

WORLD METEOROLOGICAL ORGANIZATION

PROGRAMME ON PHYSICS AND CHEMISTRY OF CLOUDS
AND
WEATHER MODIFICATION RESEARCH

(WMP Report No. 14)

REGISTER
OF
NATIONAL WEATHER MODIFICATION PROJECTS

1989



Technical Document

WMO/TD - No. 417

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TABLE OF CONTENTS

	<u>Page</u>
I. Introduction	1
II. Detailed explanations of columns used in tabular information in the Register	2
III. List of countries reporting 1989 projects	5
IV. Register of 1989 projects	7
V. Addresses of reporting agencies	33
VI. List of Members reporting no weather modification projects in 1989	37
 <u>Annexes:</u>	
Annex A: Copy of questionnaire circulated to obtain information from Members	39
Annex B: Copy of form for report on completed weather modification projects	85

I. INTRODUCTION

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

The present publication is the fourteenth 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 1989. 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 May 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 Part IV. The form to be used in reporting completed programmes or for which a physical and/or statistical evaluation has been carried out is reproduced as 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 1989 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.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CHINA (Continued)											
CN-3	PE E Ext E Inc.	15000 km ²	Precip. enhancement Proj. of Jilin	In Jilin province	1986 Yes	Gov. Agri. Fores- try Hydro. Resea- rch Fdt.	2 Aircraft artillery shells Ag I acetone generator explosives liquid spray	Ag I 0.3 - 1.0 gr/km Dry ice 100~1000 gr/km	For cumulus height of cloud base < 1 km; Temp. of cloud top > -20°C; Height of cloud top > 6 km; depth of cloud > 1.6 km; cloud seeding at -5° → -20°C	April - Sept.	Eval. based on historic. records, crop da- mage and hail pads eval. will be- come available
CN-4	O H	1000 km ²	Hail suppression plan of Beijing	Yian Zing county of Beijing	1973 Yes	Gov. Agri.	Artillery shells	Ag I Total consumption 8 kg	In cloud seeding con- vective clouds, cloud base temp. > +10°C; cloud top temps. < -20°C; cloud top height > 8 km radar reflect ≥ 40 dbz	May - Oct. 150 days	Compari- son with historic. records; document available
CN-5	R	Local obs.	Observ. and analysis of rain water temperatures of seeded and unseeded clouds	Changsha Hunan, China E111°37' N28,8°	1989 Yes	Res. Found.	Artillery shells	Ag I 20 gr-40 gr per cloud, total used 2 kg	Cumulus clouds; cloud base > 10°C; cloud tops colder than -20°C; release in cloud, 3000- 4000 m. above earth surface	July - Aug. 42 days	Evalua- tion is compari- son with temp. of rain of natural cloud

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>CHINA (Continued)</u>									
CN-6									
Randomized seeding exp. in Hunan Prov. Single Cumulus seeding experiment	1979 - 1988 July - Sept.	Two 37 mm anti-aircraft guns with Ag I + expl. 3-4 km altitude of seeding 2 km seeding track 40 gr/5 min.	Fixed target	Hilly area Target area 3300 km ² 120-130 precip. gauges recording	Standard seeding period 5 minutes 1 cloud = unit 36 seeded clouds 31 not seeded clouds selection criteria radar echo top > 6 km reflective factor > 30 dbz equivalent radius > 2 km	Double ratio statistical test more precipitation stronger radar echo level of strong core lowered seed, no seed ratio 1.14 statistical significance > 0.05			

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>CHINA (Continued)</u>											
CN-7	Hail Supp.	1240 km ²	Operation of hail suppr. Tianjin	116°42'5" - 118°3'31" E 38°33'57" - 40°14'5" N Tianjin	1974 Yes	Gov. Agri.	Artillery shells and rockets explosive type seeding	In-cloud seeding above 0°C .36 kg per operation Total consumption 10.5 kg	Convective clouds with bases generally warmer than 10°C and cloud tops colder than -20°C radar echo ≥ 30 dbz H ≥ 8 km	April - Oct. 1989 29 days	Crop damage evaluation criteria
CN-8	R. Deve. P Hail Supp	1600 km ²	Qing Hai province of weather modification	For P.E. 102°12'-102°38' E 36°07'-36°39' N For hail 101°07'-102°47' E 35°43' N	H.S. commenced operation in 74 pe 87 Yes HS area	Gov. Agri. Wea. Serv. Met. Res. Inst. Qing-Hai Prov.	37 type anti-aircraft gun	In cloud seeding -2° to -13°C (2-4 km)	P.E. Ag I. 0.11 \rightarrow 0.1 gr/kg Hail - 1-3gr/kgm ² Total consumption for: PE = 1 kg AgI H.S. = 30 kg AgI Criteria for seeding P.E. H=Height ≥ 4900 $\Delta H \geq 3000$ m db ≥ 20 db for Hail H ≥ 6000 m db > 35 db Hm ≥ 4500 m	PE 4-6 mo Hail 5-10 mo PE: 66 days Hail: 140 days	Analysis of rain drop size distr. Comp. Hist. records Crop damage evaluation
<u>COTE D'IVOIRE</u>											
CI-1	PE Inc. R	10000 km ² target 50000 km ² control	--	In a forest 120 km from the sea of the Gulf of Guinee	1987 Proj. to go from Jan 87 to Dec 91	Agr. Palm Indu.	3 AgI acetone generators	Ag I 12.5 gr/hour Total consumption 25 kg	Convective clouds with cloud base temp. $> +10^\circ\text{C}$ and cloud top temp. colder than 0°C and warmer than -20°C	Dec-Jan Feb-Apr. 150 hours	All records available to WMO Comparison with hist. records

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
COTE D'IVOIRE (Continued)									
CI-2									
Augmentation of Precipitation in a forest in Côte d'Ivoire with a ground based Ag I generator	5 years Dec-April	Ground based Ag I generator	Target control	Flat terrain	--	increase in rainfall + 40%	--	--	G.J.R. Baudet I. Dessens & J.P. Lacaux The journal of weather modificatio April 1986 Vol. 18 No. 1 p.10 to 13

