The secret life of water at very low temperatures

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Water droplet. Image: Wikimedia Commons

The secret life of water just got weirder. For years water has been known to exist in 15 phases -- not just the merry threesome of solid, liquid and gas from grade school science. Now, University of Utah chemists have confirmed the coexistence of ice and liquid after water crystallizes at very low temperatures.

They describe their work in the June 21 issue of the Journal of Chemical Physics.

It takes more than a swizzle stick and a cocktail shaker to do this kind of ice research. It takes a temperature of 180 K, an extremely cold temperature typical of the upper atmosphere called the "no-man's land" of water because of the curious blurring of two water phases -- liquid and ice -- that occurs there.

"This blurring is what's interesting," says Valeria Molinero, who led the research. "Our findings show that what goes on there is important to the behavior of water and to the formation of clouds."

Molinero and graduate student Emily Moore discovered that at 180 K rapid ice crystallization makes it difficult to follow the process. Because the molecules move too quickly to observe directly in the lab, their investigation used computer simulations.

By targeting this critical temperature zone, their work might be important for understanding cloud formations that regulate global radiation and hence climate change. While this is a boon for understanding supercooled water and its role in cloud formation, it's a breakthrough for those dreaming of a No Man's Land Physics Fun Park. One day, they just might play hockey while swimming.

More information: The article, "Ice Crystallization in Water's "No-Man's Land" by Emily Moore and Valeria Molinero will appear in the Journal of Chemical Physics. jcp.aip.org/

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