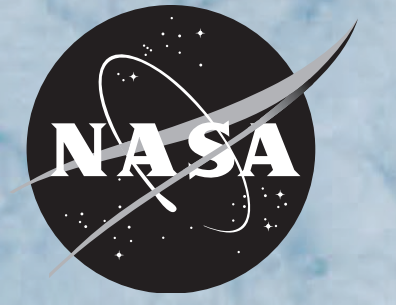


THE A-TRAIN

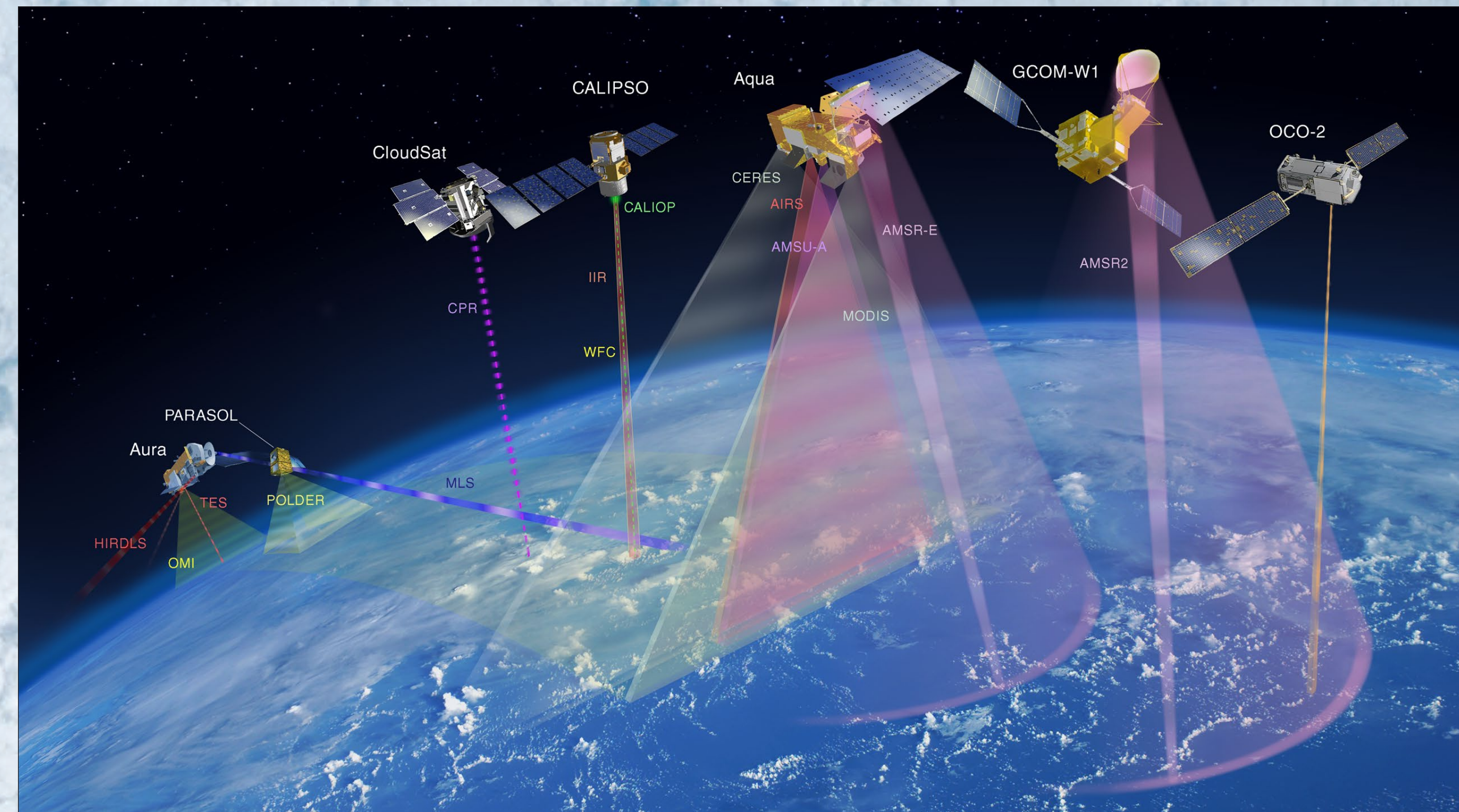
CONSTELLATION FLYING FOR UNDERSTANDING EARTH

