



nrlpao@nrl.navy.mil
202-767-2541

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NRL Scientists Take Part In Joint Research Project to Study Desert Air



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Scientists from the Naval Research Laboratory, NASA, and the Scripps Institution of Oceanography have assembled in the Arabian Desert to study tiny airborne particles, called aerosols, and their effect on weather and climate. The scientists are collaborating with researchers from the United Arab Emirates Department of Water Resources Studies and 20 other U.S., European and South African research laboratories to decipher the complex processes controlling the area's climate.

The United Arab Emirates Unified Aerosol Experiment (UAE2) mission started August 5 and runs through September 30. Scientists are using satellites, computer models, and ground stations to understand the unique "mixing bowl" of desert dust, smoke, and other aerosols created by the complex atmospheric circulations.

"We have the most intensely monitored remote-sensing aerosol network ever assembled, including two radiation and aerosol super sites, 10 satellite instruments, six computer models, a research aircraft and a research vessel," said Dr. Jeff Reid, mission scientist from NRL's Marine Meteorology Division in Monterey, Calif. "There are over a dozen institutions involved, with 70 scientists participating, 40 of them working in the field, including the large South African and Colorado-based National Center for Atmospheric Research (NCAR) weather modification teams," he added.

Aerosols have always been an interesting piece of the puzzle in studying climate behavior. Lighter aerosols reflect heat and sunlight and have cooling properties. Darker aerosols absorb heat and light, warming the atmosphere. Aerosols are also essential for cloud formation and rain. UAE2 scientists will measure aerosol properties, where aerosols move, whether they warm or cool the atmosphere, and their potential to affect clouds. Scientists also will evaluate the ability to model and explain complicated weather patterns in the coastal regions of the Arabian Gulf and the Gulf of Oman.

"The combination of man-made emissions, smoke from the Indian subcontinent and desert dust combine in the air to make a unique aerosol laboratory," said Dr. Hal Maring of NASA Headquarters, Washington.

By obtaining more accurate data about aerosols and their behavior, scientists will improve computer weather and climate models and predictions of climate behavior in response to changes in aerosol concentrations. To accomplish this task, the scientists will use data from NASA's Terra and Aqua satellites and other satellites as well.

These satellite data will be compared to ground-based remote sensing measurements of mineral dust and pollutant aerosols gathered by 15 Aerosol Robotic Network instruments over land and water, NRL's Mobile Atmospheric Aerosol and Radiation Characterization Observatory (MAARCO) and NASA's Surface-sensing Measurements for Atmospheric

Radiative Transfer.

NRL researchers will use the aircraft, MAARCO and satellite data to evaluate the Navy's global and regional weather and aerosol-transport computer models. The Arabian Gulf region presents a challenge to meteorologists trying to simulate weather with computer models because sea-surface and land temperatures vary to extremes and the topography varies dramatically. There are also diverse small- to medium-sized weather events, ranging in size from a single storm cloud to regional dust storms.

Using MAARCO, scientists from the Scripps Institution of Oceanography and Poland's Warsaw University will study the impact of aerosols and clouds on incoming solar radiation and the hydrologic cycle and energy balance in this mostly rain-free area.

"This project will complement Scripps' effort to understand climate change in this region of the world," said Dr. Piotr Flatau, a Scripps research scientist at NRL, through the University Corporation for Atmospheric Research (UCAR) visiting scientist program. Dr. Flatau will be working with Dr. Krzysztof Markowicz and others from Warsaw University during the project. "I know the Arabian Sea from research cruises during the Indian Ocean Experiment (INDOEX), but the UAE2 experiment brings a new set of challenges. While INDOEX took place in a mostly monsoonal region, the UAE is dry and hot. The temperatures are reaching 40 degrees Celsius (104° F) there right now and we do not expect much rain," Dr. Flatau said.

"The UAE Office of His Highness the President, Department of Water Resource Studies (DWRS), is providing extensive logistical support, including access to five weather radars and 50 surface stations," said Lt. Col. Mangoosh, Office of the President of the United Arab Emirates.

For more information, images and links on the Internet, visit:

http://www.nrlmry.navy.mil/aerosol/Case_studies/uae2/exec_summary.html

For the UAE2 Mission Home Page, visit:

<http://uae2.gsfc.nasa.gov/>