

WORLD METEOROLOGICAL ORGANIZATION

PROGRAMME ON PHYSICS AND CHEMISTRY OF CLOUDS

AND

WEATHER MODIFICATION RESEARCH

(WMP Report No. 18)

REGISTER

OF

NATIONAL WEATHER MODIFICATION PROJECTS

1990

WMO/TD-449



NOTE

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I. INTRODUCTION

As part of the WMO activities in weather modification, as approved by the World Meteorological Congress, the Secretary-General maintains a Register of experiments and operations in weather modification carried out within Member countries since 1975.

The present publication is the fifteenth 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 1990. For various reasons, the Register does not contain information on all weather modification projects.

To assist the reader in understanding the content 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 August 1990 is reproduced, in Annex 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 Section IV. Section V provides brief information on completed weather modification projects. 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 Annex B.

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 1990 are listed in Section VI.

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 Annex 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.

LIST OF MEMBERS REPORTING WEATHER MODIFICATION PROJECTS IN 1990

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AUSTRALIA											
AU-1	Res. PE Water Supply increase in wet periods	487km ² target. 7100 km ² for control	Melbourne and Metropolitan Board of Works Wintertime Cloud Seeding Project	37°43'S 146°15'E (100km east of Melbourne)	1988 Every Year Yes	Water Supply Government	A/C acetone burner and dry ice dispersal. In all types of cloud at -15°C for AgI and at -7°C for dry ice	AgI 419g/hr Total consumption 3.6kg	AgI seeding in stratiform cloud at -15°C and also in cumulous or at coldest temp if cloud warmer. Dry ice seeded at -7°C in orographic and cumulus clouds. Stratiform/orographic LWC>0.1gm ⁻³ Cumulus LWC>0.5gm ⁻³	May-Oct 1990 18 days	Evaluation report planned. No formal EIS C/B - Yes
AU-2	Op. PE Water augmentation Inc.	5,780 km ² target 20,000 km ² control	Hydro-electric Commission Precip. Enhanc. Project	Central Plateau, Tasmania	1988 Every Year Yes	Snr. Government	A/C acetone burner in cloud at -10°C	AgI 480g/hr Total Consumption 30kg	Both orographic and layer clouds seeded Base<10°C Tops warmer than -20°C Tops must be colder than -6°C. LWC >0.1gm ⁻³	Apr-Dec. 1990 265 days	EIS-No C/B-Yes Evaluation report available based on historical records
AUSTRIA											
AUS-1	Op. Hail	1,800 km ²	STYRIA-Hail Test Programme	Gleisdorf-Weiz (46°30'-47°15'N, 15°30'-16°00'E)	1986 Yes	Private Agri-culture	5 A/C with AgI acetone generators and pyrotechnic flares for seeding in cloud base	171/hour of AgI. 32901 or 210kg for year	Convective clouds with base <10°C and tops colder than -20°C. Subjective aided by radar	May-Sep. 44 days	Evaluation report planned based on historical data, crop damage & hail pads EIS - No C/B - No
AUS-2	Op. Hail	500km ²	Lower Austria-Hail Test Programme	Krems-Langenlois (48°15'-48°30'N 15°20'-15°50'E)	1981 Yes	Private Agri-culture	2 A/C with acetone generators and pyrotechnic flares for seeding in cloud base	101/hour of AgI. 8251 or 53kg for year	Convective clouds with base <10°C and tops colder than -20°C. Subjective aided by radar	May-Aug. 24 days	Evaluation report planned based on historical data, crop damage & hail pads EIS - No C/B - No

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
BULGARIA											
BG-1	Op. Res. Hail	13,800 km ²	Bulgarian Hail Suppression Project	42°-42°30'N 23°30'-24°00'E	1969 Yes	Government Agriculture and Weather Service	Rockets with pyrotechnic flares into clouds with temps between -5 to -10°C	PbI ₂ with 500g/rocket 2650kg total consumption	Convective clouds with bases >10°C and tops colder than <-20°C Decision to seed based on radar	May-Aug. 1990 25 days	Evaluation planned or completed? based on historical records & hail damage EIS - No C/B - No
CHINA											
CN-1	Op. PE (E) Water supply augmentation Hail	15,000 km ²	Regional Weather Modification Project Xinjiang	Xinjiang Province covering 90 counties	1978	Government Agriculture Energy and Weather Service	30 ground generators 2 A/C and artillery shells, all with acetone burners. Seeding in cloud containing supercooled droplets	AgI with 30-500g per operation 200kg total consumption	All types of clouds with bases <10° and tops warmer than -20°C. For hail suppression radar reflectivity 40dBZ	Jan, Apr-Dec. 30 days	Evaluation document available based on historical records & crop damage EIS - No C/B - Yes
CN-2	Op. PE (E) (R) Water augmentation Hail	30,000 km ² 25,000 km ² control	Precip. Enhancement and Hail Suppression Project in Shandong Province	Precip. Enh. in various locations with hail suppression in NW and E of Province	1987 Yes	Government Agriculture	2 A/C Rockets and artillery with acetone burners, explosives and solid dispersal Released both onground and incloud	AgI 0.2g/km Dry Ice 0.4kg/km AgI total consumption 5.4kg Dry Ice total consumption 2775 kg	Convective clouds with bases <10° and tops warmer than -20°C AgI seeding at -10°C Dry Ice at -5 to -10°C	Artillery from Apr-Sep. (62 days) and A/C Mar-June (13 days)	Evaluation based on crop damage & historical records prepared EIS - No C/B - Yes
CN-3	Op. PE	1,000,000 km ²	-	Inner Mongolia	1980 Yes	Government Agriculture and Drought Resistance	3 A/C with acetone burners and solid dispersal. Seeding in cloud	Dry Ice. 30kg/operational area. Total consumption 900kg	Stratiform cloud with base <10°C with tops warmer than -20°C. Seeding at -4 to -12°C	Apr-Sep. 50 days	Evaluation - No EIS - No C/B - No

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CN-4	Op. Hail	1,333 km ²	Hail suppression in Tianjin	Tianjin	1974 Yes	Government Agriculture	Rockets and Artillery shells seeding in cloud	AgI 23kg in total consumption	Convective clouds with bases >10°C and tops colder than -20°C. Radar echo >30 db and height = 9km. Seeding at temps <0°C	Apr-Oct. 1990 39 days	Evaluation based on historical records & crop damage EIS - No C/B ?
CN-5	Op. PE (R) Water augmentation PP on redistribution Hail	2,000 km ² control 2,000 km ²	Research of Artificial Precipitation in Gnanxi	Heng County in Gnanxi	1989 Yes	Government Agriculture Res. Foundation & Weather Service	1 A/C and 90 cannons with acetone burner and explosives. Seeding in cloud at temp <0°C	AgI 10kg and 300-400kg of Dry Ice in total consumption	Convective and stratiform clouds with bases >10°C and tops warmer than -20°C. Temp in cloud is <0°C where seeding and cloud >2000 m thick	Feb-Aug. 25 days	Evaluation based on historical record, crop damage & hail pads EIS - Yes C/B - Yes
CN-6	Res., Op. PE (E) Inc.	34,780 km ²		Ningxia Province	1974 Yes	Government Agriculture Res. Foundation	1 A/C and artillery shells with acetone burner and explosives. Seeding at cloud base or in cloud at temps <0°C	AgI total consumption 30kg. Dry Ice total consumption 400kg	Convective and stratiform clouds with bases <10°C and tops warmer than -20°C. Seeding in areas <0°C	May-Sep. 100 days	Evaluation based on crop damage and hail damage EIS - Yes C/B - No
CN-7	Dev. PE Inc. Hail	140,000 km ² 80,000 km ² control		Liaoning Province	1989	Government	1 A/C and 100 ground generators with explosives and solid dispersal. Seeding in cloud	AgI total consumption 40kg Dry Ice total consumption 4000kg			Evaluation based on historical records EIS - No C/B - Yes
CN-8	Res. Op. PE (E) Hail	200,000 km ² 150,000 km ² control	Science and Modernization Developing Design of Heilongjiang Province, Weather Modification	9 prefectures & 59 counties of Heilongjiang Province	1985 Yes	Government Weather Service	1 A/C and artillery shells with seeding in cloud at -10°C. PE activity uses A/C. Hail suppression uses artillery	PbI ₂ 0.5 to 1kg/km total consumption 40kgs AgI total consumption 188kgs	Convective & stratiform clouds seeded. Bases warmer than 10°C for artillery and <10°C use of A/C. Cloud tops are colder than -20°C. Decisions to seed based on weather expert systems and satellite images.	PE-Apr-June 51 days Hail-May-Sep. 138 days	Evaluation based on randomized experiment historical comparisons and crop damage. EIS - Yes C/B - No