National Aeronautics and Space Administration



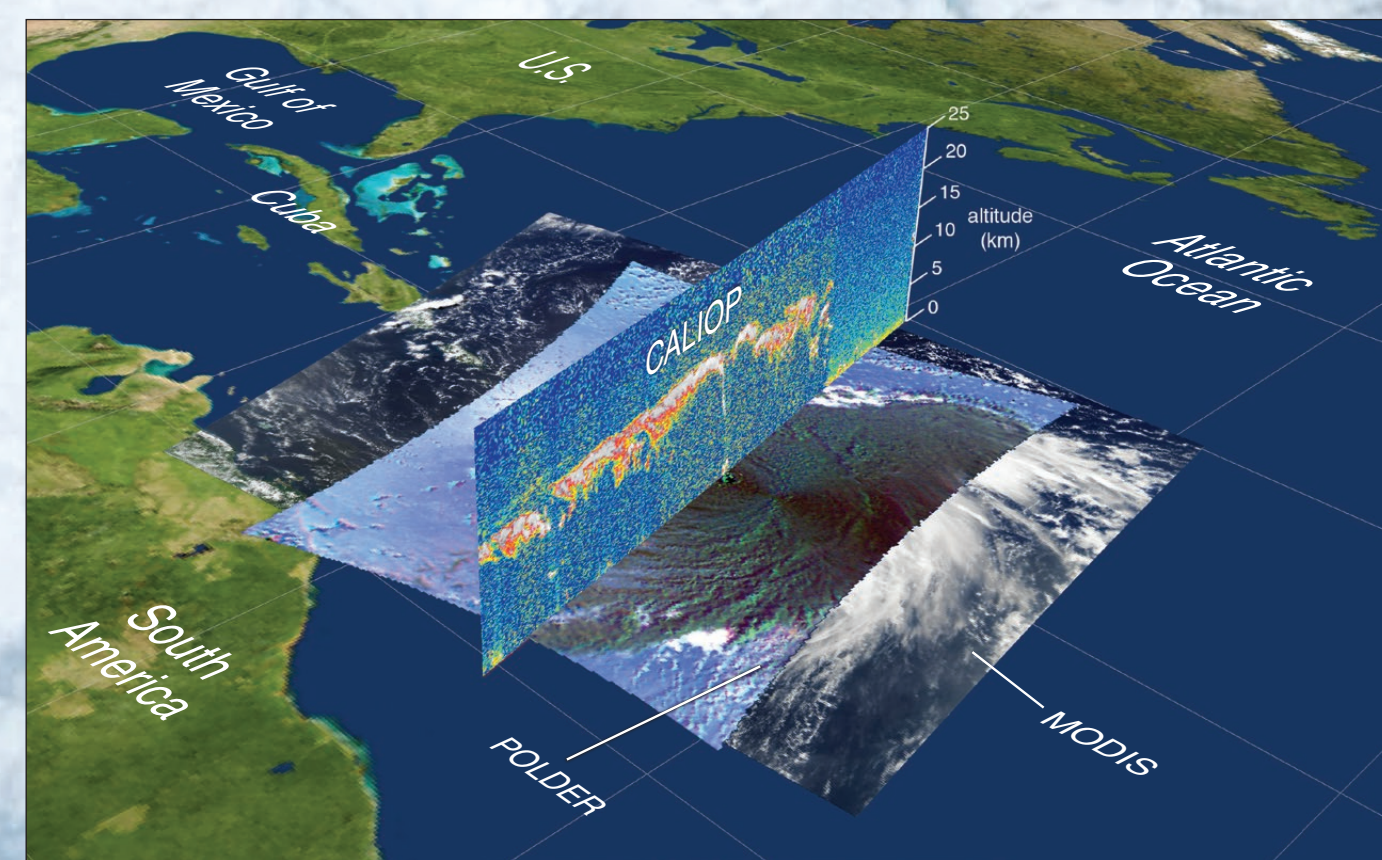
WHAT IS THE A-TRAIN?

