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RESEARCH SPOTLIGHT

Highlighting exciting new research from AGU journals

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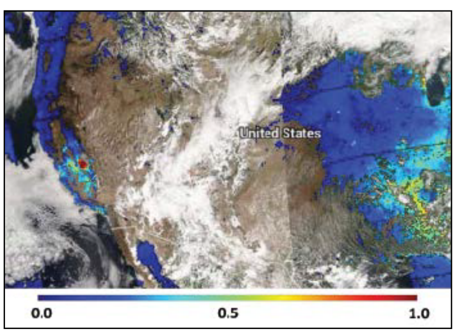
Assessing new remote sensing aerosol detection algorithms

Atmospheric aerosols affect the weather and climate by changing cloud formation and the energy balance and, depending on their type and concentration, can negatively affect air quality. Important atmospheric aerosols include dust, ash, volcanic sulfate aerosols, sea salt, biogenic particles, urban/industrial pollution, and smoke. For more than a decade, the twin Moderate Resolution Imaging Spectroradiometers (MODIS) aboard NASA's Aqua and Terra satellites have provided regular global assessments of aerosol loading, and now, following its 2011 launch, the Visible Infrared Imaging Radiometer Suite (VIIRS) aboard the Suomi National Polar-orbiting Partnership (Suomi-NPP) satellite is ready to contribute to that assessment.

In an in-depth analysis, *Jackson et al.* describe the algorithms used by VIIRS to translate raw observations into measures of aerosol optical thickness and aerosol species type. With a higher orbit and broader observational swath, VIIRS provides daily global coverage at a higher spatial resolution than MODIS. The authors compared VIIRS observations with those of MODIS and with observations made using the ground-based Aerosol Robotic Network (AERONET), finding that all three networks provide roughly equivalent measures. (*Journal of Geophysical Research-Atmospheres*, doi:10.1002/2013JD020449, 2013) —CS



NOAA/NESDIS Center for Satellite Applications and Research

Suomi National Polar-orbiting Partnership (Suomi-NPP) Visible Infrared Imaging Radiometer Suite (VIIRS) aerosol optical thickness measurements covering most of the United States show elevated values due to smoke released from California's Rim fire on 9 September 2013.

Acoustic emissions unveil internal motion in granular materials

When confronted with a heavy load or deformed by stress, the individual particles in a granular material will sometimes reorganize to a more stable arrangement. At small scales these reorganizations are little more than the redistribution of grains in the pile. In some cases, though, a reorganization is the first step of a critical failure, the trigger for an avalanche or landslide.

Understanding how the motion of individual grains translates into mass movement requires having a way to peer inside the pile without interfering with its behavior. Through a series of experiments, *Michlmayr et al.* found that specially tuned vibration sensors could be used to listen in on grain-scale dynamics. They found that elastic waves of different frequencies can be used to track and measure different types of motion within a granular material.

In their experiments, the authors stressed granular materials with varying grain sizes. They found that when subjected to a constant deformation, stresses in the materials oscillated in a sawtooth pattern, increasing steadily before dropping suddenly. The drops in shear stress—the sign of a reorganization—correlated with observations of low-frequency acoustic emissions. Materials with smaller grain sizes experienced more frequent but less powerful stress drops than those with larger grain sizes. Observations of high-frequency acoustic emissions, the authors found, were associated with grain-on-grain interactions. (*Journal of Geophysical Research-Solid Earth*, doi:10.1002/2012JB009987, 2013) —CS

Statistical analysis describes urban heat island effect in Europe

The urban heat island effect—in which urban areas are warmer than the surrounding rural areas—has been known for many decades. However, many previous studies have focused on individual cities or on a limited numbers of cities. To gain a broader regional perspective, *Zhou et al.* performed a statistical analysis of the urban heat island effect for all cities in Europe using land cover data and remotely sensed land surface temperature data.

The authors identified cities by spatial clusters of urban land cover and defined heat island intensity as the difference between the mean temperature in the cluster and that just outside the cluster. The intensity of the heat island effect in summer was found to have a strong correlation with the size of the city cluster. The authors also identified a previously unknown form of seasonality. Given the same temperature in the surroundings, in many cases the intensity differs in spring and fall. (*Geophysical Research Letters*, doi:10.1002/2013GL057320, 2013) —EB

Seal-borne sensors are valuable for studies of Southern Ocean conditions

Icy conditions make it difficult to monitor the southern part of the Southern Ocean using floats or ship-based sampling. For about a decade, scientists have been mounting temperature and salinity sensors on the heads of seals from several colonies around Antarctica. There is now a fairly large data set of seal-derived hydrographic data.

Roquet et al. sought to determine how valuable these data are in studying ocean conditions. They conducted two numerical ocean circulation experiments, one using data from a global network of floats to constrain the model and one also using seal-based data. The only difference between the two experiments was the inclusion of the seal-based data.

The authors found that including the seal-derived data modified the estimated circulation patterns and improved the model's agreement with satellite data on sea ice concentrations. They concluded that sensors mounted on animals can provide a valuable contribution to monitoring polar conditions. (*Geophysical Research Letters*, doi:10.1002/2013GL058304, 2013) —EB

K. Kovacs and C. Lydersen, NPI

A southern elephant seal with a temperature/salinity logger.

—Ernie Balcerak, Staff Writer, and Colin Schultz, Writer