How tropical humidity self-organizes into moist and dry regions

Numerical simulations have shown that the moisture in the tropical troposphere has a tendency to spontaneously aggregate, forming separate wet and dry regions. To learn more about how this self-organization occurs, Craig and Mack introduced a simple equation for the tropical troposphere moisture budget and conducted numerical simulations that included convective moistening and horizontal mixing. Based on their simulations, the authors propose that a feedback process in the troposphere causes moisture to aggregate, beginning on small scales and then coarsening to larger scales. Wet regions become wetter and dry regions become drier as the self-organization continues. (Journal of Geophysical Research-Atmospheres, doi:10.1002/igrd.50674, 2013) —EB

2012 Great Plains drought not caused by climate change

From May to July 2012, the Great Plains region of the western United States faced a powerful and unpredicted drought. Following 7 months of normal rainfall, the drought was one of the largest deviations from seasonal precipitation rates seen in the region since observations began in 1895. When such extreme events take place today against the backdrop of ongoing global climate change, they raise questions about the relationship between climate change and natural disasters. In a new modeling study, Kumar et al. used an ensemble of runs from an operational climate model, initialized with the observed conditions leading up to the 2012 Great Plains drought, to simulate the range of conditions that could have played out during the subsequent months. They found that the drought fell within the bounds of natural atmospheric variability. The strength of the drought, they suggest, was a consequence of the multiple complex nonlinear systems that make up the climate system and did not critically depend on the existence of a strong external forcing.

The authors note that their findings do not detract from the idea that climate change could enhance some extreme events. Rather, their research says that climate change was not a first-order forcing of the drought. They say that climate change and other pressures could still serve as “proximate causes,” setting the stage for or enhancing, but not necessarily causing, extreme events. That the drought was driven by natural variability not requiring a steady background forcing, they say, will limit the predictability of similar future extreme events. (Geophysical Research Letters, doi:10.1002/grl.50657, 2013) —CS

Hawaiian Islands formed through extrusive volcanic activity

Scientists generally believe that the Hawaiian Islands formed primarily through endogenous growth, or intrusion, in which hot magma intrudes into a rock and then solidifies before it reaches the surface. However, a new study suggests that the islands may actually have formed primarily through extrusion, which occurs when a volcano erupts and magma reaches the surface and flows away from the eruption site before cooling and solidifying.

Flinders et al. used gravity data from historical land surveys along with recently compiled marine gravity data to estimate the volumes of intrusive material, which can be identified by its higher density, below all of the known volcanoes throughout the Hawaiian Islands. Contrary to previous studies, which had estimated that intrusions account for about 65% to 90% of the total volume of the islands, the authors found that, on average, the volcanos of the main Hawaiian Islands are composed of less than 30% dense intrusive material. This suggests that the islands are not built primarily through endogenous growth, as had been thought, but rather through extrusive growth. (Geophysical Research Letters, doi:10.1002/grl.50633, 2013) —EB