NASA and its international partners operate several Earth-observing satellites that closely follow one after another along the same orbital "track." This coordinated group of satellites, constituting a significant subset of NASA's current operating major satellite missions, is called the *Afternoon Constellation*, or the *A-Train*, for short. The satellites are in a polar orbit, crossing the equator at about 1:30 p.m. local time, within seconds to minutes of each other. This allows near-simultaneous observations of a wide variety of parameters to aid the scientific community in advancing our knowledge of Earth system science and applying this knowledge for the benefit of society.



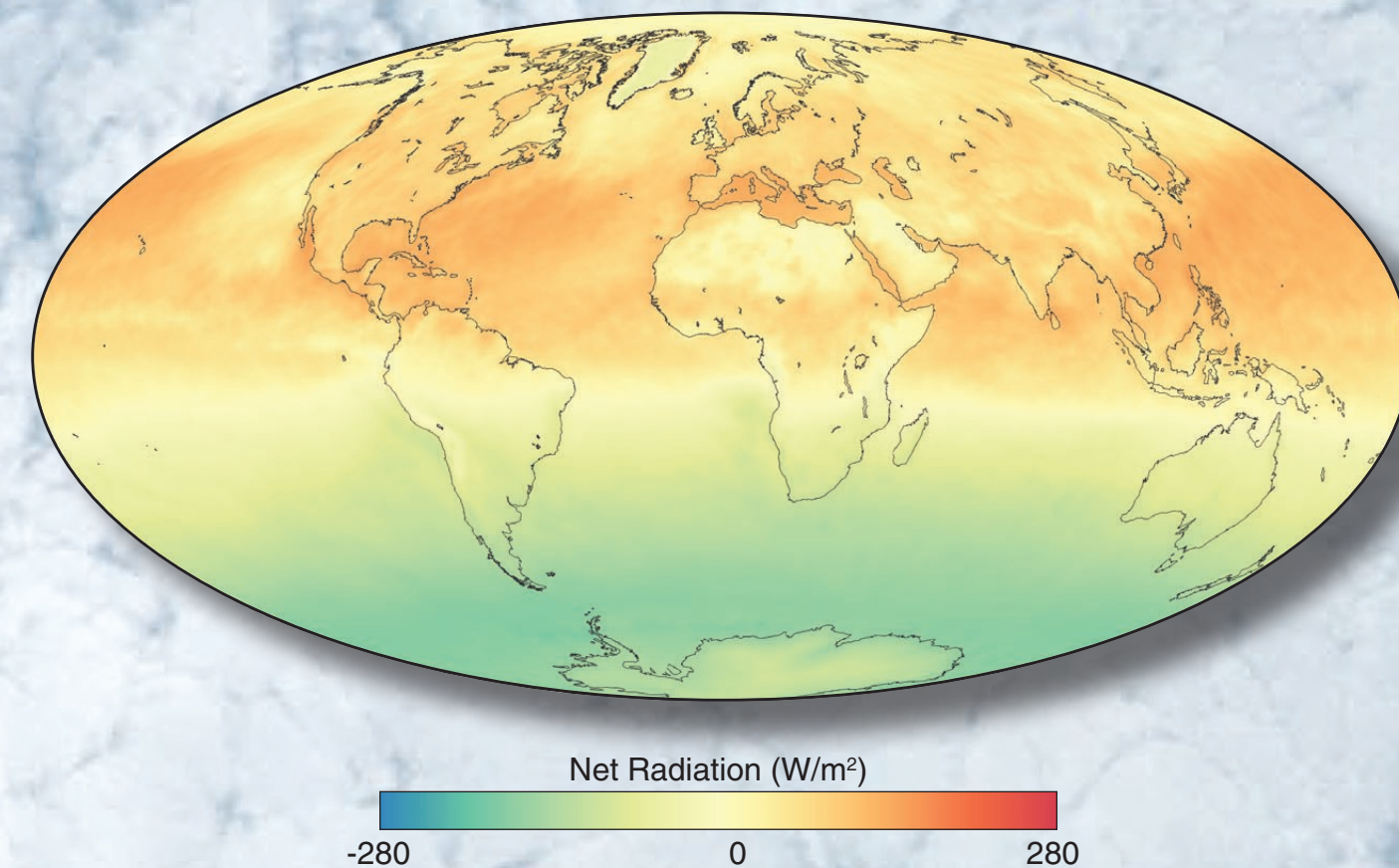
As depicted here, by about 2014 the international Afternoon Constellation should include OCO-2, GCOM-W1, Aqua, CALIPSO, CloudSat, PARASOL, and Aura. In December 2009, PARASOL began to leave the constellation; it will exit completely by fall of 2013. OCO-2 is scheduled to join the configuration in 2014. The instruments on these precisely engineered satellites make almost simultaneous measurements of clouds, aerosols, atmospheric chemistry, and other elements critical to understanding Earth's changing climate. The footprint of each of the A-Train's instruments is shown: active instruments aboard CALIPSO/CALIOP and CloudSat/CPR are indicated with dashed lines. This illustration color-codes instrument swaths based on observed wavelength ranges. Microwaves (observed by both AMSRs, AMSU-A, CPR, MLS) are represented by red-purple to deep purple colors; solar wavelengths (POLDER, OMI, OCO-2), yellow; solar and infrared wavelengths (MODIS, CERES), gray; other infrared wavelengths (IIR, AIRS, TES, HIRDLS) are represented by reds.

