UAE RESEARCH PROGRAM FOR RAIN ENHANCEMENT SCIENCE

National Center of Meteorology & Seismology

برنامج الإمارات لبحوث
علوم الاستمطار
UAE Research Program for
Rain Enhancement Science

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المركز الوطني للأرصاد الجوية والزلازل
National Center of Meteorology & Seismology

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His Highness Sheikh

Mansour Bin Zayed Al Nahyan

Deputy Prime Minister and Minister of Presidential Affairs

UAE Research Program for Rain Enhancement Science

2015 – A Year of Outstanding Achievements, scientific research and innovation

A year full of achievements and challenges, 2015 was the 'Year of Innovation'. And, the UAE Research Program for Rain Enhancement Science is a key component of the nation's innovation strategy. The program has received the special attention under the patronage of His Highness Sheikh Mansour bin Zayed Al Nahyan, Deputy Prime Minister and Minister of Presidential Affairs of the UAE. The initiative is one of the several research programs that have been launched lately to secure a more sustainable future for the UAE and the wider region.

The UAE Research Program for Rain Enhancement Science forms the core of operations at the NCMS, and we are honored to play a leading role in managing this program which, since inception, has received great interest locally and internationally thanks to the efforts and vision of our wise leadership.

The UAE Research Program for Rain Enhancement Science aims to improve global water security through encouraging best practices and promoting collaboration in the rain enhancement field. I invite all scientists, researchers, and research centers globally to contribute to this program through advancing innovative thinking and strategies. Furthermore, I welcome individuals, enterprises, as well as public and private entities locally and internationally, and for-profit and non-profit organizations to participate in the program and submit their research projects and proposed technologies that will help augment our available water resources.

In a special ceremony in January 2016, marking the conclusion of its inaugural year, the program will announce up to five successful proposals to share a total of US5$ million over three-year period. Winners were selected from a pool of valuable scientific and technical research proposals, following a two-stage rigorous review process.

With the launch of the second cycle in 2016 we expect more achievements, international collaboration and innovative scientific research, that will contribute to providing more sustainable alternatives to address water security issues globally.

Dr. Abdullah Al Mandoos
Director of NCMS

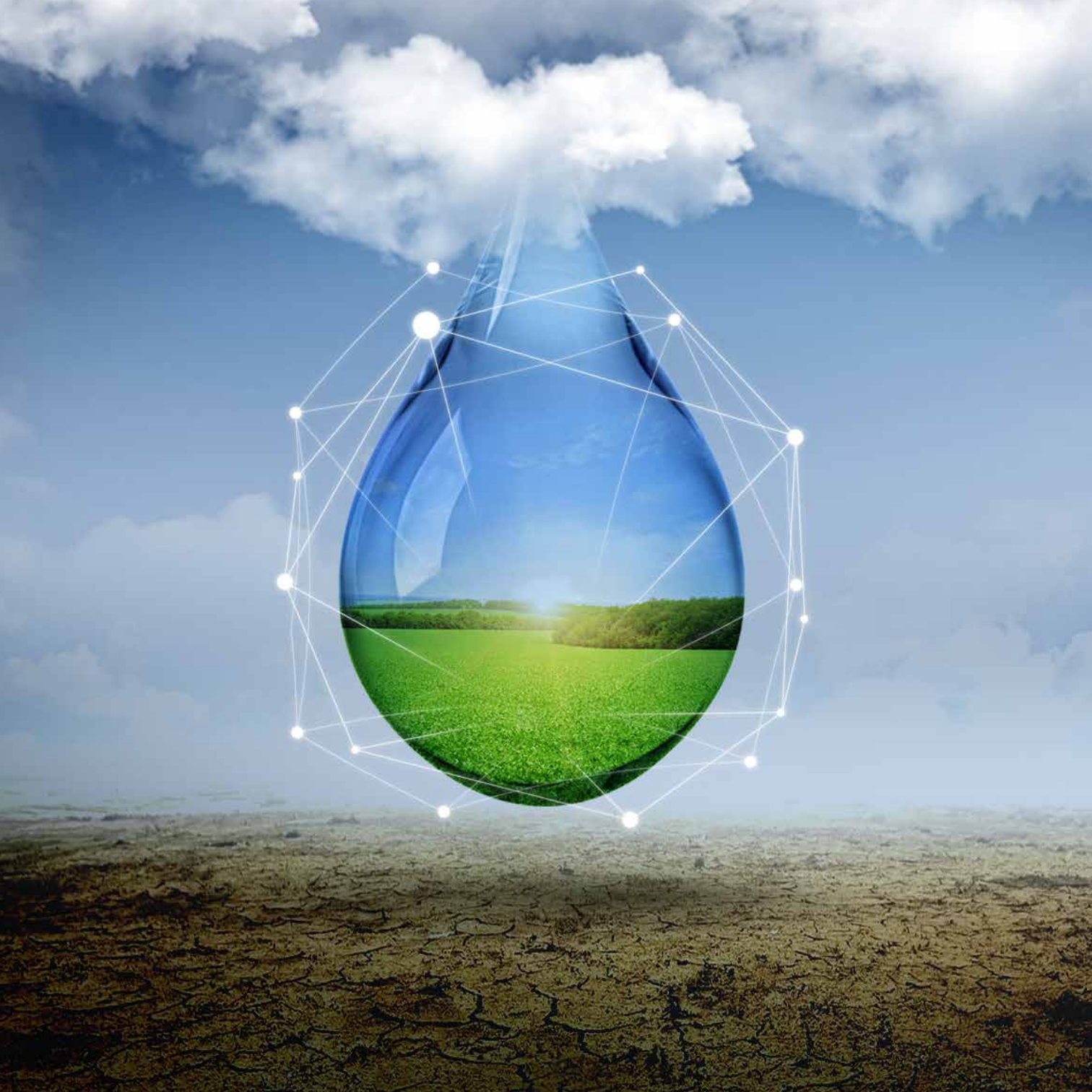
The UAE Research Program for Rain Enhancement Science :