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CN-9	Op. PE Inc. Hail			Hubei Province	1958	Government Agri- culture	85 ground generators using explosives	AgI 44.8g/operation Total consumption 12.85kg	Convective clouds with bases >10°C and tops warmer than -20°C	Mar-Oct.	No evaluation EIS? CB ?
<u>CUBA</u>											
CU-1	Dev. Inc.	10,000 km ² 15,000 km ² control	Cuban Weather Modification Project	21°N, 78°W	1978 Yes	Government Weather Service	2 A/C with pyrotechnic flares seeding in cloud		Convective clouds with bases >10°C and tops warmer than -20°C. Seeding between -1°C and -10°C at 6-8km altitude	June-Sep.	Evaluation based on randomized experiment EIS - Yes C/B - Yes
<u>FRANCE</u>											
FR-1	Hail Supp Res. Exp.	67000 km ² target 470000 km ² Control	Prevention de la Grêle Ass. Nat. d'Etude et de Lutte contre les Fléaux Atmosphériques	13 dépts. du Sud-Ouest + Cher et Loire (Roanne)	1952 Every Year Yes		Acetone burner ground	AgI 8 g/h/gener Total comsump. 746 kg/year	Convectives clouds base <10°C Top <-20°C according to hail risk evaluated by French Met. Service	April-Oct 9-43 days	Evaluation Report planned Study prepared
<u>GERMANY</u>											
GE-1	Op. Hail	2,500 km ²	Hail Suppres- sion Stuttgart Area	49°N, 10°E	1980 Yes	Government and Private Agri- culture	2 A/C with acetone burner seeding cloud base	AgI, 70g/l 156l total consumption	Convective clouds with tops colder than -20°C. Radar intensity and height determining factor	May-Sep.	Evaluation based on historical records, crop dam- age and hail pads EIS - Yes C/B - ?
GE-2	Res. Op. Hail	2,400 km ²	Hagelabwehr Versuch der Landkreise Rosenheim und Miesbach	Mountains/ hilly ground 500-1900 ASL on N.side of Alps between 11°40' to 12° 30'E	1975 Yes	County Govern- ment	2 A/C and 6 ground generators with acetone burners seeding cloud base	0.8kg/hr 41.2kg total consumption of AgI	Convective clouds with base >10°C and tops colder than -20°C. Decision to seed based on radar and synoptic information	May-Sep. 24 days	Evaluation based on historical records & crop damage EIS - No C/B - No

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>GERMANY (CONTINUED)</u>											
GE-3	Op. (E) Hail	200km ² 400km ² control	Hail Suppres- sion Mühlendorf- Altötting	Bavaria	1983 Yes	Govern- ment Agri- culture	1 A/C with acetone burner and pyrotechnic flame seeding cloud base	41/hr 1201 total consumption of AgI	Convective clouds with bases >10°C	May-Sep.	Evalu- ation based on hail pads EIS - No C/B - No
<u>GREECE</u>											
GR-1	Op. Hail	5,000 km ²	Hellenic National Hail Suppression Programme	Northern Greece	1984 Yes	Govern- ment Agri- culture	5 A/C with pyrotechnic flares seeding throughout cloud	AgI 70g/km 125.62kg total consumption	Convective clouds with bases <10°C and tops colder than -20°C. Seeding between -5°C to -10°C. Radar 35db above -5°C level	Apr-Sep. 169 days	Evalu- ation based on historical records, crop dam- age and hail pads EIC - No C/B - Yes
<u>INDIA</u>											
IN-1	Op. PE (E) Inc.	2,000 km ²	Gujarat State Cloud Seeding Operations	21°N-24°N 70°E-74°E	1990	Govern- ment Agri- culture	1 A/C with solid dispersal in cloud about 150m above base	NaCl with 500-1000kg per day 13,000kg total consumption	Convective and strati- form clouds with bases >10°C with tops warmer than 0°C. Cloud depth >1km LWC >0.5gm ⁻³	August 16 days	Evalu- ation based on historical record EIS - No C/B - No
<u>IRAN, ISLAMIC REPUBLIC OF</u>											
IR-1	Res. PE (E)	250km ² 200km ² control	Yazd Cloud Seeding Project	Shir Kuh Mountains South of Yazd City	1989 Yes	Govern- ment Hydro- logy & Weather Service	30 ground generators with acetone burners releasing seeding materials from ground	AgI			No eval- uation EIS - No C/B - No
<u>ISRAEL</u>											
IL-1	Op. Res. PE Inc. Water Supply Augment- ation	9,200 km ² 2,000 km ² control	Israel Rain Enhancement Project	Northern half of Israel and the Neger Desert	1961 Yes	Govern- ment Agri- culture and Mekorot Israel Water Co.Ltd.	60 ground generators and 4 A/C all with acetone burners re- leasing seeding material at ground and at cloud base	AgI 600 g/hr from A/C; 12g/hr from ground generators 380kg total consumption	Convective and oro- graphic clouds with bases <10°C and tops warmer than -20°C. Cloud tops must be colder than -8°C with favourable winds	Jan-Apr. Nov-Dec. 76 days	Evalu- ation based on randomized experiment & double ratios. EIS - Yes C/B - Yes

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>LIBYAN ARAB JAMAHIRIYA</u>											
LI-1	Res. Op. PE Inc.	69,000 km ²	Libyan Cloud Seeding Project	Jafara Plain, Sirte area and Elmarj	1980 Yes	Government Transportation	3 A/C seeding throughout cloud with pyrotechnic flares	5.46kg total consumption of AgI	Convective & orographic clouds. LWC >0.5gm ⁻³ seeding between -5° and -20°C	Jan-Mar. Oct-Dec. 72 days	Evaluation based on historical records EIS - No C/B - No
<u>MONGOLIA</u>											
MON-1	Res. Dev. PE (E) Hail	60,000 km ² 5,000 km ² control	Joint Mongol-Soviet Experiment	Central Mongolia	1990 Yes	Government Agriculture and Weather Service	A/C with solid dispersal in cloud and at cloud top	AgI 1.2g/km 1.2kg total consumption	Convective clouds with base <10°C and tops both warmer and colder than -20°C. Temperatures in cloud seeded colder than -10°C with radar => 18-24db	June 30 days	Evaluation based on randomized experiment historical records & crop damage EIS - Yes C/B - Yes
<u>MOROCCO</u>											
MO-1	Precip. increase Drought Water Aug.	6000 km ² for control	Programme Al-Ghait	Haut Atlas Central. Bassin Oued Oumrbia	Every Year Yes	Meteo Serv.	Acetone burner Ground and top of cloud (aircraft)	AgI 20 g/h (sol) 375 g/h (avion) Total consumption 40 kg. NaCl 6 g/h (sol) 115 g/h (avion) 2 kg/h Total consumption 13 kg	LWC>0.5g/m ³ in the cumulus. Convective clouds. Orographic clouds base <+10°C top <0°C but >-20°C	1 Nov-90 30 April 91 31 days	
<u>PHILIPPINES</u>											
PH-1	Op. PE (E) Water Supply Augmentation	100,000 km ²	Expanded Rain Stimulation Programme	Luzon Island Visangas Island Mindanao	1987 Yes	Government Agriculture Energy, Hydrology & Health Service	A/C Seeding in cloud	NaCl 250kg/hr 339,050kg total consumption	Convective clouds with bases >10°C and tops warmer than 0°C. Cloud conditions based on satellite information Seeding at 0° to 5°C	Year round 21 days/month	Evaluation based on gauge network in target areas and rainwater analysis EIS - No C/B - Yes

