Scientists seek clear-sky definition of clouds

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All through the ages, humans have dreamily gazed at those shape-shifting cotton-balls floating gently across the sky-the clouds. Atmospheric scientists-Earth's professional cloud-gazers-have learned a great deal about clouds over the decades, particularly with the advent of satellites during the 1960s and 70s. But despite years of research and the emergence of increasingly sophisticated tools, scientists are still at odds over one of the most basic issues of all: how to define a cloud.

Image: Rare cumulonimbus mammatus clouds hang low in the sky above a silhouetted view of Science Hall on the UW-Madison campus. Despite decades of research and increasingly sophisticated tools, cloud scientists are still struggling with one of the most basic issues of their field: how to define a cloud. Photo: Jeff Miller

"The problem is that what we define a cloud as depends on the type of instrument we're using to define it," says atmospheric scientist Steven Ackerman, the director of the Cooperative Institute for Meteorological Satellite Studies at the University of Wisconsin-Madison.

It is critical to define and measure clouds accurately, notes Ackerman, because their patterns and formations play an important role in shaping both weather forecasts and longer-term climate predictions. Clouds are also a crucial part of Earth's hydrological and energy cycles, both regulating atmospheric precipitation and determining how much solar energy reaches the Earth.

A number of issues, however, make measurements of planetary cloud cover a very "fuzzy" matter, Ackerman says. Orbiting satellites, for instance, make different types of cloud observations from space. In one approach - known as "active sensing" - satellites discern the presence of clouds by directing energy of varying wavelengths at successive sections of the atmosphere.

The problem, says Ackerman, is that varying that energy threshold by just 3-4 percent can significantly alter cloud cover measurements. Different satellites also introduce variation, with readings differing by up to 5-10 percent between instruments. "It's like assigning grades," says Ackerman. "If you score 90 and above you get an A; but what if someone gets 89.8 and gets a B? Is that fair? Well that's the same problem with measuring clouds."

Cirrus clouds - wispy, long formations that almost look like smoke - are particularly problematic to define. As these clouds taper off into nothingness, scientists often struggle to define the point at which they cease to be clouds, says Ackerman. Furthermore, as satellites scan consecutive blocks of the atmosphere, making readings can get pretty tricky, he adds. "An [observation] area may contain different types of clouds or may be half-full of cloud or packed with thick cloud-so then we're asking: is that a cloud or not a cloud?"

Over the years, scientists have periodically

gathered to refine the science of cloud measurements. It may be time again for that larger discussion, says Ackerman.

Source: University of Wisconsin (by Paroma Basu)