CLOUDS AND WEATHER



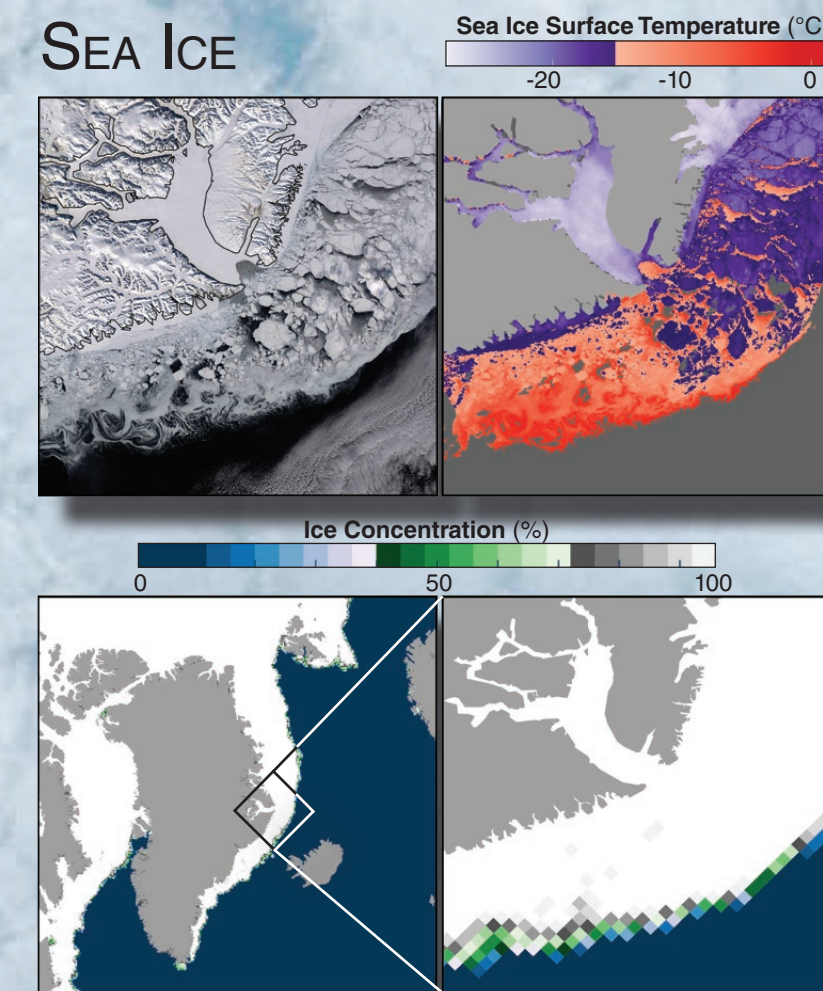
An image of Hurricane Bill as seen from the MODIS instrument (flying on Aqua) with cloud heights from the CALIOP lidar (on CALIPSO) on August 19, 2009. Superimposed over the MODIS image is the polarized reflected sunlight observed by POLDER (on PARASOL).