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>RUSSIAN FEDERATION</u>											
RF-1	Op. Hail	4,015 km ²		Odessa area of Ukraine	1980 Yes	Government Agri- culture Weather Service	Rockets with pyro- technic flares with seeding in cloud	AgI	Convective clouds with bases >10°C and tops colder than -20°C. Seeding between -6° to -10°C. Decision to seed based on prob. of hail Ph >0.4 and relationship of reflectivity on two wavelengths $\frac{3.2}{10} < 1$	Apr-Sep. 22 days	Evalu- ation based on historical records EIS - Yes C/B - Yes
RF-2	Op. Hail	7,700 km ²		Krasnodar District	1967 Yes	Government Agri- culture Weather Service	Rockets and artillery shells with pyro- technic flares and explosives seeding in cloud	AgI	As RF-1	Apr-Sep. 24 days	Evalu- ation based on historical records EIS - Yes C/B - Yes
RF-3	Op. Hail	5,070 km ²		Crimea area of Ukraine	1968 Yes	Government Agri- culture Weather Service	Rockets with pyro- technic flares seeding in cloud	AgI	As RF-1	Mon-Sep.	Evalu- ation based on historical records EIS - Yes C/B - Yes
RF-4	Op. Hail	11,450 km ²		Northern Caucasus	1967 Yes	Government Agri- culture Weather Service	Rockets with pyro- technic flares seeding in cloud	AgI	As RF-1 except seeding between -3° and -15°C and bases <10°C and tops warmer than -20°C.	Apr-Oct. 40 days	Evalu- ation based on historical records EIS - Yes C/B - Yes
RF-5	Op. Hail	10,030 km ²		Armenia	1964 Yes	Government Agri- culture Weather Service	Rockets and artillery shells with explos- ives and pyrotechnic flares, seeding in cloud	AgI	Convective clouds with bases <10°C and tops colder than -20°C. Seeding between -6° to -10°C with decision to seed the same as RF-1	Apr-Nov. 65 days	Evalu- ation based on historical records EIS - Yes C/B - Yes
RF-6	Op. Hail	7,000 km ²		Tadshikistan	1964 Yes	Government Agri- culture Weather Service	Rockets and artillery shells with explos- ives and pyrotechnic flares, seeding in cloud	AgI	As RF-1 except seeding between -6° to -12°C	Apr-Aug. 32 days	Evalu- ation based on historical records EIS - Yes C/B - Yes

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RF-7	Res. Hail	2,500 km ² control area of 3,000 km ²	Comprehensive Hail Experiment	Kabardino- Balkarskaya	1983 Yes	Government Re- search Found- ation and Weather Service	Rockets with pyro- technic flares seeding in cloud	AgI	As RF-1	May-Aug.	Evalu- ation based on historical records, hail pads and the physical effects of seeding EIS - Yes C/B - Yes
RF-8	Op. Hail	8,600 km ²		Uzbek	1967 Yes	Government Agri- culture Weather Service	Rockets and artillery shells with explosives and pyrotechnic flares and seeding in cloud	AgI	As RF-1	Apr-Aug. 55 days	Evalu- ation based on historical data EIS - Yes C/B - Yes
RF-9	Op. Hail			Azerbaijan	1967 Yes	Government Agri- culture Weather Service	Rockets and artillery shells with explosives and pyrotechnic flares and seeding in cloud	AgI	Convective clouds with bases <10°C and tops colder than -20°C. Seeding between -6° and -10°C. Decision whether to seed is the same as RF-1	Apr-Oct. 19 days	Evalu- ation based on historical data EIS - Yes C/B - Yes
RF-10	Op. Hail	24,900 km ²		Moldavia	1964 Yes	Government Agri- culture Weather Service	Rockets with pyro- technic flares seeding in cloud	AgI	As RF-1 except seeding between -6° and -15°C	Apr-Sep. 45 days	Evalu- ation based on historical records EIS - Yes C/B - Yes
RF-11	Op. PE (E)	32,000 km ²		Norosibirsk area	1990 Not known	Government Agri- culture	2 A/C with pyrotechnic flares seeding at cloud top	AgI from 1300 small and 350 large flares for 3.8kg total consumption	Convective and layer with bases warmer than 10°C and tops warmer than -20°C	Jun-Jul. 13 days	Evalu- ation based on radar data EIS - Yes C/B - Yes
RF-12	Op. PE Water Augment- ation	30,000 km ²		Omsk area	1990 Not known	Government Agri- culture	2 A/C with pyrotechnic flares seeding at cloud top	AgI from 1,100 small and 400 large flares for 4.1 kg total consumption	Convective and layer cloud with bases >10°C and tops warmer than -20°C	Jun-Jul. 17 days	Evalu- ation based on radar data EIS - Yes C/B - No

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RF-13	Op. PE (E)	3,600 km ²		Uzbek	1990 Not known	Govern- ment Agri- culture Energy and Weather Service	2 A/C with solid dispersal seeding at cloud top	AgI using 0.2-0.8kg per km. 16,200kg total consumption	Orographic and layer clouds with bases <10°C and tops warmer than -20°C	Jan-Mar. 26 days	Evalu- ation based on radar data EIS - Yes C/B - Yes
RF-14	Op. Cold fog dis- persal	84km ²		Sheremetyera A/P, Moscow	1989 Yes	Govern- ment Trans- port and Weather Service	G/B generators with liquid spray seeding at ground	Liquid nitrogen	Layer cloud base <10°C tops warmer than -20°C Presence of super cooled water in fog	Jan-Mar. Nov-Dec. 3 days	Evalu- ation based on visibility measure- ments in project area and sur- rounding areas EIS - Yes C/B - Yes
RF-15	Op. PE Water augment- ation	2,000 km ²		Uzbekistan	1985 Yes	Govern- ment Agri- culture Weather Service	Rockets with liquid spray seeding in cloud	AgI	Layer cloud, bases <10°C and tops warmer than -20°C. Seeding between -4°C and -10°C	Jan-Mar. Nov-Dec. 15 days	Evalu- ation based on historical records EIS - Yes C/B - Yes
RF-16	Op. Cold fog dis- persal	105km ²		Alma Ata A/P, Kazakhstan	1988 Yes	Govern- ment Trans- port Weather Service	G/B generators with liquid spray seeding at ground	Liquid nitrogen	Layer cloud base <10°C tops warmer than -20°C Presence of super cooled water in fog	Jan-Mar. Nov-Dec. 31 days	Evalu- ation based on visibility measure- ments in project area and sur- rounding areas
<u>SAUDI ARABIA</u>											
SA-1	Res. PE Inc. Hail		Saudi Arabian Cloud Physics Experiment (SACPEX)	South West Saudi Arabia	1989 Yes	Govern- ment Meteor- ology and Envir- mental Protec- tion Adminis- tration	1 A/C Seeding cloud tops		Convective clouds with bases <10°C and tops warmer than -20°C. Seeding normally between -9° and -11°C with LWC between 0.3 and 1gm ⁻³ cloud at least 300m deep	Mar-May 17 days	Evalu- ation based on randomized experiment EIS - Yes C/B - Yes