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>CUBA</u>											
CU-1	PE 0 Drought Inc. R during wet period	10000 km ²	Campana de Lluvia Procada	78°10' 21°30' Province of Guantanamo	1982 Yes	Govt. Met. Ser.	2 aircraft cartridges 4000 used	Ag I cartridges 4000 consumption 2 kg Ag I	In cloud seeding -5° -10°	May- Oct. 20 days	
<u>FRANCE</u>											
FR-1	Res. Op. Hail Supp	Target 55000 km ² 470000 km ² control	Hail Supp. (ANELFA)	SW France Dept. 9,11,16 17,31,33,40 64,65,66,81	1952 Yes	Ins. Agr.	AgI G/B 496 acetone burners	AgI 8 gr/hr/gen 949 kg	Convective clouds cloud base colder < +10°C cloud top colder < -20°C	April- Oct.	Compa- rison with hist. record & with claims in ad- joining area

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FRANCE (Continued)									
FR-2									
Results of a 30-year hail prev. project in SW France	38 years 1 April to 31 October 1989	496 ground based AgI generators	Target and control (adjoining) fixed areas	Hilly 55000 km ² target area 470 000 km ² control area and hail pads	Annual season is 1 unit. 8 units not seeded. 13 units lightly seeded. 22 units heavy seeded	diminution of hail mass 41% reduction in loss to risk ratio	Comparison of hail damage in the target area with hail damage in the control areas	Change in precipitation downwind from target area expected to increase	Scientific pub. Hail in SW France Part I: Hailfall characteristics and hail environment. Part II: Results of a 30 year prevention project with AgI seeding from the ground. Journal of climate and applied climatology, 25, 35-58. Analysis comment: Damage reduction from hail with a C/B ratio of 1/24
FR-3									
Testing of the Soviet hail reduction system used in Grossversuch IV	5 years 1977-81 15 May-15 Sept.	AgI with Oblakov rocket altitude of seeding 2-8 km seeding rate 84 g AgI per rocket	Cross-over design 50%-50%	Mountainous target area 1200 km ² . Control area 1200 km ² 20 preci. gauges in target area 20 in control area other verification quantities dBz > 55 dBz aircraft cloud meas. hail pads mass number of hail stones dia.	1 unit-12h-21h. Soviet criteria to determine if seedable	83 seed. 122 no seed cases with hail on ground. 62 no seed. 47 seed qualitatively no difference between seed/unseed tendency of a diminution of surface hail			Journal of Applied Meteorology, J-F. Mezeix, May 1990, p.401-417 References listed to France contribution, G.T. D'Aubigny

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GERMANY, FEDERAL REPUBLIC OF											
GE-1	Hail O R	2500 km ²	Hail Supp. in Stuttgart area	Germany around Stuttgart 49°N 10°E	1980 Yes	Priv. Local Govern Agri + Ins. Co.	1 aircraft using pyrotechnique flares for cloud base seeding	Pyrotechnique flares 0.6 kg AgI per hail cell Total consumption 26 kg	Convective Clouds cloud base temp >10°C cloud top tem <-20°C Criteria for selecting days aerological indices; for selecting clouds radar crit. ≥25 dbc + top height ≥25 000 ft	Normally May-July 25 Apr. 10 Oct. period of ope- ration in 89	Compa- rison with hist. record hail pads life history of cells & prec. charac- teristics

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
GE-2 Hail supp. in Stuttgart area involving cumulus clouds	10 years 25 April to 10 October 1989	Airborne seeding with Ag I at cloud base (1000-2500 m) seeding track ~5 km seeding rate 0.5 kg/hr → 10 kg/hr ≥ 0.5 kg/cell	Target and 5 control areas (4 adjacent + 1 distant ~150 km) 2x2 km for sub div. of target control areas	Site - hilly + flat target area 2500 km ² Control ~7000 km ² 111 precip. gauges in target + control area 8-10 recording gauges radar reflectivity aircraft cloud measurements other meas.	For ten seasons 1800 was average time of seeding	V-test Wilcoxon (Ranks) Kolmogoroff Qualitative result less rain Quantitative Hail area 55 % decrease Hail energy 41 % decrease	Sample size 177 seed days 395 no seed days	Precipitation downwind increased for up to 100 km ² Not of statistical significance	Decreasing hail stones sizes

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>GREECE</u>											
GR-1	H O	5000 km ²	National Hail Suppression Programme	Northern Greece	1984 Yes	Gov. Agri.	5 aircraft Pyrotechnique flares	AgI 70gr/km. Total consumption 111.08 kg. 4,384 flares of 20gr for seeding cloud tops. 156 endburner flares for seeding cloud base 150 gr AgI each	Seeding convective clouds with cloud base colder than +10°C & cloud tops colder than -20°C. 35 dBz above - 5°C level criteria for seeding	15 May- 30 Sept. 1989 138 days	Hist. records crop damage hail pads for eva- luation docs available

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
GREECE (Continued)										
GR-2										
Hail Supp	5 years 1984-88 15 April 30 Sept	Airborne AgI Altitude of seeding 5000m (-10°C) seeding rate 14.4 kg/h ⁻¹	Target control + cross over Area fixed	Terrain is mountainous hilly and flat target + control areas=1000 km ² 130 hailpads in each target and control area	1 unit = 24 hours 135 dBz at -5°C determines seedability 37 days seeded + 37 days not seeded	Less hail mass seed no seed Statis. signif. 95%	70% reduc- tion 95% sta- tistical signi- ficance			Greek Agri- cultural Insurance Organi- zation (ELGA) issues detailed operational and evaluation reports

