en la casilla correspondiente a la finalidad de la actividad:
- investigación - investigación de cuestiones científicas;
 - desarrollo - trabajos sobre el terreno para optimizar los procedimientos
 - operativa - trabajos sobre el terreno con la intención directa de obtener beneficios económicos.
- PREGUNTA 3 - La zona del blanco es aquella en la que se trata de obtener un efecto. La zona (o zonas) de control es aquella que se escoge para que no sea afectada por el material de siembra y se utiliza para evaluar los resultados dentro de la zona del blanco.
- PREGUNTA 4 - Consígnese el nombre y/o referencia de los proyectos que ejecuta el realizador. Si el proyecto fue comunicado ya en el inventario anterior, rogamos cite el número de inventario de la OMM que aparece en la columna 1.
- PREGUNTA 5 - Indíquese el lugar donde se ejecuta el proyecto de modificación artificial del tiempo mediante coordenadas geográficas y el nombre de la región.
- PREGUNTA 6 - a) Consígnese el año en que tuvieron lugar las primeras actividades en el marco del presente proyecto;
- b) indíquese si se han interrumpido las actividades o si se han realizado cada año desde el principio del proyecto;
- c) indíquese si está previsto que el proyecto continúe, señalando con una (X) la casilla adecuada.
- PREGUNTA 7 - Indíquense los principales intereses de la organización que financia el proyecto, señalando con una (X) la casilla apropiada (utilícense varias señales si es necesario).

APPENDIX A, ANNEX D, p.11

- PREGUNTA 8 - Indíquense los meses del año durante los cuales se han realizado actividades sobre el terreno en el marco del proyecto y el número de días de actividad. Cualquier otra información sobre el campo de aplicación de la actividad. Convendría que sólo se mencione en el inventario la parte del proyecto realizada durante el año de que se trata. Si esto no es posible, sírvase especificar los años durante los cuales se han realizado las actividades (por ejemplo: diciembre de 1985, enero-febrero de 1986).
- PREGUNTA 9 - Se entiende por aparato para la modificación artificial del tiempo cualquier aparato utilizado con la intención de producir cambios artificiales en la composición, comportamiento o dinámica de la atmósfera. Por ejemplo, generadores de humo de AgI, dispositivos de propano, fulguraciones, cohetes, proyectiles de artillería, reactores, etc.
- a) procedimiento de siembra, indíquese, señalando con una (X) la casilla adecuada, el carácter del sistema de emisión, con base en tierra, aerotransportado, etc.;
 - b) indíquese el modo en que se prepara el material de siembra para su dispersión (por ejemplo, quemando una solución de yoduro de plata en acetona). La dispersión de sustancias sólidas se refiere al lanzamiento de gránulos (por ejemplo, hielo seco), polvo (por ejemplo, NaCl), etc.;
 - c) indíquese el lugar en el que se dispersa el material de siembra;
 - d) indíquese qué material de siembra se utiliza y su índice de dispersión (masa por unidad de tiempo, masa por nube, etc.) Indíquese la cantidad total de material empleado durante el período de este informe en kilos.
- PREGUNTA 10
- a) Indíquese, señalando con una (X) la casilla adecuada, las características generales de las nubes que se seleccionan para el tratamiento;
 - b) indíquese el intervalo predominante de las temperaturas en la base de las nubes;
 - c) indíquese el intervalo predominante de las temperaturas en la cima de las nubes;
 - d) ¿Cuáles son las características distintivas de las nubes en los días en que se han sometido a tratamiento y de las nubes no tratadas?
- PREGUNTA 11 - Esta pregunta se refiere a la evaluación de la eficacia del proyecto. Se acogerá con satisfacción mayor información sobre los medios utilizados para juzgar los méritos del proyecto, y ello puede describirse bajo el punto 14 o en una página aparte.