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SPAIN											
SP-1	Op. Hail	2,000 km ²	Preventive Hail Suppres- sion Project	46°35'N- 46°10'N and 3° to 3°45' East and area around 46°N and 3°E	1976 Yes	Private Agri- culture	46 G/B acetone generators releasing seeding materials at ground level	AgI 780kgs total consumption	Convective clouds and based on forecast from Barcelona	May-Oct. 165 days	Evalu- ation based on crop damage EIS - No C/B - Yes
SP-2	Op. Res. PE (dur- ing wet period)	700km ²	Precipitation Enhancement Study - Canary Islands	Canary Isles	1981 No	Island Govern- ment	A/C Seeding in cloud	Solution of 50% distilled water, 15% ammonium nitrate and 35% UC1a	All types of clouds with bases colder than 10°C and tops warmer than -20°C whose thickness exceeds 800m seeding occurs at level 1/3 into thickness with T >0°C	Jan-Mar. Nov-Dec. 13 days	Evalu- ation based on historical records EIS - No C/B - Yes Project designed by Dr.W.H Howell, Bureau of Reclam- ation, Boulder, U.S.A.
SP-3	Dev. Op. Hail	10,000 km ²	Hail Suppression Project	Provinces of Alava, Rioja and Navarra	1969 Yes	Govern- ment Agri- culture	111 G/B acetone generators releasing seeding material at ground	AgI at 11g/hr 378kgs total consumption	Convective clouds. Seeding based on synoptic information from Zaragoza Met.Centre	May-Sep. 139 days	Evalu- ations based on crop damage EIS - No C/B - ?
SP-4	Op. Hail	8,000 km ²	Hail Suppression Campaign in Aragon	154 areas of Zaragoza and Teruel	1970 Yes	Govern- ment Agri- culture	G/B acetone generators seeding at ground level	Acetone at 328.51 per generator for total consumption of 30,000l. AgI 13.6l per gener- ator for total of 1250 litres total consumption	Convective clouds with bases <10°C and tops colder than -20°C. Deci- sion to seed based on hail storm risk issued by Ebro Zonal Met Centre	May-Oct. 57 days	
SP-5	Op. Hail	Various fruit plant- ations of 1-2km ² each	Hail Protection for Fruit Trees	Various plantations centred on 38°45'N, 6°45'W	1982 Yes	Private Agri- culture	Rockets with explosives	AgI amounts not known	Convective clouds with bases >10°C and tops generally warmer than -20°C but occasionally colder. Decision to seed based on visual observations	Apr-Sep.	No eval- uation EIS - No C/B - No