NET RADIATION



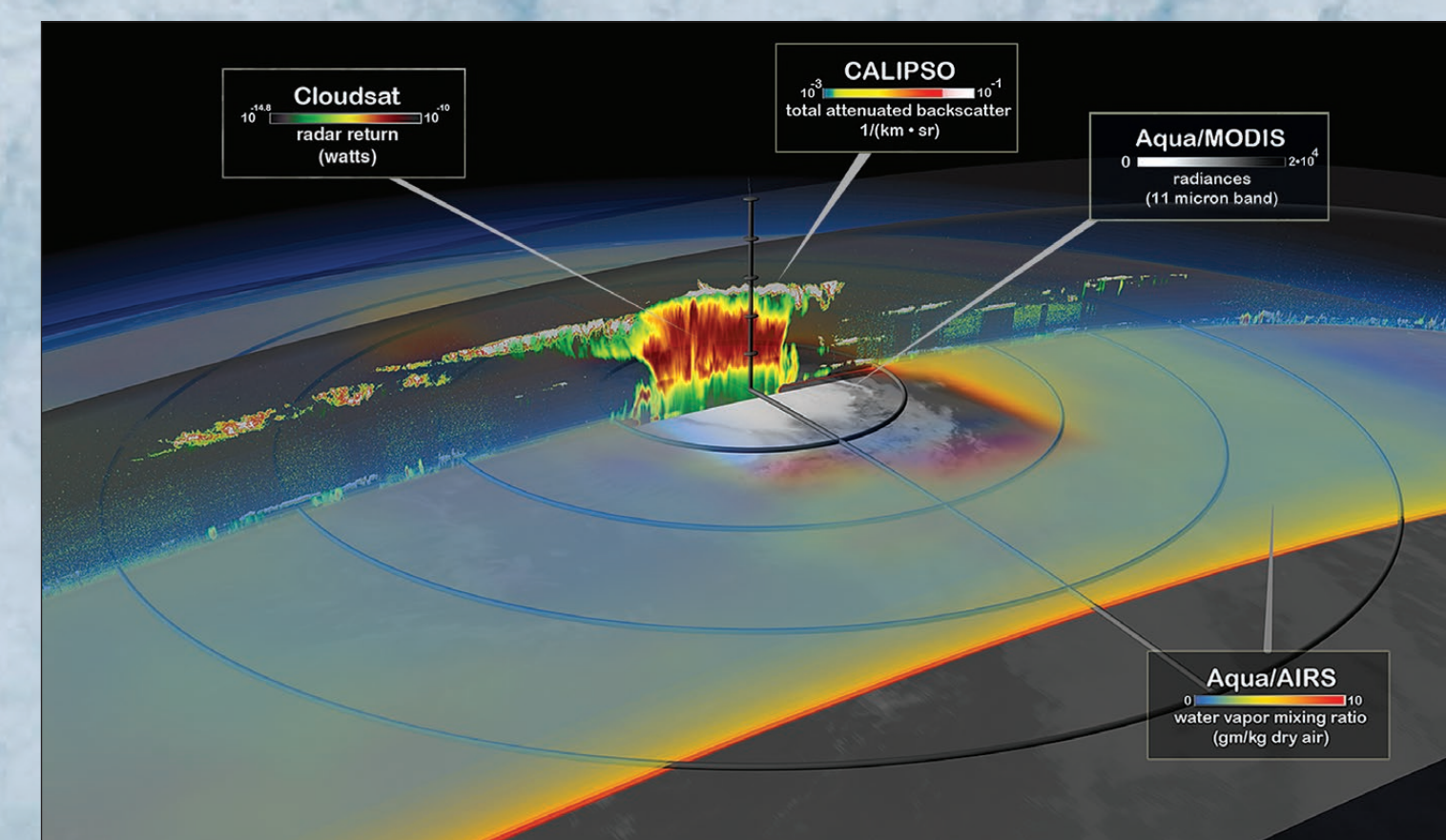
The above map shows net top-of-atmosphere radiation (difference between absorbed sunlight and emitted outgoing longwave radiation) from the Aqua/CERES instrument for July 2010. Positive values, indicating net warming, are found in the summertime (Northern Hemisphere). This is an example of synergy between A-Train instruments as CERES makes use of MODIS aerosol and cloud retrievals that are informed by CALIPSO and CloudSat observations.