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>IRAN</u>											
IR-1	PE Inc. Prec. during wet period	200 km ²	--	In central part of Iran Yazd	1989 Not fully implemented	Gov. Minis of Power Hydr.	18 ground generators acetone burners	AgI ground generators	In passage of cyclone system, especially in passage of cold front	In cold season approx. 10 days	No EIS or cost benefit studies
<u>LIBYAN ARAB JAMAHI RIYA</u>											
LI-1	PE Augment routine water supply 0	69000 km ²	Libyan cloud seeding and precipitation enhancement	Tripoli Sirte Elmarje	1980 Yes	Trans. Gov.	10 aircraft 1 Mitsubishi 5 cm radar, 2 enter- prise radars, 1 SESNA 402 B, 2 Piper 31 10+20 gr dropable flares of AgI and fixed wing flares for cloud base in cloud and cloud top seeding	For convective + orographic clouds AgI flares	Predominant cloud base seeding at -5°C single clouds form experimental unit with cold top at -10°C	1 oct- 31 March	No doc
<u>MADAGASCAR</u>											
MA-1	PE Drought 0	400 km ²	--	Fanambana	1989 not known	Gov. Agri.	1 aircraft	NaCl powder at base of cloud 225 g/mm. Total dispensed 10 kg convective clouds + orographic clouds	cloud instability criteria for seeding	Feb.	Evaluation based on historic records comparison with raingauge

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
MADAGASCAR (Continued)									
MA-2									
Region de Toliary PE-Object major clouds orographic + cumulus	1 year Jan- April	NaCl 15 kg/hour released from an aircraft at 2000- 3000 m over target	Target size 15000 km ² with 6 rain gauges	Evaluation based on comparison with other raingauges quantitatif comparison suggest 150-300% of normal					

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MOROCCO	MO-1 O R PE Drought	14300 km ²	Programme A1 Ghait	31°25'-32°5' N 5°25' - 7°25' N Central + High Atlas Mtns	-- Yes	Gov. Wea. Serv. Trans	7 AgI gen. 3 aircraft	AgI 20 gr/hr 48 kg/season 2940 kg propane/ season	Seeding in cloud at -8°C or between -10°C to -5°C seeding convective clouds and orographic formed clouds in temp between -5°C and -20°C and 1 km in depth Convective clouds seed between -10°C and -25°C and 2km deep and at least -5°C on top	Nov-April 16 hours	Evaluation based on target- control relation ship

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>MOROCCO (Continued)</u>									
MO-2									
Programme Al Ghait High Central Atlas Mtns. Precipitation augmentation both rain and snow mostly with frontal clouds	6 years 1 Nov- 30 Apr.	7 AgI ground generators 3 aircraft generators seeding between 0°C → 6°C burning 0.375 kg/hour	Target control design 150- 200 km sepa- ration	Mountainous terrain. 30 precipitation gauges in target area and 15 in control. 4 recor- ding gauges radar and aircraft to support evaluation		Qualitatively precipitation increased			

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
PHILIPPINES											
PH-1	Drough Relief Routine Water Supply 0	Missing	Bureau of soils and Water management	National scope (whenever needed)	1987	Gov. Agr.	4 aircraft	not listed	In planning phase	Jan-Dec 1989	Comparison with historic records
UNION OF SOVIET SOCIALIST REPUBLICS											
SU-1	H 0	7000 km ²	Hail Supp	Tadzhik SSR (Tajik)	1964 Yes	Agr. Wea. Serv. Gov.	Air: in cloud seeding between -6 and -10°C using rockets and artillery shells with explosives and pyrotechnic flare generator releasing AgI	AgI treating convective clouds	Cloud base temp warmer than +10°C + cloud top colder than -20°C cloud are selected for seeding when $P > 0.4$ and when $\frac{Z}{10} < 1$	April-August 40 days	Evaluation based on comparison with historic records EIS made but not available
SU-2	H 0	8600 km ²	Hail Supp	Uzbek SSR	1967 Yes	Agr. Wea. Serv.	Rockets and artillery shells with pyrotechnic + explosive Ag I charges	AgI	Convective clouds. In cloud seeding between -6°C and -10°C cloud bases warmer than +10°C cloud top temp. < -20°C Treatment started when $Pt > 4$ when $\frac{Z}{10} < 1$	April-Sept. 52 days	Evaluation based on historic records Evaluation made but not available
SU-3	H	13150	Hail Supp	Georgian SS Rep.	1964 Yes	Agr. Wea. Serv. Gov.	Rockets and artillery shells using pyrotechnic flares and explosives	Using AgI in cloud seeding between -6°C and -10°C	Convective clouds with cloud base temp colder than +10°C and cloud top temp colder than -20°C seeding to commence when $P > 4$ for $\frac{Z}{10} < 1$	April-Oct. 67 days	Evaluation based on comparison with historic records EIS made but not available

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (continued)											
SU-4	H O	24400 km ²	Hail Supp	Moldavian SS Rep.	1964 Yes	Agr. Wea. Serv. Gov.	Rockets + pyrotechnic flares for in cloud seeding at -6°C to -15°C	AgI	Convective clouds with cloud base warmer than +10°C and cloud top colder than -20°C seeding to commence when $P_t > 4$ and $\frac{\lambda 3.2}{\lambda 10} < 1$	May- Sept. 50 days	EIS made but not availabl evalua- tion based on histo rical records
SU-5	H	4015 km ²	Hail Supp	Odessa Region Ukrainian Rep.	1980 Yes	Agr. Wea. Serv.	Rockets + pyrotechnic flares	In cloud seeding at -6° to -10°C AgI	Convective clouds with cloud base warmer than +10°C and cloud top colder than -20°C Criteria for modifi- cation $P_t > 4$ and $\frac{\lambda 3.2}{\lambda 10} < 1$	May- Sept. 25 days	Evalua- will be based on compari- son with historic records
SU-6	O	10030 km ²	Hail Supp	Armenian SS Rep.	1964 Yes	Agr. Wea. Serv. Gov.	Rockets + artillery shells	AgI in cloud seeding disbursed by explosions and pyrotechnic flares at temp at -6° to -10°C	Convective clouds with cloud base temp colder than 10°C and the cloud top temp colder than -20°C. Criteria for modification	April- Oct. 70 days	Evalua- will be based on compari- son with historic records
SU-7	H O	5010 km ²	Hail Suppression	Crimea region Ukrainian SS Rep	1968 Yes	Gov. Agri. Wea. Serv.	Rockets and flares	AgI in cloud seeding between -6°C → -10°C	Convective clouds with cloud base temp +10°C or warmer and cloud top temp are colder than -20°C	May Sept. 37 days	Evalua- tion be based on compari- son with hist. records
SU-8	Hail O	7700 km ²	Hail supp.	Krasnodar Territory	1967 Yes	Gov. Agri. Wea. Serv.	Rockets artillery shells and pyrotechnic flares explosive flares in cloud seeding between -6°C -10°C	Ag I	Convective clouds with cloud base +10°C or warmer and cloud top -20°C or colder. criteria for seeding when $P_t > 0.4$ and $\frac{\lambda 3.2}{\lambda 10} < 1$	May- Sept. 56 days	Evalua- tion based on comp with historica records