- PREGUNTA 12 - Esta pregunta se refiere a cualquier análisis realizado para prever y/o medir el conjunto de las modificaciones del medio ambiente como consecuencia de esta actividad así como a cualquier análisis sobre las ventajas económicas previstas o alcanzadas.
- PREGUNTA 13 - Rogamos proporcione el nombre y dirección del organismo al que ha de dirigirse toda petición de mayor información.
- PREGUNTA 14 - Esta pregunta tiene por finalidad permitir que la persona que presenta el informe incluya toda información no tratada por las preguntas 1 a 13 pero que estime importante o de interés, como pueden ser las referencias a informes publicados en los que se describen los resultados de la operación o experimento de modificación artificial del tiempo. Toda información no consignada anteriormente, planes concretos para un nuevo proyecto, información que se solicita, etc. puede exponerse en la pregunta 14.
- PREGUNTA 15 - Rogamos proporcione el nombre y dirección del organismo que transmite esta información a la OMM.
-

APPENDIX B

COPY OF FORM FOR REPORT ON COMPLETED WEATHER MODIFICATION PROJECTS

APPENDIX B ANNEX A

WORLD METEOROLOGICAL ORGANIZATION
REPORT ON COMPLETED WEATHER MODIFICATION PROJECT

(Please mark X in box or boxes which apply)

Member of WMO:

1. Description of project

1.1 Project identification (name/location/organization)
.....
.....

1.2 Purpose(s) of project:
Precipitation augmentation - rainfall ☐ snow ☐
Hail suppression ☐
Lightning suppression ☐
Other (please specify)
.....

1.3 Major cloud type involved:
Orographic ☐ Cumulus ☐ Stratiform ☐ Frontal ☐

2. Duration of project

2.1 Project duration in years:
2.2 Operational period within each year: from
to inclusive.

3. Seeding operation

3.1 Seeding agent: AgI ☐ CO₂ ☐ NaCl ☐
Other (please specify)
3.2 Generator(s): On ground ☐ Airborne ☐
If on ground, please give number of generators

APPENDIX B ANNEX A, p.2

- 3.3 Procedure for airborne seeding:
Altitude of seeding m
Length of seeding track m or km
Seeding rate Kg h^{-1}

4. Project design

- 4.1 Basic design: Target only ☐ Target + control ☐
Cross-over ☐
4.2 Distance between areas: km
4.3 Area definition: Fixed ☐ Variable ☐
If variable, give basis for definition
4.4 Area subdivisions, if any (give number and nature)
.....

5. Project site

- 5.1 Project terrain: Mountainous ☐ Hilly ☐ Flat ☐
5.2 Size of target area: km^2
5.3 Size of control area: km^2
5.4 Number of precipitation gauges:
5.4.1. All types of precipitation gauges: in target area
in control area
5.4.2. Recording precipitation gauges: in target area
in control area
5.5 Other verification quantities (e.g. radar reflectivity, aircraft cloud
measurements, hailpads, etc.):
.....

6. Experimental unit

- 6.1 Duration of unit in hours or days:
6.2 Conditions determining whether unit is seedable or not:
.....
6.3 Total number of units seeded and not seeded (in case of cross-over
design this applies to each area):

- 6.4 Randomization of experimental units:
Unrestricted ☐ Restricted ☐
If restricted, give nature of restriction
.....
- 6.5 Standard seeding period: hours
7. Overall project results (no stratification or partitioning)
- 7.1 Name of statistical test(s) and/or analysis (analyses):
.....
- 7.2 Transformation(s) for each test:
- 7.3 Results for each test and/or analysis:
- 7.3.1 Qualitative:
No difference ☐ More precipitation ☐ Less precipitation ☐
Less hail mass ☐
Other qualitative results:
.....
- 7.3.2 Quantitative:
Seed/no-seed ratio: Statistical significance
8. Basis for assessment of results
- 8.1 Analytical specifications fixed before the project
- 8.1.1 Nature of stratification(s), if any
- 8.1.2 Sample size for each stratification (no. of seed/no-seed units)
- 8.1.3 Test(s) and/or analysis (analyses) for each stratification:
- 8.1.4 Transformation(s) for each stratification and each test:

APPENDIX B ANNEX A, p.4

8.1.5 Results for each stratification, test and transformation:

8.1.5.1 Qualitative:

8.1.5.2 Quantitative:

8.2 Analytical specifications chosen after the project

8.2.1 Nature of partitioning(s):

8.2.2 Sample size for each partition (no. of seed/no-seed units):

8.2.3 Test(s) and/or analysis(analyses) for each partition:

8.2.4 Transformation(s) for each partition and each test:

8.2.5 Results for each partition, test and transformation:

8.2.5.1 Qualitative:

8.2.5.2 Quantitative:

9. Extended area effects (i.e. outside the target area)

9.1 Sign of effect:

9.2 Maximum distance observed:

9.3 Statistical significance (size of area and probability)

10. Comments

11. Principal references to published results (where details of above may be found):

APPENDIX B ANNEX B
FRENCH

ORGANISATION METEOROLOGIQUE MONDIALE
=====

RAPPORT SUR UN PROJET DE MODIFICATION ARTIFICIELLE DU TEMPS

DEJA REALISE

(veuillez cocher x dans la ou les cases appropriées)

Membre de l'OMM :

1. Description du projet

1.1 Identification du projet (titre/zone d'exécution/organisation)
.....
.....

1.2 But(s) du projet :

augmentation des précipitations - pluie ☐ neige ☐
suppression de la grêle ☐
suppression de la foudre ☐
autres modifications (veuillez préciser)
.....

1.3 Principaux types de nuages traités :

Orographiques ☐ Cumulus ☐ Stratiformes ☐ Système frontal ☐

2. Durée du projet

2.1 Durée du projet, en années :

2.2 Période opérationnelle au cours de chaque année : du au
.....inclusivement.

3. Opérations d'ensemencement

3.1 Agent d'ensemencement : AgI ☐ CO₂ ☐ NaCl ☐

Autres (veuillez préciser)

Dans le cas de générateurs au sol, veuillez indiquer le nombre de générateurs utilisés

Taux d'ensemencement kg h⁻¹

Zone cible et zone témoin ☐ Zone cible et/ou zone témoin sans distinction ☐

Si elle est variable, veuillez indiquer les critères de définition

4.4 Subdivisions des zones, le cas échéant (indiquer le nombre et la nature)

5.5 Autres mesures de vérification (par exemple, réflectivité radar, mesure des nuages par aéronefs, coussins à grêle, etc.) :

6.1 Durée de l'unité en heures ou en jours

APPENDIX B ANNEX B, p.3

- 6.2 Conditions permettant de déterminer si une unité est ensemençable ou pas :
.....
- 6.3 Nombre total d'unités ensemençées et non ensemençées (dans le cas de la conception avec zone cible et/ou zone témoin, sans distinction, ceci s'applique à chaque zone ;)
- 6.4 Répartition aléatoire des unités expérimentales :
illimitée ☐ limitée ☐
Dans ce dernier cas, indiquer la nature des limites fixées
.....
- 6.5 Période standard d'ensemencement : heures

7. Résultats d'ensemble du projet (pas de stratification ou de division)

- 7.1 Test(s) statistique(s) et/ou analyses :
.....
- 7.2 Transformation(s) pour chaque test)
- 7.3 Résultats de chaque test et/ou analyses :
- 7.3.1 Qualitatifs :
Pas de différence ☐ augmentation des précipitations ☐
Diminution des précipitations ☐
Diminution de la masse de grêle ☐
Autres résultats qualitatifs :
.....
- 7.3.2 Quantitatifs :
Rapport ensemencement/pas d'ensemencement :
Signification statistique

8. Critères choisis pour l'évaluation des résultats

- 8.1 Spécifications analytiques fixées avant le projet
- 8.1.1 Nature de la ou des stratifications(s), le cas échéant
- 8.1.2 Dimension de l'échantillon pour chaque stratification (nombre d'unités ensemencement/pas d'ensemencement)