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>UKRAINE</u>											
UK-1	PE Inc. Res. Dev. Op.	Target 5000 km ² Control 11000 km ²	Development of methods of PE from various clouds	48.4-47.3°N 32.2-34.1°E and 45.3-44.1°E 34.0-33.4°S	1960-1965; 1972-1980; 1981-1985; 1990-1991	Agr. Res. Found Wea Ser.	3 A/C with acetone burner, pyrotechn. flare and solid disp Temperature <-4°C for CO ₂ and <-7° for Ag I	AgI 20-50 ice nuclei/1 dry ice - 500-600 g/km for stratus and 10-12 kg for a convective cell	t<-4°C for CO ₂ and t<-7°C for AgI; cloud thickness > 400m; cloud bases colder than +10°C Cloud top colder than 0°C and warmer than -20°C	12/90-3/91, 195 days	EIS C/B
<u>UNITED ARAB EMIRATES</u>											
UAE-1	Dev. PE Inc.	83,000 km ²	Rain Enhancement	UAE	1989 Yes	Government Hydrology	1 A/C with pyrotechnic flares and wing generator seeding in cloud and cloud top	AgI 2.478kg total consumption Snomax 15.7kg total consumption	Convective and orographic clouds with bases <10°C and tops warmer than -20°C. Seeding at -3°C	Dec-Apr.	No evaluation EIS - Yes C/B - No
<u>UNITED STATES OF AMERICA</u>											
US-1	Fog Dispersal	25km ²	NOAA 90-717D	Medford A/P, Oregon		Private Airline	A/C	2060kg of Dry Ice total consumption		Dec. 8 days	
US-2	PE	5,800 km ²	NOAA 90-717c 89-684	Kings River Conservation District California		Government	A/C and G/B	AgI 20.09kg total consumption		Jan-May Dec. 54 days	
US-3	PE	2,850 km ²	NOAA 90-717B	San Joaquin River, California		Private Energy	A/C G/B	AgI 2.254kg total consumption		Nov-Dec. 8 days	
US-4	Cold fog dispersal	2.5km ²	NOAA 90-717A	Salt Lake Int. A/P		Private Airline	G/B	22.7kg of Dry Ice total consumption		Nov-Dec. 4 days	
US-5	Snow and rain enhancement	260km ²	NOAA 90-717	Central Colorado (Vail)		Government local	G/B	AgI 7.51kg total consumption		Jan-Mar. Nov-Dec. 34 days	
US-6	PE		NOAA 90-716	Catalina, California		Private Energy	A/C	Nil		Dec. 0 days	
US-7	Snowpack increase	1,550 km ²	NOAA 90-715	West Uintas Utah		Private Water Re-sources	G/B	AgI 4.89kg total consumption		Nov-Dec. 9 days	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
US-8	Increase Snowpack	465km ²	NOAA 90-714	Wind River, Wyoming		Govern- ment Hydro- logy	G/B	AgI 1.92kg total consumption		Nov-Dec. 7 days	
US-9	Warm fog dis- persal		NOAA 90-713 89-681	Salt Lake Int. A/P Utah		Private Weather Modifi- cation	A/C	Nil		Jan-Mar. Nov-Dec. 0 days	
US-10	PE	3,100 kms ²	NOAA 90-712	Tuolumne River, California		Private Weather Modifi- cation	A/C	AgI 1.1kg total consumption		Nov-Dec. 6 days	
US-11	PE	9,100 km ²	NOAA 90-711	West Central Texas		Govern- ment Local Hydro- logy	A/C	AgI 4.74kg total consumption		May-Sep. 25 days	
US-12	PE	9,100 km ²	NOAA 90-710 89-672	Santa Barbara, California		Govern- ment Local	A/C G/B	AgI 14.58kg total consumption		Jan-Apr. Nov-Dec. 9 days	
US-13	Increase Snowpack	520km ²	NOAA 90-709 89-673	Wastach Front Front Utah		Govern- ment Hydro- logy	G/B	AgI 20.31kg total consumption		Jan-Apr. Nov-Dec. 31 days	
US-14	Increase Snowpack	1,300 km ²	NOAA 90-708 89-675	Lake Almanor, California		Private Energy	G/B	AgI 46.43kg total consumption		Jan-May Nov-Dec. 50 days	
US-15	Increase Snowpack	650km ²	NOAA 90-707 89-674	Mukelumne, California		Private Energy	G/B	AgI 31.2kg total consumption		Jan-May Nov-Dec. 48 days	
US-16	Increase Snowpack	29,500 km ²	NOAA 90-706 89-683	South and Central Utah		Private Water Re- sources	G/B	AgI 75.79kg total consumption		Jan-Apr. Nov-Dec. 47 days	
US-17	Increase Snowpack	1,950 km ²	NOAA 90-705	Box Elder Rich County, Utah		Private Water Re- sources	G/B	AgI 11.93kg total consumption		Nov-Dec. 13 days	
US-18	PE	610km ²	NOAA 90-705 89-671	American River, California		Govern- ment local	G/B	AgI 9-78kg total consumption		Jan-Mar. Oct-Dec. 18 days	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
US-19	Increase precip. and Snowpack	3,900 km ²	NOAA 90-703 89-678	Truckee-Tahoe, California and Nevada		Government Desert Research	A/C G/B	AgI 59.24kg and 112.7 kg of Dry Ice total consumption		Jan-May Oct-Dec. 47 days	
US-20	Increase precip. and Snowpack	3,900 km ²	NOAA 90-702 89-677	Carson-Walker, Nevada and California		Government Desert Research	A/C G/B	AgI 25.50kg total consumption		Jan-May Oct-Dec. 59 days	
US-21	Increase precip. and Snowpack	2,300 km ²	NOAA 90-701 89-676	Ruby Mtn. Nevada		Government Desert Research	G/B	AgI 6.88kg total consumption		Jan-Apr. Oct-Dec. 45 days	
US-22	PE Hail	21,500 km ²	NOAA 90-700	West Kansas		Government Hydrology	A/C	AgI 58.80kg and 1150kg Dry Ice total consumption		May-Sep. 47 days	
US-23	Cold fog dispersal	125km ²	NOAA 90-699 89-669	Fairchild AFB, Washington		Government Military	G/B	Approx. 82501 of Propane total consumption		Jan-Mar. Nov-Dec. 18 days	
US-24	Cold fog dispersal		NOAA 90-698 89-668	Elmendorf AFB, Arkansas		Government Military	G/B	Propane		Jan-Apr. Oct-Dec. 0 days	
US-25	PE Hail	17,650 km ²	NOAA 90-697	WMP Dis.II North Dakota		Government	A/C	AgI 92.86kg and 1,000kg of Dry Ice total consumption		Jun-Aug. 35 days	
US-26	PE	7,500 km ²	NOAA 90-696	Monterey County, California		Government Hydrology	A/C	AgI 0.92kg total consumption		Jan-Dec. 5 days	
US-27	PE	21,000 km ²	NOAA 90-695	Clear Lake, California		Government Hydrology	A/C	AgI 0.82kg total consumption		Jan-Feb. 4 days	
US-28	PE Snowpack increase	1,800 km ²	NOAA 90-694	Grand Mesa West Elks Colorado		Government Private Hydrology	G/B	AgI 5.99kg total consumption		Feb-May 16 days	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
US-29	Snowpack increase	520km ²	NOAA 90-693	West Uintas, Utah		Government Private Hydrology	G/B	AgI 4.96kg total consumption		Jan-May 21 days	
US-30	Snowpack increase	260km ²	NOAA 90-692	Sun Valley, Idaho		Private ski operations	A/C	AgI 2.53kg total consumption		Jan. 5 days	
US-31	PE	1,300 km ²	NOAA 90-691	San Diego, California		City Government Hydrology	A/C	AgI 3.11kg total consumption		Jan-Dec. 27 days	
US-32	PE	3,100 km ²	NOAA 90-690	Kern River, California		Government Hydrology	A/C	AgI 1.08kg total consumption		Nov-Dec. 4 days	
US-33	PE	1,300 km ²	NOAA 90-689	Kaweah River, California		Government ?	A/C	AgI 8.11kg total consumption		Jan-Dec. 28 days	
US-34	PE Snowpack increase	1,150 km ²	NOAA 90-688	Eastern Sierra, California		Government City of LA	A/C	AgI 18.57kg and 38.5kg of Dry Ice		Jan-Dec. 41 days	
US-35	PE	3,100 km ²	NOAA 90-687	San Joaquin River, California		Private Energy	A/C G/B	AgI 21.93kg and 20kg of Dry Ice total consumption		Jan-Oct. 62 days	
US-36	PE	900km ²	NOAA 90-686	Calaveras River, California		Government Hydrology	A/C	AgI 3.51kg total consumption		Jan-Dec. 16 days	
US-37	Snowpack increase	1,950 km ²	NOAA 90-685	North Utah, Utah		Private Water Resources	G/B	AgI 25.33kg total consumption		Jan-Apr 28 days	
US-38	PE Snowpack increase	2,600 km ²	NOAA 89-682	Western Wyoming, Eastern Idaho		Private Energy	G/B	AgI 12.25kg total consumption		Jan-Apr 24 days	
US-39	Cold fog dispersal	25km ²	NOAA 84-680	Salt Lake A/P		Private Airline	A/C	Dry ice 222.7kg total consumption		Jan-Mar. 2 days	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>YUGOSLAVIA</u>											
YU-1	Op. Hail	80,351 km ² 4,069 km ² (in Bosnia & Herzegovina)	Hail suppression in Serbia Slovenia, Macedonia, Bosnia, Croatia, Herzegovina	45°-46°30'N 15°30'-19°30'E	Serbia 1967 Bosnia 1970 Slovenia & Macedonia 1971 Croatia 1976 Yes?	Govern- ment & Private Agriculture Government Weather Service & Local Government	Rockets with pyrotechnic flares seeding in cloud	AgI with 40gm/ rocket 3,148kg total consumption	Convective clouds with bases colder and warmer than 10°C Z>40db at 0°C. material seeded between -4° to -15°C	May-Oct. Macedonia 180 days, Slovenia 25 days, Serbia 37 days, Bosnia & Herzegovina 114 days Croatia 35 days	Evaluation based on historical records EIS - Yes (Serbia only) C/B - Yes (Serbia only)
<u>ZIMBABWE</u>											
ZM-1	Op. PE Inc. routine water supply augmentation	18,000 km ²	National Cloud Seeding Organization (NACSO)	Harare and Chiredzi	1968 Yes	Govern- ment Weather Service	3 A/C with solid dispersal at cloud top	AgI with one cartridge per cloud. 1101 cartridges used	Convective clouds with tops warmer than -20°C. Cloud tops need to be 19 to 20,000 feet ASL with temp. at top -10° to -15°C. Seeding in area of max. updraught	Nov-Apr. 129 days	No evaluation EIS - No C/B - Yes

LOCATION AND TERRAIN	PURPOSE AND DURATION	AGENT AND ALTITUDE OF SEEDING	REFERENCES TO PUBLISHED RESULTS	CONTACT FOR INFORMATION
<u>FRANCE</u>				
1. Sud Ouest Flat terrain Terrain accidenté	Hail Suppression Stratiform clouds 39 years 15 April - 15 Oct.	AgI 569 ground gene.	Simeonov P., Dessens J.: Comparative study of the hail suppression efficiency in Bulgaria and France. Dessens J.: Use of hail pads in the control of non-randomized hail prevention exp. Second Int. Meeting on Agriculture and Weather Modification (Zamora, 1991)	ANELFA 52, rue Alfred Duméril 31400 TOULOUSE France
<u>GERMANY</u>				
1. Stuttgart area, flat terrain. 2,000km ²	Hail suppression 12 years	AgI 1,500-2,000m (cloud base)	Evaluations not yet available	Mr. Edenberger Landratsamt Rems-murrkreis D-7050 Waiblingen Germany
2. Munich area, hilly terrain. 200km ²	Hail suppression 1983-present (May-Sept)	AgI Various altitudes under cloud base	Last evaluations were published in 1984 by Landratsamt Rosenheim	G. Vogl Landkreis Rosenheim Wittelsbacherstrasse 53 8200 Rosenheim
<u>GREECE</u>				
1. Northern Greece covering mountainous, hilly and flat terrain 1,000km ²	Hail suppression 1984-1988 Apr-Sept)	AgI 5,000m altitudes	Results published in ELGA Reports	Hellenic Agricultural Insurance Organization 30 Patission Street 10170 Athens
<u>INDIA</u>				
1. Gujarat State 2,000km ²	Precipitation Enhancement 1990 (August)	NaCl, 1,000-1,500m	Reported in Section IV reference IN-1	Dr. A. S. R. Murty Indian Institute of Tropical Meteorology Dr Homi Bhabha Road Pashan Pune 411008
<u>MOROCCO</u>				
1. Haut Atlas Central Mount. terrain	Precipitation enhancement (Rain + Snow). Stratiform orographic, cumulus clouds 10 years 1 Nov - 30 April	AgI - NaI T _g -5°C Length of seeding 60 km 0,375 kg/h	Report on the 5th Scientific Conf. on Weather Modification, China May 1989	Direction de la Météorologie Nationale Centre National de Climat et de Recherche Météorologique Aéroport Casa-Anfa CASABLANCA Maroc