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (continued)											
SU-9	H O	11450 km ²	Hail Supp	The North Caucasus	1967 Yes	Gov. Agri. Wea. Serv.	Rockets + pyrotechnic flares in cloud seeding between -3°C and -15°C	Ag I	Convective clouds with cloud base colder than +10°C and cloud tops colder than -20°C criteria for seeding $Pt \geq 0.4$ ratio of reflection $\frac{\lambda 3.2}{\lambda 10} < 1$	April- Sept. 58 days	Compari- son with hist. records
SU-10	Hail O	13300	Hail Supp	Azerbaijan SS Rep	1967	Gov. Agr. Wea Serv	Ag I	Rockets artillery shells + pyrotechnic flare Ag I	In cloud seeding between - 6°C → -10°C Convective clouds with cloud base colder than + 10°C and cloud tops colder than -20°C Probability of hail $Pt \geq 4$ and $\frac{\lambda 3.2}{\lambda 10} < 1$	April- Oct. 53 days	Compari- son with historical records
SU-11	H Res	Target 2500 km ² control 3000 km ²	Complex hail experiment	Kabardino Balkarian Autonomous SS Rep	1983 Yes	Gov. Res. Foun- dation Wea. Serv.	Rockets pyrotechnic flares in cloud seeding between - 6°C → -10°C	Ag I	Convective clouds with bases colder than +10°C and cloud tops colder than -20°C ratio of ZR reflections $\frac{\lambda 3.2}{\lambda 10} < 1$ $Pt \geq 0.4$	May- August	Evalu- ation compari- son with historical records
SU-12	PE H Op	5000	Cloud seeding for preci- pitation Enhancement	Ukrainia SS Rep	1985 Yes	Gov. Agri. Wea Serv.	Aircraft	Ag I Pyrotechnic flare + solid dispersal	Stratiform clouds. Cloud base colder than +10°C. Cloud tops colder than 0°C but warmer than -20°C. Stratiform clouds must be thicker than than 500 m	Jan-March Nov-Dec 72 days	Evalua- tion based on comp. with histo- rical records
SU-13	PE H Op.	6800 km ²	Cloud seeding for precipi- tation enhancement	Georgian SS Rep	1985 Yes	Gov. Agri. Wea Serv.	Rockets Pyrotechnic flare. In cloud seeding at -6°C to -10°C	Ag I	Conv. clouds with cloud bases colder than +10°C and cloud tops colder than -20°C. Vertical depth of clouds more than 2 km	May-Sept 42 days	Evalua- tion using histo- tical records

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>UNION OF SOVIET SOCIALIST REPUBLICS</u> (continued)											
SU-14	H O PE	2000 km ²	Cloud seeding for precipi- tation enhan- cement	Uzbek, SS Rep	1985 Yes	Gov. Agri. Wea. Serv.	Rockets. In cloud seeding in -4°C to -10°C. Temperature range	AgI	Layer type clouds. Cloud base colder than +10°C. Cloud top colder than 0°C but warmer than -20°C.	Jan to March Nov to Dec. 23 days	Evalu- tion based on historic records Evalu- ation available
SU-15	Fog O	3500 x 500 x 100 m	Artificial dispersal of supercooled fog at air- fields	Airport in Kishinev city Moldavian SS Rep	1985 Yes Yes	Trans- porta- tion Wea. Serv.		Ground seeding Acetone generator operated in area to be affected liquid nitrogen and propane	Stratiform cloud colder than + 10°C at base & colder than 0°C but warmer than -20°C. Temperature wind speed availability of supercooled water in fog	Jan to March Nov- Dec 8 days	Physical assess- ment
<u>UNITED ARAB EMIRATES</u>											
UAE-1	PE O Aug. Water Supply Inc. water in wet period	250 km ²	HQ Air Force GHQ Armed Forces Rain Enhan- cement Project	24°26' N 54°27' E	1989 Yes	Gov. Armed Forces	1 aircraft with pyrotechnic flare	AgI rate of consumption varies Total consumption 35.00 kg	In cloud and cloud top seeding. Seeding level approx. -10°C Cloud base > 10°C Cloud top > 0°C colder but warmer than -20°C 1 gm/m ³ super cooled water 300 ft updrafts	Jan-May 1989 20 days	Seeded cloud trajec- tory US rain gauge results
<u>UNITED STATES OF AMERICA</u>											
US-1	Op Inc. Snow pack	1500 km ²	Utah water resources Dev Corp. NOAA 89-685	Northern Utah	--	State	30 ground based Ag I generators	6gr/hr/gen. Ag I-30 13587 gm 1062 gm	--	1-4/89 25 days 12/88 4 days	--
US-2	Op PE	2225 mi ²	Kings River Conserv. District Fresno, CA NOAA 89-684	Kings River Watershed, CA	--	Water Dist.	10 ground based Ag I generators 1 aircraft wing tip generator	Ag I ground generators 6-9 gr/hr. Total used 5565 gm. Aircraft gen. 120-180 gr/hr	--	1-5/89 21 days 12/89 0 day	--