SEA ICE



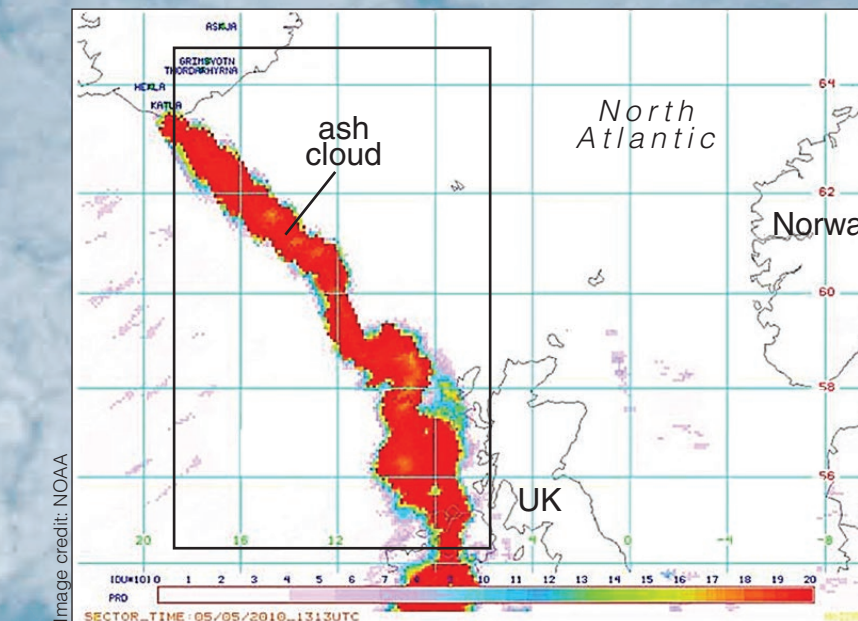
Images from Aqua of East Greenland, March 27, 2010. A MODIS image (upper left) shows glaciers and snow cover on land, and sea ice floes in the ocean. Ice-surface temperature (IST), derived from MODIS (upper right), increases roughly with decreasing sea ice concentration, derived from AMSR-E (lower right), toward the ice-water boundary.