LOCATION AND TERRAIN	PURPOSE AND DURATION	AGENT AND ALTITUDE OF SEEDING	REFERENCES TO PUBLISHED RESULTS	CONTACT FOR INFORMATION
<u>SAUDI ARABIA</u> 1. South West Saudi Arabia Mountainous	Rain augmentation 3 to 4 years (Mar-May)	SNOMAX at 5,900m	Major findings given in Aircraft Studies in the Asir Region (G. Vall, May 1991). Many other reports available	Mr. M. D. Ajlan MEPA Jeddah 21431 P.O. Box 1358
<u>SPAIN</u> 1. Province of Alava, Rioja and Navarro over hilly and flat terrain 10,000km ²	Hail suppression activities from May-Sept from 1969-1991	AgI from 110 G/B generators	Reports are available from the service	Elena Beaumont Aristu c/o Milicie No. 4-10 26003 Logroño La Rioja
<u>UNITED ARAB EMIRATES</u> 1. United Arab Emirates Mountainous 83,000km ²	Rain augmentation 1 to 2 years (Dec-Apr.)	AgI and SNOMAX at 5,500m	Additional information provided in Section IV, reference UAE-1	H. Kameri Ministry of Communications Directorate General of Civil Aviation P.O. Box 900 Abu Dhabi
<u>YUGOSLAVIA</u> 1. Serbia, mountainous, hilly and flat terrain 31,770km ²	Hail suppression 1967-1990 (inclusive)	AgI at 3,500m	Did Hail Suppression in Serbia lead to Reducing Hail Frequency (F. Mesinget) (presented at Yugoslav Conf. on Weather Modification in Mavrovo, 1990)	S. Maksimovic Federal Hydrometeorological Institute P.O. Box 604 Bircaninova 6 11001 Belgrade

VI - ADDRESSES OF REPORTING AGENCIES

AUSTRALIA

CSIRO
Division of Atmospheric Research
Private Bag No.1
Mordialloc, Vic. 3195

Hydro-electric Commission
Water Resources Department
P.O. Box 355D
Hobart, Tasmania 7001

Snowy Mountains Council
The Secretary
G.P.O. Box 858
Canberra, ACT 2601

AUSTRIA

Department of Climatology
Central Institute for Meteorology and Geodynamics
Hohe Warte 38
A-1190 Vienna

BULGARIA

National Institute of Meteorology and Hydrology
Department of Modification of Atmospheric Processes
Mladost 1
1184-Sofia

CHINA

State Meteorological Administration
Weather Modification Programme Office
46 Baishigiaolu Ave
Beijing 100081

CUBA

Institute de Meteorologia
Dpta de Influencia Activa
Apartado Postal 17032
Habana 17, Ciudad Habana
CP 11700

FRANCE

ANELFA
52, rue Alfred Duméril
31400 TOULOUSE
France

GERMANY

Deutscher Wetterdienst-Zentralamt
Frankfurter Str. 135
D-6050 Offenbach

GREECE

ELGA
Antihail Department
30 Patission Street
10170 Athens

INDIA	Indian Institute of Tropical Meteorology Dr. Homi Bhabha Road, Pashan Pune 411 008
IRAN, ISLAMIC REPUBLIC OF	Islamic Republic of Iran Meteorological Organization (IRIMO) Mehrabad P.O. Box 13185-461 Tehran
ISRAEL	Ems Rain Stimulation Branch P.O. Box 20 Ben Gurjon Airport 70100 Israel
LIBYAN ARAB JAMAHIRAYA	Libyan Cloud Seeding Project P.O. Box 14616 Tripoli
MONGOLIA	Hydrometeorological Research Institute Ulan Bator 11 October Str. 5
MOROCCO	Direction de la Météorologie Nationale Centre National de Climat et de Recherche Météorologique Aéroport Casa-Anfa CASABLANCA Maroc
PHILIPPINES	Bureau of Soils and Water Management National Rain Stimulation Office Elliptical Road c.r Visayas Avenue Diliman, Quezon City
RUSSIAN FEDERATION	Russian Federatiuon Committee for Hydrometeorology Weather Modification and Special Tasks 12 Pavlik Morozov Street Moscow 123376
SAUDI ARABIA	Meteorological and Environmental Protection Administration Research Analysis and Forecasting Department Jeddah 21431 P.O. Box 1358
SPAIN	ACV Terres de Ponext Rouira Roure 177 25006 Lleida Intituto Nacional de Meteorologia Historiador Fernando de Armas, 12 Tafrá Apartado de Dorreos No 20, Tafira 35017 Las Palmas de Gran Canaria

SPAIN (cont.)

Diputacion General de Aragon
Apartado 727
50080 Zaragoza

Centro Meteorologico Zonal de Badajoz
4 Jose Rebello Lopez ZI
06071 Badajoz

Servico Antigranizo
c/o Milicie No. 4-10
26003 Logroño (La Rioja)

UKRAINE

Ukrainian Hydrometeorological Research Institute
Prospekt Nauki 37
252650 KIEV 28
Ukraine

UNITED ARAB EMIRATES

UAE Ministry of Communications
Directorate General of Civil Aviation
P.O. Box 900
Abu Dhabi

USA

NOAA
NWS International Activities Division
1325 East West Highway
SSMC-Z-RM 13323
Silver Spring, MD 20910

YUGOSLAVIA

Federal Hydrometeorological Institute
P.O. Box 604
Bircaninova 6
1101 Beograd

ZIMBABWE

National Cloud Seeding Organization
Meteorological Service
Ministry of Transport
P.O. Box BE 150
Belvedere, Harare

VII - REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

List of Members reporting no weather modification projects in 1990

AFGHANISTAN	MYANAMAR
ARGENTINA	NAMIBIA
BAHRAIN	NETHERLANDS
BARBADOS	NEW CALEDONIA
BELIZE	PAKISTAN
BOTSWANA	PERU
BRITISH CARIBBEAN TERRITORIES	POLAND
BRUNEI DARUSSALAM	REPUBLIC OF KOREA
CANADA	QATAR
COLOMBIA	ROMANIA
CZECHOSLOVAKIA	SEYCHELLES
DENMARK	SUDAN
DOMINICAN REPUBLIC	SURINAME
EGYPT	SWAZILAND
ETHIOPIA	SWEDEN
FINLAND	SWITZERLAND
FRENCH POLYNESIA	SYRIAN ARAB REPUBLIC
GHANA	TANZANIA
GUINEA-BISSAU	TRINIDAD & TOBAGO
GUYANA	TURKEY
HUNGARY	UGANDA
IRELAND	U.K.
JAPAN	URUGUAY
KENYA	VANUATU
MALAWI	VENEZUELA
MALI	ZAMBIA
MEXICO	

WORLD METEOROLOGICAL ORGANIZATION

R/CLA/4, ANNEX A
FORM (1 JANUARY 1990)

CLOUD PHYSICS AND WEATHER MODIFICATION RESEARCH PROGRAMME

QUESTIONNAIRE
TO GATHER DATA FOR THE 1990
REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

PLEASE MARK APPROPRIATE BOXES

MEMBER OF WMO

No weather modification activities in 1990 ☒

(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):

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 1989, January-February 1990; another might be: January-February 1990, December 1990).

- (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?

.....

.....

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:

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

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 October 1991.