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>UNITED STATES OF AMERICA</u> (continued)											
US-3	Op PE	10000 mi ² 11400 mi ²	Utah water Resources Co. Development Corp. NOAA 89-683	Southern and Central Utah	-- --	State State	71 ground based Ag I gen	6 gr/hr 18,999 gm and 6,561 gm	--	1-4/89 24 days 11-12/89 13 days	--
US-4	Op PE	1000 mi ²	Utah power and light. Salt Lake City Utah, NOAA 89-682	Smith and Thomas Forks of the Bear River Water- shed, Utah	--	Elec- tric Power Uti- lity	12 propane fired Ag I ground based	Ag I - 6 gr/hr 7095 gm and 3306 gm	--	1-4/89 18 days 11-12/89 12 days	--
US-5	Fog Disp.	10 mi ²	Salt Lake City Airport NOAA 89-681	Salt Lake City Airport	--	Pri- vate Co.	Aerial release of CO2	--	--	0	--
US-6	Fog Disp.	10 mi ²	Salt Lake City Airport NOAA 89-680	Salt Lake City Airport	--	Delta air- lines	Aerial Release of CO2	CO2 (dry ice) 1-3 (89) 11-12 (89)	--	10 days 0 days	--
US-7	PE Snow pack	100 mi ²	Vail + Beaver Creek ski areas NOAA 89-679	Beaver Creek Town of Vail Town of Avon	-- -- --	Pri- vate Co	10 ground based Ag I NH ₄ I generators	Ag I - NH ₄ I 5-20 gm/hr 4136 gm	--	1-3/89 18 days 11-12/89 20 days	--
US-8	Snow pack	1500 mi ²	Nevada State Wea. Mod. Programme NOAA 89-678	Truckee River watershed	--	DRI State Inst.	Ground based gen. aerial released flares	6 propane burning AgI-CH ₃ COCH ₃ generators + 200 AgI flares 6 gr/hr/generator 200 g/hr/flare 34159 gr 5935 gr	--	1-4/89 34 days 10-12/89 5 days	--
US-9	Inc. Snow- pack	1500 mi ²	Nevada State Wea. Mod. Programme NOAA 89-677	Carson + Walker Rivers Watershed	--	DRI State Inst.	Ground based gen. aerial release flares	3 propane burning AgI-CH ₃ COCH ₃ ground based generators 6gr/hr 200 gr/hr/flares 4697 gm and 1920 gm	--	1-4/89 24 days 10-12/89 2 days	--

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNITED STATES OF AMERICA (continued)											
US-10	Inc. Snow pack	900 mi ²	Nevada State Wea. Mod programme NOAA 89-676	Western Ruby Mts. Nev.	--	DRI State Inst.	Ground based	6 propane burning gen. AgI CH ₃ COCH ₃ 6 gr/hr 2405 gm and 570 gm	--	1-4/89 25 days 10-12/89 4 days	
US-11	Inc. Snow-pack	500 mi ²	Pacific gas + electric Co. NOAA 89-675	Lake Almanor Sierra Nevada Mts (CA)	--	Priv. Utility	Ground based	9 propane burning generators AgI + CH ₃ COCH ₃ AgI - NH ₄ I 25 gr/hr 21850 gm and 2100 gm	--	1-5/89 34 days 11-12/89 3 days	
US-12	Inc. Snow pack	250 mi ²	Pacific Gas Electric Co. NOAA 89-674	Mokelumne Central Sierra Nevada Mts	--	Priv. Elec. Utility	Ground based 5 CH ₃ COCH ₃ -AgI and AgI-NH ₄ I generators	25gr/hour CH ₃ COCH ₃ AgI and AgINH ₄ I 14437 gm and 0 gm	--	1-5/89 26 days 11-12/89 0 days	--
US-13	Inc. Snow pack	200 and 600 mi ²	Utah water resources dev. NOAA Corp. 89-673.	Wasatch Mtns east of Salt Lake	--	Utah State	16 ground based propane burning AgI generators	6 gr/hour/gen AgI 9830 gm and 5549 gm	--	1-4/89 19 days 11-12/89 12 days	--
US-14	Inc. Prec.	3500 mi ²	Santa Barbara County Water Agency	Coastal Strip of Santa Barbara and San Luis Obispo County, CA	--	Gal State Water Agency	10 ground based AgI generators. 2 wing tip AgI generators	Ground based 9 gr/hour aerial release 180 gr/hour 6745 gm 1150 gm	--	1-4/89 7 days 11-12/89 2 days	--
US-15	Inc. Prec.	236	SMUD NOAA 89-671 Sacramento Municipal Utility Dist.	American River Watershed, CA	--	Elec- tric Power	8 ground based CH ₃ COCH ₃ -AgI and AgI-NH ₄ I generators	CH ₃ COCH ₃ -AgI and AgI-NH ₄ I 6080 gm and 631 gm	--	1-3/89 12 days 10-11/89 3 days	--
US-16	Inc. Prec.	1088 mi ²	NOAA 89-670 Comanche Co Wea. Mod. Inc.	Comanche County OK, USA	--	Reg. Water Supply	22 ground based propane AgI generators	AgI 5-2.0 gr/hour 2426 gm	--	7-10/89 54 days	--

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNITED STATES OF AMERICA (continued)											
US-38	PE	1200 mi ²	So Cal Edison, CO NOAA 88-640	San Joaquin River Water- shed	--	Elec. Power Co.	Aerial release + ground based	Ag I. 14 AgI generators 10-30000 gr/hour consuming 11954 gm	--	1-11/89 48 days	--
US-39	PE	500 mi ²	Kaweah Delta Water Conser- vation Dist. NOAA 88-636	Kaweah River Watershed west slope of Central Sierra Nevada Mtns, CA	--	Irri- gation water	Pyrotechnic aerial release + 6 AgI ground based generators	AgI 60-30000 gr/hr consumed 4138 gm	--	1-4/89 11/89 13 days	--
US-40	PE	1000 mi ²	Red Bluff Water Power Control Dist. NOAA 88-628	Texas Portion of Red Bluff Lake Watershed, Texas	--	Public Uti- lity Co.	Ground based arc type generators	Ag I. 13 AgI arc type generators 26 gr/hr/gen Total consumed 4601 gm	--	1-10/89 22 days	--
US-41	Super Fog Disp.	Est. 1 mile	Northwest Orient Air- lines Spokane Int. Airport NOAA 86-574	Runways Spokane Int. Airport	--	Air- line Op.	Aerial release of of dry ice CO ₂	CO ₂ pellets 6 lbs/mile Total consumption 4200 lbs	--	1-3/89 8 days	--
YUGOSLAVIA											
YU-1	H Dev Op.	80000 km ²	Hail supp in Slovenia Creatia, Bosnia Herzegovinia Serbia Macedonia	15°30'to 19°30' east and 45°C to 46°30' North South Serbia Macedonia	1971 Slo- venia 1976 Croatia 1968 Serbia 1971 Macedonia	Gov. Priv. Agr.	40gr. AgI rocket 680 kg total used	AgI	Convective clouds with cloud bases colder than 10°C and cloud tops colder than -20°C Z>40 dBz at 0°C; + 1.4 km depth Altitude of 45 dBz >alt. of 0°C + 1.4 km	Slovenia 25 Apr- 15 Oct. Croatia 1 Apr- October Serbia April- October Macedonia 15 Apr- 15 Oct.	40 days 180 days 184 days 180 days
YU-2	Fog Disp. Res. Op.	50 km ²	Experimental operational supercooled fog seeding at open coal mines Kolubara	50 km South of Belgrade	1986 Yes	Gov. Ener.	Liquid propane 24 propane devices release in fogs colder than -1°C	25 kg/hr liquid propane total consumption 1200 kg	Fogs must be colder than -4°C and visibility less than 200 m	Dec 89 Jan 90 6 days	Evalu- ation based on amount of snow ice falling from fog increase visibility

