



World Meteorological Organization
Weather • Climate • Water

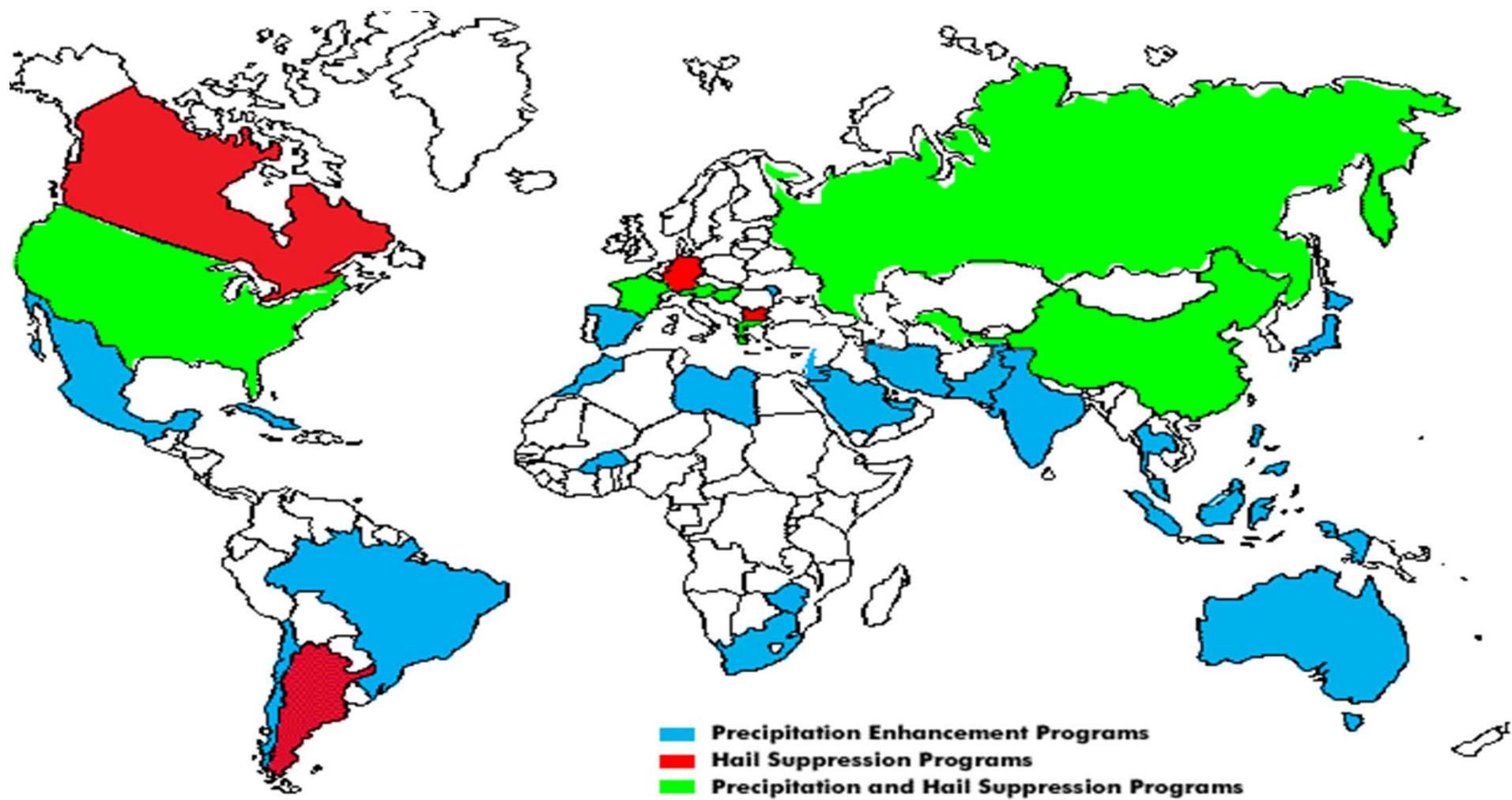
WMO Expert Committee on Weather Modification Research