The United Arab Emirates Research Program for Rain Enhancement Science is an initiative of the UAE Ministry of Presidential Affairs (MOPA), under the management of the National Center of Meteorology and Seismology (NCMS). Aligned with the National Innovation Strategy, the program reiterates the UAE's commitment to advancing the science of rain enhancement through research and development.

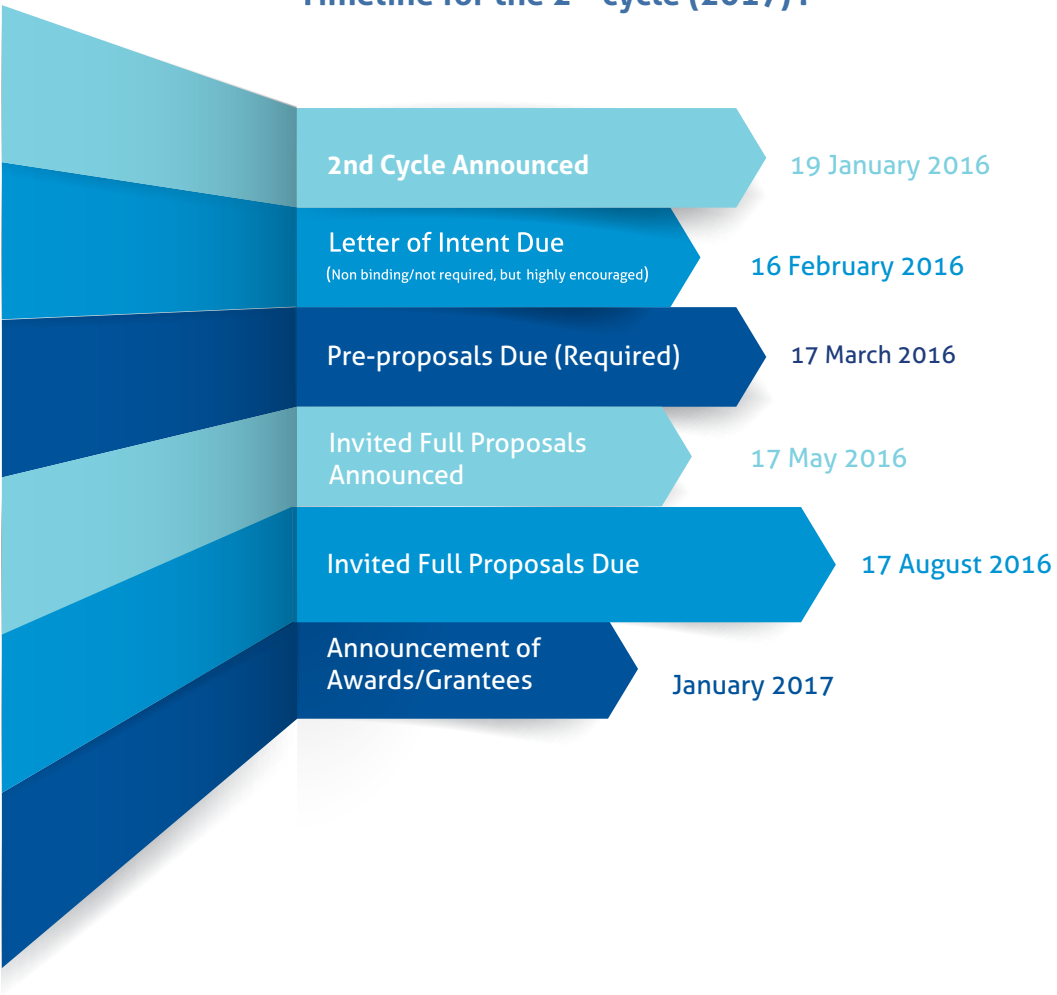
Aiming to expand global water security through promoting scientific best practices and collaboration in rain enhancement research, the program will identify scientifically verified and sustainably implementable methods of enhancing precipitation to increase rainfall in the UAE, as well as other arid and semi-arid regions. The program invites innovative research and technology proposals from domestic or foreign, public or private, non-profit or for-profit organizations and, individuals.

