

# The ARM West Antarctic Radiation Experiment (AWARE)

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West Antarctica is one of the most rapidly warming regions on Earth, and this warming is closely connected with global sea level rise. Yet there has been no substantial atmospheric science or climatological fieldwork on West Antarctica since that started during the 1957 International Geophysical Year and continuing for just a few years afterward. Direct meteorological information on the WAIS has been limited to a few automatic weather stations for several decades. And yet satellite imagery and meteorological reanalysis indicate that West Antarctica is highly susceptible to advection of warm and moist maritime air and cloud cover, depending on the location and strength of low-pressure cells in the Amundsen, Ross, and Bellingshausen Seas. There is a need to quantify the role of these changing air masses on the surface energy balance, including all surface energy components and cloud radiative forcing, and to identify teleconnections with lower latitudes. Fortunately, McMurdo Station, where the most advanced cloud and aerosol instrumentation can be situated, has a meteorological relationship with the WAIS via circulation patterns in the Ross and Amundsen Seas.

The US Department of Energy Atmospheric Radiation Measurement (ARM) program West Antarctic Radiation Experiment (AWARE) will deploy an ARM Mobile Facility (AMF) to McMurdo Station, Antarctica from October 2015 until October 2016. AWARE will deploy an additional subset of ARM instruments to the West Antarctic Ice Sheet (WAIS) Divide Ice Camp for a 75-day observing period between November 2015 through January 2016. The full AMF at McMurdo will comprise the most advanced ground-based atmospheric research equipment available, including a suite of cloud radars, high spectral resolution lidar, and spectral radiometers operating at the visible through microwave wavelengths. AWARE will also send basic radiometric, surface energy balance, and upper air equipment directly to the WAIS to make the first well-calibrated climatological suite of measurements seen in this extremely remote but globally critical region in more than forty years. The suite of instruments going to the WAIS has been selected for maximum value for climate science consistent with the logistical constraints at this distant summer-only field station. AWARE has been approved for full Department of Energy support, pending NSF agreeing to support preliminary but substantial research by the AWARE Science Team.

AWARE data will be analyzed first in two areas: (1) provide quantitative information on WAIS energy balance components and cloud radiative forcing as they relate to changing air masses and warm air advection, which are ultimately related to lower latitude teleconnections, and (2) provide cloud microphysical data to evaluate and improve climate model performance in the coldest and most pristine environment on Earth. More generally, this year-long field campaign with the most advanced atmospheric science instrumentation available, the first of its kind in Antarctica, will provide a data set having lasting value for climate and geophysical science.

- Climate and accumulation (*It Never Rains in California*)