Report

November 2014

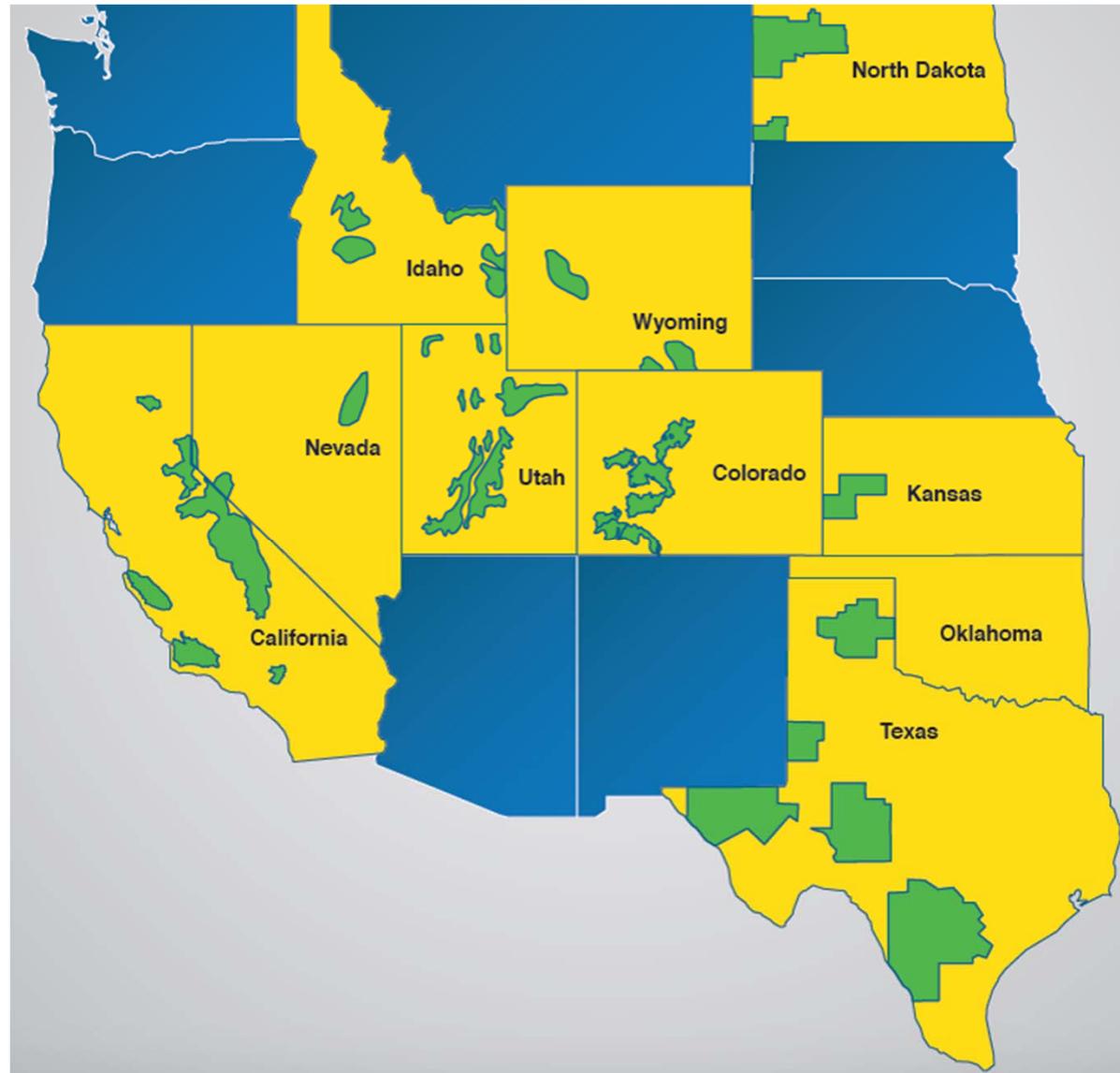
Weather Modification Around the World

52 Countries with active cloud seeding programs



Cloud seeding programs in the USA

39 active weather modification programs



Activities since 2013

- Number of countries doing weather modification programs increased from 47 in 2013 to 52 in 2015 and several new programs in individual countries
- The meeting in China did not materialize due to lack of funding.
- Meteorological Services are often asked to provide advice and most of the time refer to the WMO statements
- Several Expert Team members participated in several international and local meetings over the past year. The important meetings were:
 - WMO-CMA International training Course on Weather Modification
 - Workshop on UAE research program for Rainfall Enhancement Science in Arid and Semi-Arid regions of the world
 - U.S. Bureau of Reclamation workshop on the status of cloud seeding to enhance snowpack and research needs

