Researchers find storm periodicity in southern oceans

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Credit: Tiago Fioreze / Wikipedia

(Phys.org) —A pair of researchers with the Department of Atmospheric Science at Colorado State University has found that storms in the Southern Hemisphere tend to occur on a 20 to 30 day periodic basis. In their paper published in the journal *Science*, David Thompson and Elizabeth Barnes describe how they analyzed thirty years of atmospheric data and used it to create a weather model that revealed the periodic

behavior of weather patterns in the Southern Hemisphere.

Future weather conditions are hard to predict due in part to their seemingly random nature, but one part of the world may not be as random as has thought. In this new effort, the research duo pulled out atmospheric data (from balloons, surface temperature readings and satellite observations) relevant to southern hemispheric oceans, covering the past thirty years. In so doing, they focused primarily on circulation of large atmospheric events in the middle latitudes over the southern oceans. That led them to the discovery of a near rhythmic flow of heat as it was carried from the tropical regions into the colder mid-latitudes. That flow, they noted, tended to cause an imbalance in atmospheric conditions that led to the development of storms. It happens, they report, over and over, with storms occurring roughly every 20 to 30 days.

Atmospheric scientists have long known about tropic based circulation patterns—so well-known are they that some of them have names, such as the Quasi-Biennial or Madden-Julian Oscillation. What's surprising is that such circulation patterns are apparently indirectly impacting weather patterns in the mid-latitudes in the south—so much so that the weather there has become periodic as a result. At least as startling, perhaps, is that no one until now has noticed this weather system—at least not in the scientific community—anecdotal evidence suggests sailors have known about it for years.

The team used what they had learned to build a computer model to simulate the conditions that were evident in the data record and found the same result, which they suggest means that storms really do follow a periodic pattern in the oceanic part of the Southern Hemisphere—a finding that could prove invaluable for weather forecasters in South America, Africa, Australia or even Antarctica.

More information: Periodic Variability in the Large-Scale Southern

Hemisphere Atmospheric Circulation, *Science* 7 February 2014: Vol. 343 no. 6171 pp. 641-645. DOI: 10.1126/science.1247660

Abstract

Periodic behavior in the climate system has important implications not only for weather prediction but also for understanding and interpreting the physical processes that drive climate variability. Here we demonstrate that the large-scale Southern Hemisphere atmospheric circulation exhibits marked periodicity on time scales of approximately 20 to 30 days. The periodicity is tied to the Southern Hemisphere baroclinic annular mode and emerges in hemispheric-scale averages of the eddy fluxes of heat, the eddy kinetic energy, and precipitation. Observational and theoretical analyses suggest that the oscillation results from feedbacks between the extratropical baroclinicity, the wave fluxes of heat, and radiative damping. The oscillation plays a potentially profound role in driving large-scale climate variability throughout much of the mid-latitude Southern Hemisphere.