ADDRESSES OF REPORTING AGENCIES

AUSTRALIA

CISRO
Division Atmospheric Research
Private Bag No. 1
MORDIALLOC, Vic. 3195

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

AUSTRIA

Zafmug
Zentralanstalt für Meteorologie und
Geodynamik
Hohe Warte 38
A-1190 VIENNA

BRAZIL

Funceme
Av. Bezerra de Menezes 1820
60000 FORTALEZA - CEARA

BULGARIA

Institute of Meteorology and Hydrology
Cloud Physics and Weather Modification
Department
Blvd. Lenin 66
SOFIA 1184

CHINA

Meteorological Bureau of Liaoning Province
Office of Artificial Precipitation and Hail
Suppression of Liaoning Province,
69 Chang de Street
Heping Boulevard
SHENYANG, Liaoning Province

Weather Modification Office
Wang Wen Hui
No. 100 Meteorological Road
TIANJIN

The Office of Qing Hai Province
Weather Modification Province Meteorological
Administration
Meteorological Research Institute of Qinghai
Province
XINING

Meteorological Institute of Shandong,
Atmospheric Physics Research Group
Wu Ying Shan
Post Code 250031
JINAN

CHINA (continued)	Hunan Meteorology Research Institute Atmosphere Physical Office 23 Yuhua Road CHANGSHA
	Weather Modification Office of Beijing 44 Zi-Zhu-Yuan-Lu Hai Dian Qu BEIJING 100081
COTE D'IVOIRE	Université Nationale de Côte d'Ivoire Département de la physique B.P. 582 ABIDJAN 22
CUBA	Instituto de Meteorologia Dpto de Influencia Activa Apartado 17032 HABANA 17
FRANCE	ANELFA 52 rue Alfred Duméril 31400 TOULOUSE
GERMANY, FEDERAL REPUBLIC OF	Deutscher Wetterdienst - Zentralamt Frankfurter Str. 135 6050 OFFENBACH AM MAIN
	Universität Hohenheim Institut für Landeskultur und Planzenökologie 320 Postfach 700562 D-7000 STUTTGART 70
GREECE	ELGA Antihail Department 30, Patission Str. 10170 ATHENS
IRAN	Regional Water Organization P.O. Box 575 YAZD
LIBYAN ARAB JAMAHIRIYA	Lybian Cloud Seeding Project P.B. 14616 TRIPOLI
MADAGASCAR	Direction de la Météorologie et de l'Hydrologie Division de la Météorologie Agricole B.P. 1254 ANTANANARIVO 101

MOROCCO
Direction de la Météorologie Nationale
Division du Développement et
de la Recherche
Aéroport CASA/ANFA

PHILIPPINES
Bureau of Soils and Water Management
Corner Visayas Avenue
Elliptical Road
Diliman, QUEZON CITY

USSR
USSR State Committee for Hydrometeorology
and Control of Natural Environment
12, Pavlik Morozov Street
123376 MOSCOW

UNITED ARAB EMIRATES
UAE, HQ AF & AD
Committee on Rain Enhancement
Planning Department
P.O. Box 906
ABU DHABI

USA
Office of Oceanic and Atmospheric Research
SILVER SPRING, MD 20910

YUGOSLAVIA
Hydrometeorological Institute of Serbia
Kneza Viseslava 66
11000 BEOGRAD

REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

List of Members reporting NO weather modification projects in 1989

ARGENTINA	THE NETHERLANDS
BAHAMAS	NEW CALEDONIA
BELGIUM	NEW ZEALAND
BELIZE	OMAN
BRUNEI	PAKISTAN
CAMEROON	PANAMA
CANADA	POLAND
CENTRAL AFRICAN REPUBLIC	QATAR, STATE OF
CHAD	REPUBLIC OF KOREA
COLOMBIA	REPUBLIC ST. THOMAS
COSTA RICA	ROMANIA
DENMARK	RWANDA
ECUADOR	SAUDI ARABIA
EGYPT	SENEGAL
ETHIOPIA	SEYCHELLES
FRENCH POLYNESIA	SINGAPORE
GAMBIA	SOLOMON ISLANDS
GUYANA	SRI LANKA
HAITI	SUDAN
HONDURAS	SWEDEN
INDIA	SWITZERLAND
IRELAND	SYRIAN ARAB REPUBLIC
JAPAN	TANZANIA
KUWAIT	TRINIDAD AND TOBAGO
LUXEMBOURG	TURKEY
MALAWI	UGANDA
MALTA	URUGUAY
MONGOLIA	VENEZUELA
MYANMAR	ZAMBIA
THE CZECH AND SLOVAK FEDERAL REPUBLIC	

WORLD METEOROLOGICAL ORGANIZATION

R/CLA/4, ANNEX A
FORM (1 JANUARY 1989)

CLOUD PHYSICS AND WEATHER MODIFICATION RESEARCH PROGRAMME

QUESTIONNAIRE
TO GATHER DATA FOR THE 1989
REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

PLEASE MARK APPROPRIATE BOXES

MEMBER OF WMO

No weather modification activities in 1989

(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)		

ANNEX A, p. 2

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 1988, January-February 1989; another might be: January-February 1989, December 1989).

