When It Rains, It Doesn't Always Pour

Research Highlight

Rainfall comes in a variety of forms: mist, drizzle, showers, downpours. The type and frequency of rainfall usually depends on the season and geographic location. As Earth's climate changes, scientists are taking a closer look at how large-scale environmental conditions affect rainfall patterns in hopes of improving rainfall predictions and, by extension, informing regional water resource planning.

Research recently reported in the journal *Monthly Weather Review* suggests some answers. Building on previous studies, an international team of researchers used long-term observations from the U.S. Department of Energy's Atmospheric Radiation Measurement (ARM) facility in Darwin, Australia, to determine the effect of the large-scale atmospheric environment on rainfall properties.

"Our underlying question was how much do rainfall physical properties vary as a function of the large-scale context," said Dr. Guillaume Penide of the French Université Lille 1, who partnered for this work with Australian scientists from the Centre for Australian Weather and Climate Research. "We also wanted to inform development of rainfall parameters for climate models."

The team chose the Darwin site because of the extensive data set available and the site's well-characterized climate. Annually, Darwin sees three distinct climate patterns: a dry continental regime, a wet monsoon season, and a transition period between the two. Using data from weather instruments, the researchers studied drop size distributions and rain rates over the Darwin area during two consecutive wet seasons. They then developed statistics for a number of parameters, including the total amount of daily rainfall and the areas where rain fell.

The research showed surprising links between precipitation and environmental conditions. For example, daily rain accumulation was higher during the active monsoon regime than in the other regimes, yet this regime was associated with the lowest rainfall rates. How? Precipitation in this active monsoon regime was widespread and mainly composed of small particles in high concentrations. In contrast, rainfall rates in the drier regimes were higher than in the moister regimes, with precipitation mainly formed of large raindrops in relatively low concentrations produced by large storms.

These statistics offer a comprehensive basis on which to assess climate models that provide estimates about rainfall timing and variability.

Measurements from the Atmospheric Radiation Measurement facility at Darwin, Australia, helped scientists determine how drop size distribution and rain rates are affected by larger-scale weather patterns.

Reference(s)

Penide G, V Kumar, A Protat, and P May. 2013. "Statistics of drop size distribution parameters and rain rates for stratiform and convective precipitation during the North Australian wet season." Monthly Weather Review, 141(9), 10.1175 /mwr-d-12-00262.1.

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Cloud Life Cycle