RESEARCH SPOTLIGHT

Highlighting exciting new research from AGU journals

Clouds' effects on daily temperature

Clouds reflect some incoming sunlight, tending to cool Earth's surface, but they also trap some heat leaving Earth's surface, causing warming. These effects, known as cloud radiative forcing, play a key role in temperature variations on Earth's surface and thus are important for climate modeling.

However, the precise effects of cloud cover on the diurnal temperature cycle have not been well documented. *Betts et al.* provide a detailed analysis of a 40-year data set of hourly observations from 14 climate stations across the Canadian Prairies to determine how clouds affect daily maximum and minimum temperatures and the daily ranges of temperature and humidity.

The scientists found that from April through October, maximum temperatures and diurnal ranges of temperature and relative humidity increase with decreasing cloud cover, while minimum temperature is almost independent of cloud cover. However, during winter months, both maximum and minimum temperatures fall with decreasing cloud cover. The study could help improve modeling the effects of cloud radiative forcing on Earth's surface temperature. (*Journal of Geophysical Research-Atmospheres,* doi:10.1002/jgrd.50593, 2013) —EB

Precipitation underestimated in extreme storms in South America

Subtropical South America experiences some of the world's most intense deep convective storms, which generate heavy precipitation. To study such storms, scientists commonly use the Precipitation Radar on the Tropical Rainfall Measuring Mission (TRMM) satellite. However, studies have shown that the algorithm used to estimate rainfall from this instrument tends to significantly underestimate precipitation in regions of intense deep convection over land.

To better understand the source of bias in the TRMM Precipitation Radar algorithm, *Rasmussen et al.* focus on intense convective storms in tropical and subtropical South America, investigating the bias in the rainfall estimates from four different types of storms. They determined the range of probable errors introduced by the TRMM Precipitation Radar algorithm.

The improved knowledge of the sources of biases in TRMM data could help improve scientists' understanding of the effects of intense deep convective storms on total rainfall. Although the study focuses on South America, the authors note that the results could also be relevant to other regions that experience intense convection. (*Geophysical Research Letters,* doi:10.1002/grl.50651) —EB

Kristen Rasmussen

A thunderstorm near the foothills of Argentina.

Independent observations corroborate surface air temperature record

One of the most important foundations of scientists' understanding of global climate change is the land surface air temperature record, the long-term observations of air temperature measured 2 meters above the ground. These observations have been made around the world, for more than a century in some places. The air temperature records have shown a long-term warming trend due mainly to anthropogenic climate change, and variability seen in the air temperature

in urban and agricultural regions than in remote plots of land. Gridded temperature data sets have been designed to account for these biases and sources of uncertainty. However, for these and other reasons, some scientists and political figures have questioned the accuracy and validity of the historical air temperature record, arguing against its usefulness for understanding historical temperature trends and variability.

In response to these critics, *Compo et al.* calculated an independent record of historical land surface air temperatures that used a range of historical observations but did not use any measurements of air temperature itself. As such, any problems in the existing air temperature record that stem from changing techniques or tools or other fac-

Younger sediments more likely to be eroded by meandering rivers

The duration of the journey that an individual grain of sand takes as it bounces its way down the length of a river is incredibly difficult, if not impossible, to determine. Finding the answer to that question could be useful because the amount of time that sediment spends in a river can affect how pollutants or other materials move through the system. At the bulk scale, sediment balance measurements, comparing the inputs and outflows of sediment, can be used to help calculate how much sediment is moving through a waterway. Figuring out the storage time of particular grains is more dif-

Traditionally, researchers modeling sediment storage have assumed that rivers meander randomly, meaning that all deposited sediments are equally likely to be eroded. In a new study, however, *Bradley and Tucker* found that river meandering, and hence sediment erosion, follows a complex relationship that shows that sediments that had been in storage for less time were more likely to be eroded. Using a river-meandering model, they found that the age-erodibility relationship breaks into three groupings: In sediments that had been in storage for a few hundred to a few thousand years, grains were eroded equally; in sediments stored from a few thousand to tens of thousands of years, younger grains