8.1.3 Test(s) et/ou analyse(s) pour chaque stratification :

8.1.4 Transformation(s) pour chaque stratification et pour chaque test :

8.1.5 Résultats pour chaque stratification, test et transformation :

8.1.5.1 Qualitatifs :

8.1.5.2 Quantitatifs :

8.2 Spécifications analytiques choisies après le projet

8.2.1 Nature de la ou des subdivision(s) :

8.2.2 Dimension de l'échantillon pour chaque subdivision (nombre d'unité
ensemencement/pas d'ensemencement) :

8.2.3 Test(s) et/ou analyse(s) pour chaque subdivision :

8.2.4 Transformation(s) pour chaque subdivision et chaque test :

APPENDIX B ANNEX B, p.5

8.2.5 Résultats pour chaque subdivision, test et transformation

8.2.5.1 Qualitatifs :

8.2.5.2 Quantitatifs :

9. Effets observés (c'est-à-dire à l'extérieur de la zone cible)

9.1 Indice de l'effet :

9.2 Distance maximale observée :

9.3 Signification statistique (superficie de la zone et probabilité)

10. Commentaires

11. Principales références à des résultats publiés (dans lesquels sont indiqués les détails des procédures ci-dessus)

ВСЕМИРНАЯ МЕТЕОРОЛОГИЧЕСКАЯ ОРГАНИЗАЦИЯ

ОТЧЕТ О ЗАВЕРШЕННОМ ПРОЕКТЕ
ПО АКТИВНОМУ ВОЗДЕЙСТВИЮ НА ПОГОДУ

(Просьба поставить X в соответствующем квадрате)

Член ВМО:

1. Описание проекта

1.1 Обозначение проекта (название/местонахождение/организация)

.....
.....

1.2 Цель(и) проекта:

Увеличение осадков - дождя ☐ снега ☐

Предотвращение града ☐

Предотвращение молний ☐

Другие (просьба указать)

.....

1.3 Основной тип облаков:

Орографи-
ческие ☐ Кучевые ☐ Слоисто-
образные ☐ Фрон-
тальные ☐

2. Продолжительность проекта

2.1 Продолжительность проекта по годам:

2.2 Оперативный период в каждом году: с
до включительно

3. Засев

3.1 Реагент засева: AgI ☐ CO₂ ☐ NaCl ☐

Другие (просьба указать)

APPENDIX B ANNEX C, p.2

3.2 Генератор(ы): Наземные ☐ Воздушные ☐
Если генератор наземный, указать количество

3.3 Процедура засева с воздуха:

Высота засева м

Длина трассы засева м или км

Норма засева кг ч⁻¹

4. Построение проекта

4.1 Основная схема: Целевые ☐ Целевые +
контрольные ☐
Перекрестные ☐

4.2 Расстояние между районами: км

4.3 Определение района: Постоянный ☐ Переменный ☐

Если переменный, указать основу определения

4.4 Подразделение района, если имеется (указать число и характер)

.....

5. Площадка

5.1 Местность: Горная ☐ Холмистая ☐ Ровная ☐

5.2 Размер целевого района: км²

5.3 Размер контрольного района: км²

5.4 Количество осадкомеров:

5.4.1 Все виды осадкомеров: в целевом районе
в контрольном районе

5.4.2 Осадкомеры-самописцы: в целевом районе
в контрольном районе

5.5 Другие средства проверки (например, отражательная способность
радиолокаторов, измерения облаков с самолетов, градомеры и т.д.):

.....

6. Экспериментальная единица

6.1 Продолжительность единицы в часах или днях:

6.2 Условия для определения, подлежит ли единица засеву или нет:

6.3 Общее количество засеянных и незасеянных единиц (при перекрестном построении это относится к каждому району):

6.4 Рандомизация экспериментальных единиц:

Неограниченная

☐

Ограниченная

☐

Если ограниченная, то дать характер ограничения

6.5 Стандартный период засева: часов

7. Общие результаты проекта (без стратификации и деления)

7.1 Название статистического испытания(ий) и/или анализа (анализов)

7.2 Трансформация(ии) для каждого испытания:

7.3 Результаты каждого испытания и/или анализа:

7.3.1 Качественные

Различий

нет

☐

Больше

осадков

☐

Меньше

осадков

☐

Меньше града по массе

☐

Другие качественные результаты:

7.3.2 Количественные

Соотношение

засев/нет засева

Статистическая

значимость

8. Обоснование для оценки результатов

8.1 Аналитические спецификации, установленные до проекта

8.1.1 Характер стратификации(ий), если имеется

8.1.2 Объем выборки для каждой стратификации (число единиц засев/нет засева)

APPENDIX B ANNEX C, p.4

8.1.3 Испытание(я) и/или анализ (анализы) для каждой стратификации:

8.1.4 Трансформация(ии) для каждой стратификации и каждого испытания:

8.1.5 Результаты для каждой стратификации, испытания или трансформации:

8.1.5.1 Качественные:

8.1.5.2 Количественные:

8.2 Аналитические спецификации, выбранные после проекта

8.2.1 Характер деления(ий):

8.2.2 Объем выборки для каждого деления (число единиц засев/нет засева):

8.2.3 Испытание(я) и/или анализ (анализы) для каждого деления:

8.2.4 Трансформация(ии) для каждого деления и каждого испытания:

8.2.5 Результаты для каждого деления, испытания или трансформации:

8.2.5.1 Качественные:

8.2.5.2 Количественные:

9. Воздействие на другие районы (т.е. за пределами целевого района)

9.1 Признак воздействия:

9.2 Максимальное расстояние:

9.3 Статистическая значимость (размер района и вероятность)

10. Замечания

11. Ссылки на опубликованные результаты (в которых можно найти более детальную информацию):

APPENDIX B, ANNEX D
SPANISH

ORGANIZACION METEOROLOGICA MUNDIAL
=====

INFORME SOBRE PROYECTOS TERMINADOS DE MODIFICACION ARTIFICIAL DEL CLIMA

(Colóquese una X en la casilla o casillas que corresponde)

Miembro de la OMM:

1. Descripción del proyecto

1.1 Identificación del proyecto (nombre/lugar/organización):
.....
.....

1.2 Finalidad(es) del proyecto:

Aumento de las precipitaciones - lluvia ☐ nieve ☐
Supresión del granizo ☐
Supresión de los relámpagos ☐
Otros (sírvase especificar)
.....

1.3 Principales tipos de nubes de que se trata:

Orográfica ☐ Cumulus ☐ Estratiforme ☐ Frontal ☐

2. Duración del proyecto

2.1 Duración del proyecto en años

2.2 Período en que se han llevado a cabo las operaciones durante cada año:
del al inclusive.

3. Operaciones de siembra

3.1 Reactivo químico de siembra: AgI ☐ CO₂ ☐ NaCl ☐
Otras (sírvase especificar)

3.2 Generador(es): Terrestre ☐ Aerotransportado ☐

Si es terrestre, sírvase dar el número de generadores

3.3 Procedimiento de siembra mediante aeronaves:

Altitud de la siembra m

Longitud de la trayectoria de siembra m o km

Índice de siembra Kg h⁻¹

4. Concepción del proyecto

4.1 Concepción básica: Sólo en la zona del blanco ☐ En la zona del blanco y zona de control ☐ En la zona del blanco y/o zona de control ☐

4.2 Distancia entre las zonas: km

4.3 Determinación de la zona: Fija ☐ Variable ☐
Si es variable, sírvase dar la base para la definición
.....

4.4 Subdivisiones de la zona, en caso de que hubiera (sírvase dar el número y la naturaleza)
.....

5. Ubicación del proyecto

5.1 Terreno donde se lleva a cabo el proyecto: Montañoso ☐ Accidentado ☐
Llano ☐

5.2 Tamaño de la zona del blanco: km²

5.3 Tamaño de la zona de control: km²

5.4 Número de pluviómetros:

5.4.1 Todos los tipos de pluviómetros: en la zona del blanco
en la zona de control

5.4.2 Registro de los pluviómetros: en la zona del blanco
en la zona de control

APPENDIX B, ANNEX D, p.3

5.5 Otra serie de verificaciones (por ejemplo reflectividad del radar, medida de las nubes mediante una aeronave, paquetes de granizo, etc.):
.....

6. Unidad experimental

6.1 Duración de la unidad en horas o días:

6.2 Condiciones que determinan si una unidad puede ser sembrada o no:
.....
.....

6.3 Número total de unidades sembradas y no sembradas (en el caso de que el diseño sea de una zona del blanco y/o de control indistintamente esto se aplica a cada zona):
.....

6.4 Selección aleatoria de las unidades experimentales:
No limitada ☐ Limitada ☐
Si es limitada, sírvase dar el carácter de la limitación
.....

6.5 Período de siembra normalizado: horas

7. Resultados de los proyectos generales (no estratificación o partición)

7.1 Nombre de la(s) prueba(s) estadística(s) y/o análisis:
.....

7.2 Transformación(es) para cada prueba:

7.3 Resultados de cada prueba y/o análisis:

7.3.1 Cualitativo

No hay diferencia ☐ Más precipitación ☐
Menos precipitación ☐ Menos masa de granizo ☐

Otros resultados cualitativos:
.....