The Secretary-General
World Meteorological Organization
41, Avenue Giuseppe-Motta
Case postale 2300
1211 GENEVA 2
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).

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 1989, January-February 1990.

- 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

R/CLA/4, ANNEXE A
FORMULAIRE (1er janvier 1990)

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 1990 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 1990 ☐

(Veuillez renvoyer la première page de 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) ☐

ANNEXE A, p. 2

2. (de recherche ☐
(
IL S'AGIT PRINCIPALEMENT D'UNE ACTIVITE (de développement .. ☐
(
(d'exploitation ☐
3. ZONE COUVERTE PAR LE PROJET
- a) Superficie approximative de la zone cible du projet (km^2) :
- b) Superficie approximative de la zone témoin
(le cas échéant) (km^2) :
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 ☐

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 1990

- 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 1989, janvier-février 1990, ou janvier-février 1990, décembre 1990.

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

.....

ANNEKE A, p. 4

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

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 ☐

ANNEXE A, p. 6

- 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)

Veuillez remplir ce questionnaire et le renvoyer dès que possible, et
dans tous les cas avant le 31 octobre 1991, à l'adresse suivante :

Monsieur le Secrétaire général
Organisation météorologique mondiale
41, Avenue Giuseppe-Motta
Case postale 2300
1211 GENEVE 2
Suisse

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.

ANNEXE A, p. 8

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 COMPLÉMENTAIRES
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).

ANNEXE A, p. 10

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 1989, janvier-février 1990).

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 granules (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 ?

- 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

R/SLA/4, ПРИЛОЖЕНИЕ А
ФОРМА (1 ЯНВАРЯ 1990 г.)

ПРОГРАММА НАУЧНЫХ ИССЛЕДОВАНИЙ ПО ФИЗИКЕ ОБЛАКОВ И
АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА ПОГОДУ

ВОПРОСНИК
ПО СБОРУ ДАННЫХ ДЛЯ РЕЕСТРА НАЦИОНАЛЬНЫХ ПРОЕКТОВ ПО
АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА ПОГОДУ ЗА 1990 г.

ПРОСЬБА ПОМЕТИТЬ СООТВЕТСТВУЮЩИЕ КВАДРАТЫ

ЧЛЕН ВМО

Деятельность по активному воздействию на погоду в 1990 г.
не проводилась

☐

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

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

a) Увеличение осадков

☐

Деятельность вызвана чрезвычайными обстоятельствами
(например, засухи)

☐

Деятельность осуществляется в целях увеличения обычного
водоснабжения

☐

С целью продления влажного периода

☐

С целью увеличения осадков в течение влажного периода ...

☐

b) Перераспределение осадков

☐

c) Подавление града

☐

d) Рассеивание тумана

☐

e) Другие виды (просьба указать)

☐

2. ЭТА ДЕЯТЕЛЬНОСТЬ НОСИТ
ПРЕЖДЕ ВСЕГО ХАРАКТЕР
- | | | |
|---------------------|--------------------------|---|
| (исследований | <input type="checkbox"/> |) |
| (разработок | <input type="checkbox"/> |) |
| (оперативных | |) |
| (применений | <input type="checkbox"/> |) |

3. РАЙОН, ОХВАТЫВАЕМЫЙ ПРОЕКТОМ

а) Приблизительный размер целевого района, где осуществляются воздействия, предусмотренные проектом (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 ☐ Неизвестно ☐

с) Предполагается ли продолжение проекта в течение следующего года?

Да ☐ Нет ☐ Неизвестно ☐

7. ХАРАКТЕР ОРГАНИЗАЦИИ-СПОНСОРА ПРОЕКТА
(просьба поставить X в соответствующем месте)

ОБЛАСТЬ ДЕЯТЕЛЬНОСТИ ОРГАНИЗАЦИИ	ПРАВИТЕЛЬСТВЕННАЯ	ЧАСТНАЯ
Сельское хозяйство		
Энергетика		
Лесное хозяйство		
Гидрология		
Фонд для научных исследований		
Транспорт		
Метеорологическая служба		
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 течение декабря и января, то просьба указать годы. Пример: декабрь 1989 г., январь-февраль 1990 г.; другой пример: январь-февраль 1990 г., декабрь 1990 г.).

- б) Сколько дней проводилась эта деятельность?

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

- а) Система доставки засеивающих веществ:

Наземная ☐ Сколько генераторов? ☐

Самолет ☐ Сколько самолетов? ☐

Ракеты ☐ Артиллерийские снаряды ☐

Другие (просьба указать):

ПРИЛОЖЕНИЕ А, стр. 4

б) Тип генератора:

Ацетоновая горелка ☐ Пиротехническая ракета ☐
 Взрывчатое вещество ☐ Разбрызгиватель жидкости ☐
 Распылитель твердых частиц ☐ Другие:

с) Расположение выпуска засеивающего вещества:

Наземное ☐ Нижняя граница облаков ☐
 Верхняя граница облаков ☐ В облаках ☐

Если выпуск осуществляется в облаке, то при какой температуре или по каким другим критериям?

.....

Реагент засева	Расход (указать единицы измерения)	Общий расход в течение года (в кг)
-------------------	---------------------------------------	---------------------------------------

AgI	.....	.....
PbI ₂	.....	.....
Сухой лед	.....	.....
NaCl	.....	.....
Пропан	.....	.....
.....
.....
.....

10. ХАРАКТЕРИСТИКИ ОБРАБАТЫВАЕМЫХ ОБЛАКОВ

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

б) Преобладающая температура в основании облака (°C):

Выше 10°C ☐ Ниже 10°C ☐

с) Преобладающая температура в вершине облака:

Выше 0°C ☐

Ниже 0°C, но выше -20°C ☐

Ниже -20°C ☐

d) Критерии, используемые при выборе дней или облаков для их обработки:

.....

11. ОБОСНОВАНИЯ ДЛЯ ОЦЕНКИ

a) Не имеются ☐

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 31 октября 1991 г. по адресу:

The Secretary-General
World Meteorological Organization
41, Avenue Giuseppe-Motta
Case postale 2300
1211 GENEVA 2
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) квадрат, который 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) квадрат, соответствующий цели деятельности:
- | | |
|--------------------------|---|
| - исследования | - вопросы научных исследований; |
| - разработки | - полевая работа по оптимизации процедур; |
| - оперативные применения | - полевая работа, направленная непосредственно на достижение экономических выгод. |
- ПУНКТ 3** - Под целевым районом осуществления воздействий подразумевается район, в пределах которого предполагается обнаружить последствия деятельности по активному воздействию на погоду. Под контрольным районом (или районами) понимается территория, которая выбрана так, чтобы она не подвергалась воздействиям засевающих веществ; она используется для оценки результатов в пределах целевого района.
- ПУНКТ 4** - Впишите название и/или обозначение проектов, используемых оператором. Если проект был зарегистрирован в предыдущем Реестре, просьба указать номер по Реестру 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** -
- a) Укажите год осуществления первоначальной деятельности по настоящему проекту;
 - b) Укажите, были ли перерывы в деятельности, или же она проводилась каждый год со времени начала;
 - c) Укажите, предполагается ли продолжить проект в будущем, поставив значок (X) в соответствующем квадрате.
- ПУНКТ 7** - Укажите основную область деятельности организации, которая финансирует проект, обозначив значком (X) соответствующий квадрат (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 1989 г., январь-февраль 1990 г.

ПУНКТ 9 - Под оборудованием для 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, реактивные двигатели и т.д.