Activities since 2013

WMO-CMA International training Course on Weather Modification

- Approximately 50 people attended the International Training Course on Weather Modification that was held in Beijing, China from 18-29 August 2014.
- While most of the attendants were from provinces in China, about 14 persons representing 10 other countries also attended the course.
- Although the course was well organized and attended it may be worthwhile in the future to enhance its international focus and to have some more thought put into the course content.
- The idea of the course is great, but especially with technologies rapidly developing and many countries not really familiar or inexperienced with the technologies, it is difficult to address and convey all the issues in such a short time.
- One idea would be to have the presenters provide a paper of their presentations that could be compiled into a report.
- It was also clear in some of the presentations that although some countries have acquired new advanced instrumentation for their research, they often lack the experience on how to use these new tools in their research programs.

Activities since 2013

Workshop on UAE research program for Rainfall Enhancement Science in Arid and Semi-Arid regions of the world

- The higher authorities in the UAE have provided approximately \$3mil per year for this future grant program.
- The focus of the meeting was to identify critical research needs in this field that would have to be included in the Request for Proposals (RFP).
- The meeting was co-organized by ScienceWorks Inc. in the USA that is contracted to help develop the administrative structure of the grant program for NCMS.
- The previous Chief Scientist of NASA in the USA was leading the ScienceWorks group and six members of the WMO Expert Team and representatives from WMO, South Africa, University of Belgrade and MASDAR University in Abu Dhabi attended the two-day meeting.
- The announcement for the request for proposals will go out early in 2015 and the idea at this stage is to award about two grants each year with approximately US\$500,000 per year for three years to successful applicants.

Activities since 2013

U.S. Bureau of Reclamation workshop on the status of cloud seeding to enhance snowpack and research needs

- The Western Governor's conference in the past few years have included again cloud seeding to enhance snowpack in their alternative sources for water resources document
- The Bureau of reclamation has in the past few years again became involved in supporting research in this area.
- Currently the Bureau is evaluating how to become more involved again in this field of research and the purpose of the meeting in November is to evaluate the current status and how the Bureau should become involved.

Recent Scientific highlights

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Recent Scientific highlights

- Manton, M. J., Warren, L., 2011: A confirmatory snowfall enhancement project in the Snowy Mountains of Australia. Part II: Primary and associated analyses. *Jour. of Appl. Meteor. and Climat.*, **50**, 1448-1458.
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Geo-Engineering

- During the past year WMO established an Ad-Hoc Team to help WMO to develop a statement for WMO on Geo-Engineering.
- The Committee was co-chaired by the chair of the Expert team.
- The Statement followed the AMS statement on Geo-Engineering and guidelines were taken from the Oxford principles
- National Academy of Sciences study on Geo-engineering sponsored by the CIA, NOAA and NASA focused on solar radiation management and carbone dioxide should be available some time next year.

Geo-Engineering (WMO Statement)

World Meteorological Organization recommends:

- Enhanced research on the scientific and technological potential for geoengineering the climate system, including research on intended and unintended environmental responses.
- Coordinated study of historical, ethical, legal, and social implications of geoengineering that integrates international, interdisciplinary, and intergenerational issues and perspectives and includes lessons from past efforts to modify weather and climate.
- Development and analysis of policy options to promote transparency and international cooperation in exploring geoengineering options along with restrictions on reckless efforts to manipulate the climate system.

Trust Fund

- During the past year several team members in coordination with the PR's have approached entities that are active in this field in different countries with the result that several entities in countries such as China, USA, Russia and South Africa have come forward with potential contributions to the trust fund.
- We anticipate that early in the New Year some of the contributions will reach the trust fund. These contributions will come from a variety of different entities including government agencies and the private sectors, all of which have an interest to further the science in this field and to support the work of the Expert Team.
- We anticipate that once the initial contributions are received that other countries and entities will start to participate also.
- Currently working with NOAA and the U.S. PR to approach organizations involved in weather modification activities to obtain funding.
- Working with other committee members and WMO to approach similar organizations in other countries.

Future Plans

- Committee meeting in Thailand in March/April 2014 hosted by DRRAA in Thailand.
- Conduct a review of weather modification activities and science and publish as book or report.
- Review WMO statement on weather modification after Wyoming and other results become available
- Review funding opportunities and avenues for international collaboration in weather modification research.