CLOUDS AND WEATHER

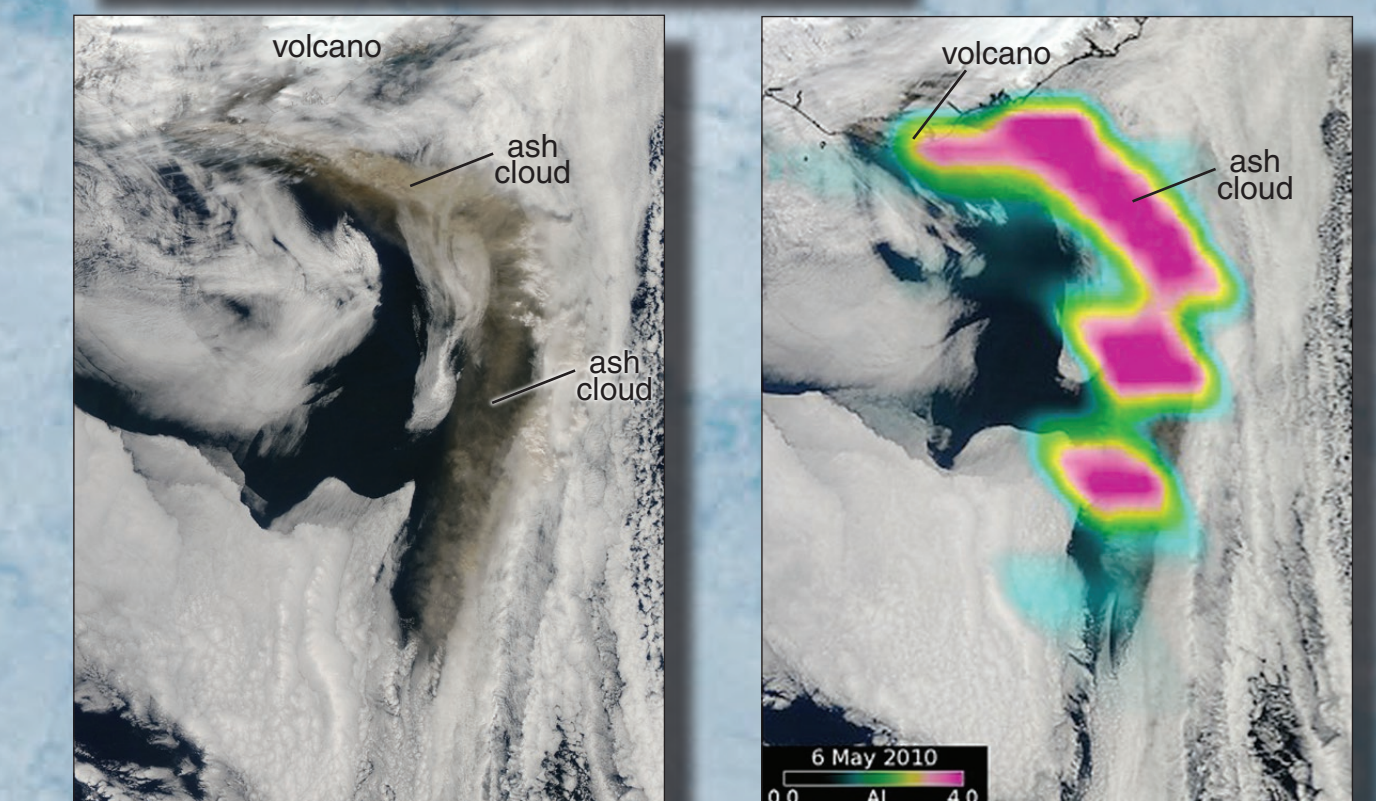


Tropical Storm Debby crossed the Central Atlantic on August 24, 2006 and was observed by four different A-Train instruments: Aqua/MODIS (in gray, center) shows an overview of the storm; Aqua/AIRS water vapor mixing ratio data are superimposed; and CloudSat's radar (CPR) and CALIPSO's lidar (CALIOP) show different types of information on a vertical slice through the storm's center.