(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 August 1990:

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 1988, January-February 1989.

- 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
FORM (1er JANVIER 1989)

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 1989 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 1989

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

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

- (a) Augmentation des précipitations
 - Activité déployée à la suite d'une situation
d'exception (par exemple, sécheresse)
 - Activité déployée en prévision d'une augmentation
régulière de l'approvisionnement en eau
 - Il s'agit de prolonger la période humide
 - Il s'agit d'augmenter les précipitations
pendant la période humide
- (b) Redistribution des précipitations
- (c) Suppression de la grêle
- (d) Dispersion du brouillard
- (e) Divers (veuillez préciser)

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

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 1989

(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 1988, janvier-février 1989, ou janvier-février 1989, décembre 1989).

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

.....

ANNEXE 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)

Veillez remplir ce questionnaire et le renvoyer dès que possible, et dans tous les cas avant le 31 août 1990, 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 COMPLEMENTAIRES
CONCERNANT LE QUESTIONNAIRE A REMPLIR POUR
L'INVENTAIRE DES PROJETS NATIONAUX DE MODIFICATION ARTIFICIELLE DU TEMPS

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

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 1988, janvier-février 1989).
- 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.
-

ORGANIZACION METEOROLOGICA MUNDIAL

R/CLA/4, ANEXO A
FORMULARIO (1 DE ENERO DE 1989)

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

CUESTIONARIO
PARA RECOPIRAR DATOS DESTINADOS AL INVENTARIO DE 1989 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 1989

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

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

a) Intensificación de la precipitación

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

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

Se trata de prolongar el período húmedo

Se trata de aumentar la precipitación durante el período húmedo

b) Redistribución de la precipitación

c) Supresión del granizo

d) Dispersión de la niebla

e) Otros (especifíquense):

ANEXO A, p. 2

2. SE TRATA PRINCIPALMENTE DE UNA ACTIVIDAD (de investigación /) (de desarrollo /) (operativa /)

3. ZONA QUE CUBRE EL PROYECTO

- a) Superficie aproximada de la zona del blanco (km²):
- b) Superficie aproximada de la zona de control (si procede) (km²):

4. NOMBRE Y/O REFERENCIA DEL PROYECTO:
.....

5. SITUACION DE LA ZONA EN LA QUE SE EJECUTA EL PROYECTO:
.....

6. HISTORIAL DEL PROYECTO

a) Año del comienzo del proyecto:

b) Indique si el proyecto se ha realizado cada año desde el principio de los trabajos

Sí / No / No se sabe /

c) ¿Se ha previsto que continúe el proyecto durante el año próximo?

Sí / No / No se sabe /

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 1988, enero-febrero de 1989 o enero-febrero de 1989, diciembre de 1989).

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?

ANEXO A, p. 4

Desde aeronaves ¿Cuántas aeronaves?
 Mediante cohetes Proyectiles 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

ANEXO A, p. 6

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

13. ORGANIZACION ENCARGADA DEL PROYECTO

a) Nombre de la persona encargada de los aspectos técnicos

.....

b) organización

c) dirección

.....

.....

14. DEMAS OBSERVACIONES:

.....

.....

.....

.....

15. ORGANISMO QUE PRESENTA LA INFORMACION:

a) Nombre del organismo:.....

b) Título oficial de la dependencia responsable:

.....

c) Dirección:

.....

.....

.....

.....

.....
(Firmado)

.....
(Fecha)

Sírvase rellenar el presente cuestionario y devolverlo lo antes posible, y en todo caso antes del 31 de agosto de 1990 a la dirección siguiente:

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

ANEXO A, p. 8

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

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

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

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

Por ejemplo:

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

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

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

ANEXO A, p. 10

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 1988, enero-febrero de 1989).
- 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?

ANEXO A, p. 12

- 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.
-

с) Предполагается ли продолжение проекта в течение следующего года?

Да

Нет

Неизвестно

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

ДЕЯТЕЛЬНОСТЬ ОРГАНИЗАЦИИ	ПРАВИТЕЛЬСТВЕННАЯ	ЧАСТНАЯ
_____	_____	_____
Сельское хозяйство	_____	_____
Энергетика	_____	_____
Лесное хозяйство	_____	_____

ПРИЛОЖЕНИЕ А, стр. 4

(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 1988 г., январь-февраль 1989 г.; другой пример: январь-февраль 1989 г., декабрь 1989 г.).

б) Сколько дней проводилась эта деятельность?

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

а) Система доставки материала для засева:

Наземная Сколько генераторов?

Самолет Сколько самолетов?

Ракеты Артиллерийские снаряды

Прочая (просьба указать).....

б) Тип генератора:

Ацетоновая горелка Пиротехническая ракета

Взрывчатое вещество Разбрызгиватель жидкости

Распылитель твердых частиц Прочее:

с) Расположение выпуска засеивающего вещества:

Наземное Нижняя граница облаков

Верхняя граница облаков В облаках

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

.....

.....

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

10. ХАРАКТЕРИСТИКИ ОБРАБАТЫВАЕМЫХ ОБЛАКОВ:

а) Конвективные (кучевые) Орографические Слои (слоистообразные)

б) Преобладающая температура в нижней части облака (С⁰):

Выше +10⁰C Ниже +10⁰C

с) Преобладающая температура в верхней части облака:

Выше 0⁰C

Ниже 0⁰C, но выше -20⁰C

Ниже -20⁰C

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

.....

.....

.....

ПРИЛОЖЕНИЕ А, стр. 6

11. **ОБОСНОВАНИЯ ДЛЯ ОЦЕНКИ**

- a) Не имеется
- б) Рандомизированный эксперимент
- с) Сравнение с историческими данными
- д) Ущерб урожаю Градомеры
- е) Прочие:
- ф) Имеется ли документ по оценке или планируется таковой? ДА НЕТ
- г) 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
- б) Проведен ли анализ предполагаемых (или фактических) затрат и выгод? ДА НЕТ

13. **НАЗВАНИЕ ОРГАНИЗАЦИИ, ОТВЕТСТВЕННОЙ ЗА ПРОЕКТ:**

- a) Фамилия главного технического лица:
- б) Организация:
- с) 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 августа 1990 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;

- 9) использование лазеров или других источников электромагнитной радиации.