This $5 million dollars program will support up to five awards annually, and the grants will be dispersed over a three years period. All awards will be selected by a two stage merit review process and announced in January 2017.

For more information on the program, grant, submission details and deadlines, please visit www.uaerep.ae



Timeline for the 2nd cycle (2017) :



Why is this program important to the UAE ?

The UAE has an arid climate with less than 100 mm per year of rainfall, a high evaporation rate of surface water and a low groundwater recharge rate that is far less than the total annual water used in the country.

Furthermore, population increase and economic expansion will put additional pressure on existing water supplies and rainfall for food and water. This program was launched to address that concern and to advance the development of sustainable approaches for providing water to arid and semi-arid regions globally.

What achievements has the UAE made in rainfall enhancement ?

The UAE cloud-seeding program was initiated in 1990. By early 2001 the program was being conducted through an increasingly scientific base in cooperation with well-known organizations such as the National Centre for Atmospheric Research (NCAR) in Colorado, USA, as well as the Witwatersrand University in South Africa and the US Space Agency, NASA.

This cooperation has continued with joint studies into the physical and chemical features of the UAE's atmosphere with a focus on the properties of aerosols and pollutants, which have a major impact on cloud accumulation. The purpose of these studies has been to formulate a proper nucleation agent to ensure the development and augmentation of the clouds, and to eventually achieve rainfall enhancement.

To ensure the success of the program, NCMS has invested heavily in a cloud seeding infrastructure, including more than 60 networked automatic weather stations distributed strategically across the UAE, a sophisticated weather radar network, and six state of the art aircrafts for cloud seeding operations.

Today, cloud seeding rainfall enhancement has a permanent unit at the NCMS's meteorological department, which conducts operations anywhere in the UAE where there are amenable clouds mostly along the eastern mountainous terrains.

Importantly, no harmful chemicals are used in these operations, relying instead on natural salts such as potassium chloride and sodium chloride.

Goals of the UAE Research Program for Rain Enhancement Science :

- To advance the science, technology and implementation of rain enhancement, and to spur additional investments in research funding and partnerships globally.

- To increase rainfall in the UAE, and other arid and semi-arid regions.

Pathway to Goals :

Enhance the level of research and innovation in the field
Increase the level of research activities and funding globally, including attracting diverse new researchers, technologists and entrepreneurs to the field, while leveraging program funding from participating entities.

Advance scientific understanding of rainfall enhancement
Obtain new scientific understandings of cloud physics and dynamics, cloud-cloud interactions, cloud systems, precipitation production, and other relevant physical processes. Additionally, consolidate current knowledge and understanding through the sharing of experimental data, sponsored symposia, and the like.