- a) Система доставки засеивающих веществ. Укажите, обозначив значком (X) соответствующий квадрат, характер системы доставки - наземная, воздушная и т.д.;
- b) Укажите способ подготовки засеивающего вещества для распыления (например, путем сжигания ацетонового раствора соединения йодистого серебра). Распыление твердых частиц относится к рассеиванию ледяных крупинок (например, сухой лед), порошка (например, NaCl) и т.д.;
- c) Укажите, обозначив значком (X), соответствующий квадрат, место рассеивания реагента;
- d) Укажите, какие засеивающие реагенты используются и какова 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) квадрат, общую характеристику облаков, которые выбраны для обработки;
- b) Укажите преобладающий диапазон температур на нижней границе облаков;
- c) Укажите преобладающий диапазон температур на верхней границе облаков;
- 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 о средствах, используемых 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 дополнительной информации.

ПУНКТ 14 - Этот пункт предназначен для того, чтобы позволить 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 ссылка 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

R/CLA/4, ANEXO A
FORMULARIO (1 DE ENERO DE 1990)

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

CUESTIONARIO
PARA RECOPIRAR DATOS DESTINADOS AL INVENTARIO DE 1990 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 1990 ☐

(Sírvasse 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 ☐

ANEXO A, p. 2

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 ☐

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 1989, enero-febrero de 1990 o enero-febrero de 1990, diciembre de 1990).

- 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
.....
.....
.....

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:

.....

.....

.....

.....

ANEXO A, p. 6

15. ORGANISMO QUE PRESENTA LA INFORMACION:

a) Nombre del organismo:.....

b) Título oficial de la dependencia responsable:

.....

c) Dirección:

.....

.....

.....

.....

.....

(Firmado)

.....

(Fecha)

Sírvase rellenar el presente cuestionario y devolverlo lo antes posible, y en todo caso antes del 31 de octubre de 1991 a la dirección siguiente:

Señor Secretario General
Organización Meteorológica Mundial
41, Avenue Giuseppe-Motta
Case postale 2300
1211 GINEBRA 2
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 electromagnética.

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 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 ATIFICIAL DEL TIEMPO

- PREGUNTA 1 - Escribábase 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 - Escribábase 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).

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 1989, enero-febrero de 1990).

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.
-

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.

ANNEX B, p. 2

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):

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 (km²):

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:
- 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:

ANNEX B, p. 4

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

.....

.....

.....

.....

.....

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

.....

.....

.....

.....

.....

ORGANISATION METEOROLOGIQUE MONDIALE

R/CLA/4, ANNEXE B

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 ☐

ANNEXE B, p. 2

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 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) :

.....
.....

ANNEKE B, p. 4

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 (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 (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) :

.....

ANNEKE B, p. 6

10. COMMENTAIRES

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

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

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

ВСЕМИРНАЯ МЕТЕОРОЛОГИЧЕСКАЯ ОРГАНИЗАЦИЯ

R/CLA/4, ПРИЛОЖЕНИЕ В

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 ☐

Подавление града ☐

Предотвращение молний ☐

Другие (просьба указать):

.....

1.3 Основной тип облаков:

Орографические ☐ Кучевые ☐ Слоистообразные ☐ Фронтальные ☐

2. ПРОДОЛЖИТЕЛЬНОСТЬ ПРОЕКТА

2.1 Продолжительность проекта, в годах:

2.2 Оперативный период в каждом году:

С: До: включительно.

ПРИЛОЖЕНИЕ В, стр. 2

3. ЗАСЕВ

3.1 Реагент, используемый для засева: AgI ☐ CO₂ ☐ NaCl ☐

Другие (просьба указать):

3.2 Генератор(ы): Наземные ☐ Воздушные ☐

Если генератор наземный, то просьба указать количество:

3.3 Процедура засева с воздуха:

Высота засева (м):

Длина трассы засева (м или км):

Норма засева (кг/час):

4. СХЕМА 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:*

Все виды осадкомеров в контрольном районе:

5.4.2 *Осадкомеры-самотисцы в целевом районе:*

- Осадкомеры-самописцы 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:
7. ОБЩИЕ РЕЗУЛЬТАТЫ ПРОЕКТА (без стратификации или деления)
- 7.1 Название статистического испытания(ий) и/или анализа(ов):
.....
- 7.2 Трансформация(ии) для каждого испытания:
- 7.3 Результаты каждого испытания и/или анализа:
- 7.3.1 *Качественные:*
Различий ☐ Больше ☐ Менее ☐ Менее
нет осадков осадков града по
массе ☐
Другие качественные результаты:
.....
- 7.3.2 *Количественные:*
Соотношение засев/нет засева: Статистическая значимость:

ПРИЛОЖЕНИЕ В, стр. 4

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):

Засев: Нет засева:

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

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

8.1.5 Результаты для каждой стратификации, испытания или трансформации:
Качественные:
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):
Засев: Нет засева:

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

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

8.2.5 Результаты для каждого деления, испытания или трансформации:
Качественные:
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):

.....

.....

.....

.....

.....

ORGANIZACION METEOROLOGICA MUNDIAL

R/CLA/4, ANEXO B

INFORME SOBRE PROYECTOS TERMINADOS DE MODIFICACION ARTIFICIAL DEL CLIMA

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

MIEMBRO DE LA OMM:

1. DESCRIPCION 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 (sírvasse especificar) :

.....

1.3 Principales tipos de nubes de que se trata:

Orográfica ☐ Cumulus ☐ Estratiforme ☐ Frontal ☐

2. DURACION 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.

ANEXO B, p. 2

3. OPERACIONES DE SIEMBRA

3.1 Reactivo químico de siembra: AgI ☐ CO₂ ☐ NaCl ☐

Otros (sírvese 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 la siembra (Kg h⁻¹)

4. CONCEPCION 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 hubieran (sírvese dar el número y la naturaleza)

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5. UBICACION 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:
- Todos los tipos de pluviómetros en la zona de control:
- 5.4.2 Registro de los pluviómetros en la zona del blanco:
- Registro de los pluviómetros en la zona de control:.....
- 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 dife- rencia	/ /	Más precipi- tación	/ /	Menos precipi- tación	/ /	Menos masa de gra- nizo	/ /
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Otros resultados cualitativos:

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7.3.2 Cuantitativo:

Relación de la siembra/no siembra:

Significado estadístico:

8. BASE PARA LA EVALUACION DE LOS RESULTADOS

8.1 Especificaciones analíticas fijadas ANTES de que se haya llevado a ca-
bo 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
siembra/o sin siembra):

Siembra: Sin siembra:

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:

Cualitativo :

Cuantitativo :

8.2 Especificaciones analíticas seleccionadas DESPUES de revisarse el pro-
yecto:

8.2.1 Carácter de la partición(es):

8.2.2 Tamaño de muestra para cada partición (número de unidades de siembra/
sin siembra):

Siembra: Sin siembra:

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:

Cualitativa:

Cuantitativa:

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):

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10. COMENTARIOS

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11. PRINCIPALES REFERENCIAS PARA QUE SE PUBLIQUEN LOS RESULTADOS (lugar en el que se pueden encontrar los detalles antes mencionados):

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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

WMP-No. 13	Register of National Weather Modification Projects - 1987-1988	WMO/TD-No. 330
WMP-No. 14	Register of National Weather Modification Projects - 1989 (Geneva, May 1991)	WMO/TD-No. 417
WMP-No. 15	Report of a Meeting of Experts to review Findings and make Recommendations on the Saudi Arabia Cloud Physics Experiment (SACPEX) (Geneva, 14-16 November 1990)	
WMP-No. 16	Report of the Seventeenth Session of the Executive Council Panel of Experts/CAS Working Group on Physics and Chemistry of Clouds and Weather Modification Research (Geneva, 19-23 November 1990)	
WMP-No. 17	WMO Meeting of Experts on the Role of Clouds in the Chemistry, Transport, Transformation and Deposition of Pollutants (Obninsk, 30 September-4 October 1991	WMO/TD-No. 448

LIST OF PRECIPITATION ENHANCEMENT PROJECTS 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 PROJECTS REPORTS, p. 2

- 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)