7.3.2 Cuantitativo:

Relación de la semilla/no semilla:

Significado estadístico:

8. Base para la evaluación de los resultados

8.1 Especificaciones analíticas fijadas antes de que se haya llevado a cabo el proyecto

8.1.1 Carácter de la estratificación(es), en caso de que hubiere

8.1.2 Tamaño de muestra para cada estratificación (número de unidades de semillas/o no semillas):

8.1.3 Prueba(s) y/o análisis para cada estratificación:

8.1.4 Transformación(es) para cada estratificación y cada prueba:

8.1.5 Resultados para cada estratificación, prueba y transformación:

8.1.5.1 Cualitativo:

8.1.5.2 Cuantitativo:

APPENDIX B, ANNEX D, p.5

8.2 Especificaciones analíticas seleccionadas después de revisarse el proyecto:

8.2.1 Carácter de la partición(es):

8.2.2 Tamaño de muestra para cada partición (número de unidades de semilla/no semilla):

8.2.3 Prueba(s) y/o análisis para cada partición:

8.2.4 Transformación(es) para cada partición y cada prueba:

8.2.5 Resultados para cada partición, prueba y transformación:

8.2.5.1 Cualitativo:

8.2.5.2 Cuantitativo:

9. Efectos que tiene fuera de la zona (por ejemplo fuera de la zona del blanco)

9.1 Indicio del efecto:

9.2 Distancia máxima observada:

9.3 Significado estadístico (tamaño de la zona y probabilidad):

10. Comentarios

11. Principales referencias para que se publiquen los resultados (lugar en el que se pueden encontrar los detalles antes mencionados):

LIST OF WEATHER MODIFICATION PROGRAMME REPORTS

WMP-No. 1	Review of Warm Cloud Modification by Bh. V. Ramana Murty (September 1984)	WMO/TD-No. 5
WMP-No. 2	Papers Presented at the Fourth WMO Scientific Conference on Weather Modification (Honolulu, Hawaii, 12-14 August 1985)	WMO/TD-No. 53
WMP-No. 3	Notes for the International Cloud Modelling Workshop/Conference (Irsee, Federal Republic of Germany, 15-19 July 1985). (Out of print)	WMO/TD-No. 57
WMP-No. 4	Register of National Weather Modification Projects 1983 (November 1985)	WMO/TD-No. 78
WMP-No. 5.	The Evaluation of Hail Suppression Experiments - Report of Meeting of Experts (March 1986)	WMO/TD-No. 97
WMP-No. 6	Information Concerning Weather Modification Directed to Government Decision-Makers (June 1986)	WMO/TD-No. 123
WMP-No. 7	Trends in Weather Modification - 1975-1983 (L.R. Koenig, Geneva, November 1986)	-
WMP-No. 8	Report of the International Cloud Modelling Workshop (Irsee, Federal Republic of Germany, 15-19 July 1985)	WMO/TD-No. 139
WMP-No. 9	Register of National Weather Modification Projects - 1984 and 1985 (Geneva, July 1987)	WMO/TD-No. 182
WMP-No. 10	Register of National Weather Modification Projects - 1986 (Geneva, December 1988)	WMO/TD-No. 208
WMP-No. 11	Report of the Second International Cloud Modelling Workshop (Toulouse, 8-12 August 1988)	WMO/TD-No. 268
WMP-No. 12	Proceedings for the Fifth WMO Scientific Conference on Weather Modification and Applied Cloud Physics (Beijing, China, 8-12 May 1989)	WMO/TD-No. 269