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

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

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

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

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

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

- ПУНКТ 7 - Укажите основной род занятий организации, которая финансирует проект, обозначив значком (X) соответствующую ячейку (при необходимости используйте несколько значков).
- ПУНКТ 8 - В какие месяцы и сколько дней осуществлялась оперативная полевая фаза проекта? Была бы полезна любая информация, касающаяся целей деятельности. В некоторых случаях проекты охватывают два года. Желательно включить в Реестр за конкретный год только ту часть, которая проводилась в отчетный период. Если это невозможно, просьба указать годы, в которые проводилась деятельность, например, декабрь 1988 г., январь-февраль 1989 г.
- ПУНКТ 9 - Под устройством активного воздействия на погоду подразумеваются любые устройства, используемые с целью намеренного вызывания искусственных изменений в составе, поведении или динамике атмосферы. Например: генераторы засеивания йодистым серебром, пропановые устройства, пиротехнические устройства, ракеты, артиллерийские снаряды, реактивных двигатели и т.д.
- а) Система доставки засеивающих веществ. Укажите, обозначив значком (X) соответствующую ячейку, характер системы доставки - наземная, воздушная и т.д.;
 - б) Укажите способ подготовки засеивающего вещества для распыления (например, путем сжигания ацетонового раствора соединения йодистого серебра). Распыление твердых частиц относится к рассеиванию ледяных крупинок (например, сухой лед), порошка (например, NaCl) и т.д.;
 - с) Укажите, обозначив значком (X), соответствующую ячейку, место рассеивания засеивающего реагента;

ПРИЛОЖЕНИЕ А, стр. 12

- 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), ячейку, общую характеристику облаков, которые выбраны для обработки;
- b) Укажите преобладающий диапазон температур на нижней границе облака;
- c) Укажите преобладающий диапазон температур на верхней границе облака;
- d) По каким характеристикам отличают дни или облака, подвергнутые воздействию, от тех, которые не были подвергнуты воздействию?
- ПУНКТ 11 - Этот вопрос относится к оценке эффективности проекта. Предоставление большего объема информации по средствам, используемым для оценки положительных сторон проекта, только приветствуется, и эта информация может быть представлена под пунктом 14 или на отдельной странице.
- ПУНКТ 12 - Этот вопрос относится к любому анализу, проведенному с целью расчета и/или измерения общего изменения окружающей среды, подвергнутой воздействию, и отдельный вопрос касается предполагаемых или полученных экономических выгод.
- ПУНКТ 13 - Сообщите название и адрес организации, в которую можно направлять запросы о последующей информации.
- ПУНКТ 14 - Этот пункт позволит лицу, представляющему отчет, включить любую информацию, которая не вошла в пункты с 1 по 13, но которую он считает важной или представляющей интерес, такую, например, как 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.

WORLD METEOROLOGICAL ORGANIZATION
=====

R/CLA/4, ANNEX B

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 <u> / / </u>	tation <u> / / </u>	tation <u> / / </u>	Mass <u> / / </u>

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 avions, coussins à grêle, etc.) :

.....
.....

6. UNITE EXPERIMENTALE

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

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

.....

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

.....
.....

ORGANIZACION METEOROLOGICA MUNDIAL

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)
.....

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:

ANEXO B, p. 4

7.3.1 Cualitativo:

No hay dife- rencia / <u> </u> /	Más precipi- tación / <u> </u> /	Menos precipi- tación / <u> </u> /	Menos masa de gra- nizo / <u> </u> /
---	---	---	---

Otros resultados cualitativos:

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 cabo el proyecto

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

8.1.2 Tamaño de muestra para cada estratificación (número de unidades de 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 proyecto:

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):
.....

10. COMENTARIOS
.....
.....
.....
.....
.....

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

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

Предотвращение града

Предотвращение молний

Другие (просьба указать):

.....

ПРИЛОЖЕНИЕ В, стр. 2

1.3 Основной тип облаков:

Орографи-
ческие Кучевые Слоисто-
образные Фрон-
тальные

2. ПРОДОЛЖИТЕЛЬНОСТЬ ПРОЕКТА

2.1 Продолжительность проекта по годам:

2.2 Оперативный период в каждом году:

С: До: включительно.

3. ЗАСЕВ

3.1 Реагент засева: AgI CO₂ NaCl

Другие (просьба указать):

3.2 Генератор(ы): Наземные Воздушные

Если генератор наземный, указать количество:

3.3 Процедура засева с воздуха:

Высота засева (м):

Длина трассы засева (м или км):

Норма засева (кг ч⁻¹):

4. ПОСТРОЕНИЕ ПРОЕКТА

4.1 Основная схема:

Целевые Целевые + контрольные Перекрестные

4.2 Расстояние между районами (км):

4.3 Определение района:

Постоянный

Переменный

Если переменный, указать основу определения:

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

.....

5. ПЛОЩАДКА

5.1 Местность:

Горная

Холмистая

Ровная

5.2 Размер целевого района (км²):

5.3 Размер контрольного района (км²):

5.4 Количество осадкомеров:

5.4.1 Все виды осадкомеров в целевом районе:

Все виды осадкомеров в контрольном районе:

5.4.2 Осадкомеры-самописцы 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:

.....

7.3.2 Количественные:

Соотношение засев/нет засева	Статистическая значимость
---------------------------------------	------------------------------------

8. ОБОСНОВАНИЕ ДЛЯ ОЦЕНКИ РЕЗУЛЬТАТОВ

8.1 Аналитические спецификации, установленные ДО проекта

8.1.1 Характер стратификации(ий), если имеется:

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

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:
.....

ПРИЛОЖЕНИЕ В, стр. 6

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):

.....

.....

.....



LIST OF CLOUD PHYSICS AND WEATHER MODIFICATION
RESEARCH 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, July 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 and 1988 (Geneva, June 1990)	WMO/TD-No. 330
WMP-No. 14	Register of National Weather Modification Projects - 1989 (Geneva, May 1991)	WMO/TD-No. 417

LIST OF PRECIPITATION ENHANCEMENT PROJECT REPORTS

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

- 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)

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