Advance state-of-the-art techniques in rainfall enhancement practices and operations
Make high-quality experimental data, current and historical, available to researchers and spur the analysis of that data with multiple, state-of-the-art techniques. Also, add to the technology base for cloud seeding with the testing of materials and delivery methods, demonstrating improved cloud modeling capabilities.

Enhance and further develop capacity in the field both locally and globally
Develop local and regional capacities for meteorology, water and environmental R&D and additional workforce capacity for scientific and technical fields in general. Spur global research collaborations in the region and the deployment of infrastructure for meteorology, water and environmental R&D.

Research Impacts :

The following is a non-exhaustive list of the research areas that the program intends to address:

Fundamental Understanding of Rainfall Enhancement

• Cloud microphysics (nucleation processes, water and ice processes, precipitation processes)
• Cloud dynamics and thermodynamics – including linking the microphysics and dynamics to characterize the physical chain of events (single and multiple cell clouds, large mesoscale systems, cloud-ground interactions)
• Aerosol/cloud interactions, characterization of background aerosols in relevant environments (particle size, chemical composition, diurnal variations, production mechanisms)
• Precipitation particle formation and mechanisms of rainfall
• Characterization of cloud seeding materials and delivery to fundamentally understand how cloud seeding works regarding chemistry, physics, dynamics and thermodynamics
• Impact of cloud seeding methods on cloud system chemistry, physics, and dynamics
• Now casting and forecasting of weather to properly time seeding operations and measurement activities

Data Modeling, Analysis, and Evaluation

• Data and analysis (comprehensive data bases, historical and new data, analysis and re-analysis of previous experiments)
• Modeling (microphysical, cloud dynamics, mesoscale, seeding effects, validation with data sets)
• Evaluation/Statistics – especially separating quantification of seeding effects from natural variability (covariates prediction, advanced statistical techniques, integration of validation into experimental and operational methodologies)

Experimental Design, Technologies, Instrumentation

• Production and characterization of different/new seeding materials and approaches to seeding
• Seeding methodologies assessment (ground-based, airborne)
• Remote sensing as well as in-situ observation techniques and technologies applied to rainfall enhancement
•Field experiments design; small but focused and large scale

Submitting Proposals :

Domestic or foreign, public or private, non-profit or for-profit entities are eligible to receive this grant and, in some cases, individuals.

The two-stage selection process will evaluate the technical aspects of the proposed projects and their potential to contribute to advancing regional rainfall enhancement, effectiveness and efficiency.

One year following the launch of the program, up to five awardees will be selected to receive up to $1.5M dollars over a three-year period based on a rigorous merit review selection process that considers the following elements:

- Overall Scientific & Technical Merit, Significance and Innovation
- Research Approach
- Qualifications of the Research Team
- Required Resources and Budget
- Contribution to Capacity Development in the Field

Details of the program and complete instructions for proposal submission are available on the program website

www.uaerep.ae

ABOUT NCMS :

The National Center of Meteorology & Seismology (NCMS) in the UAE is engaged in the study of a broad range of atmospheric phenomena and processes, using methods ranging from mathematical analysis to field experimentation.

Research projects range in size from basic studies involving individual scientists to national and international programs involving teams of scientists. The center is concerned with:

Synoptic Meteorology: which is the analysis and prediction of weather systems, such as cyclones and their associated fronts and jet streams.

Mesoscale Metrology: which accounts for the majority of weather phenomena directly impacting human activity. Examples of mesoscale phenomena include thunderstorms, gap winds, down slope windstorms, land-sea breezes, and squall lines.

Atmospheric Dynamics: which involves the observational and theoretical analysis of all motion systems of meteorological significance, including diverse phenomena as thunderstorms, tropical storms, jet streams, and global-scale circulations.

Atmospheric Chemistry: which examines the complexity and evolution of the atmosphere due to natural events, biological and anthropogenic activities.

Boundary Layer Research: which looks at the structure and dynamics of the lowest layer of our atmosphere that is of vital importance to the understanding of weather and climate.

Cloud Dynamics Precipitation Processes and Storms: which concerns the organization of air motions and precipitation processes in all types of clouds, such as convection over the mountain ranges.

Cloud and Aerosol Research: which is concerned with the origins of various particles and gases in the air and their effects on the atmosphere locally.

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