ATMOSPHERIC CHEMISTRY

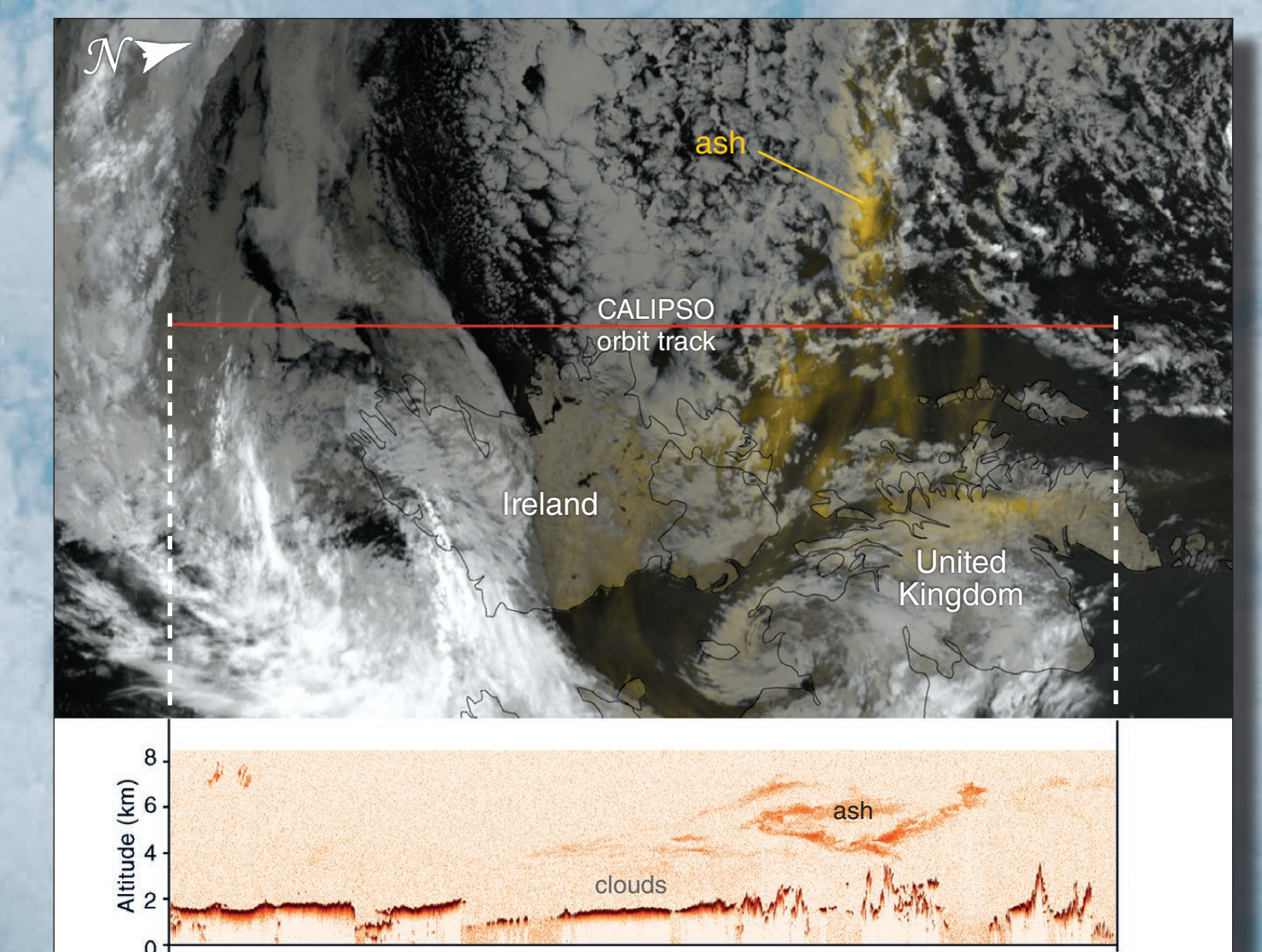


On May 5, 2010, Aura/OMI observed a sulfur dioxide (SO_2) plume from the eruption of Iceland's Eyjafjallajökull volcano. Such a plume is an indicator of fresh volcanic ash clouds.



On May 6, 2010, Aqua/MODIS (left) and Aura/OMI (right) observed the volcano's ash cloud. MODIS gives a "visible" picture of the ash cloud (brown). OMI measures aerosol concentration. Highest aerosol concentrations are in pink.

AEROSOLS



An aerosol-laden ash plume from the Eyjafjallajökull volcano in Iceland was observed from Aqua/MODIS (top image) and CALIPSO/CALIOP (bottom image) on May 16, 2010.