LIST OF PRECIPITATION ENHANCEMENT PROJECT REPORTS

- Report No. 1 Report of the First Session of the Interim Precipitation Enhancement Project Board
(Geneva, November 1976)
- Report No. 2 Position Papers Used in the Preparation of the Plan for PEP
(Geneva, November 1976)
- Report No. 3 Plan for the Precipitation Enhancement Project
(Geneva, November 1976)
- Report No. 4 A Review of the Hydrological Aspect of Evaluation of Precipitation Enhancement
(Geneva, May 1977)
- Report No. 5 Cloud Seeding Reagents (Sofia, Bulgaria, October 1977)
(Geneva, November 1977)
- Report No. 6 Areal Extent of Seeding Effects in Relation to the Precipitation Enhancement Project (Charlottesville, VA, USA, November 1977) - (Geneva, December 1977)
- Report No. 7 Aircraft Instrumentation for Cloud Physics Research and Weather Modification Programmes (Boulder, CO, USA, February 1978) - (Geneva, March 1978)
- Report No. 8 Report of the Second Session of the Interim Precipitation Enhancement Project Board - (Geneva, April 1978)
- Report No. 9 PEP Design Document - (Geneva, April 1978)
- Report No. 10 Survey of the Climatology and Synoptic Weather Patterns at the Proposed PEP Site in Spain - (Geneva, November 1978)
- Report No. 11 Operations Plan for Site-Selection Phase-3
(Geneva, November 1978)
- Report No. 12 Preliminary Environmental Impact Study of the Site Proposed for PEP (Geneva, December 1978) - (Geneva, August 1979)
- Report No. 13 WMO Training Workshop on Weather Modification for Meteorologists - Lecture Notes - (Geneva, December 1979)
- Report No. 14 The Dispersion of Cloud Seeding Reagents (Valladolid, Spain, March 1979) - (Geneva, April 1980)
- Report No. 15 PEP Site Selection Phase-3, 1979 Field Programme - Overview and Data Catalogue - (Geneva, February 1980)
- Report No. 16 Report of the Third Session of the Precipitation Enhancement Project Board (Geneva, September 1979)
(Geneva, November 1979)

LIST OF PEP PROJECT REPORTS (Contd.)

- Report No. 17 Statistical Design Considerations for Precipitation Enhancement Projects (Moscow, USSR, 29 October to 2 November 1979) - (Geneva, February 1980)
- Report No. 18 PEP Site Selection Phase-3, 1979 Field Programme - General Weather Conditions and Rainfall Characteristics (Geneva, March 1980)
- Report No. 19 PEP Site Selection Phase-3, 1979 Field Programme - Two Studies of Precipitation Patterns - (Geneva, March 1980)
- Report No. 20 Report of the Fourth Session of the Precipitation Enhancement Project Board (Valladolid, Spain, May 1980) (Geneva, May 1980)
- Report No. 21 PEP Site Selection Phase-3, 1980 Field Season - Overview and Data Catalogue - (Geneva, October 1980)
- Report No. 22 PEP Site Selection Phase-3, 1980 Field Season - General Weather Conditions and Cloud Structures (Geneva, November 1980)
- Report No. 23 Rainstorms, Synoptic Background and Radar-Seen Clouds During the 1980 PEP Season - (Geneva, November 1980)
- Report No. 24 The Uses of Numerical Models in Weather Modification Research and Operations (Toronto, Montreal, Canada, December 1980) - (Geneva, April 1981)
- Report No. 25 Report of the Fifth Session of the Precipitation Enhancement Project Board (Geneva, May 1981) - (Geneva, May 1981)
- Report No. 26 PEP Site Selection Phase-3, 1981 Field Season - Data Catalogue Weather Conditions and Cloud Structures (Geneva, September 1981)
- Report No. 27 Report of the Sixth Session of the Precipitation Enhancement Project Board (Geneva, March 1982) - (Geneva, April 1982)
- Report No. 28 Preliminary Assessment Report of the Site Selection Phase-3 of the Precipitation Enhancement Project (Geneva, April 1982)
- Report No. 29 PEP Site Selection Phase-3 - Studies Based on Data Acquired by Radar (Geneva, January 1983)
- Report No. 30 PEP Site Selection Phase-3, Supplementary Report on Analysis of Duero River Basin Data (Geneva, February 1984)
- Report No. 31 Modification of Precipitation from Cumulus Clouds (Geneva, February 1984)
- Report No. 32 Numerical Simulation of Cloud Behavior Based on Duero River Basin Data (Geneva, June 1984)

LIST OF PEP PROJECT REPORTS (Contd.)

- Report No. 33 PEP Site Selection Phase-3, Descriptions of Regions of
Potential Identified by Aerial Reconnaissance
(Geneva, May 1985)
- Report No. 34 Synopsis of the Precipitation Enhancement Project - 1985
(Geneva, August 1986)
-