A Science Service Feature

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? WHY THE WEATHER ?

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FIRST SKIM OF ICE

Towards the close of autumn the first skims of ice on ponds and other shallow water become interesting objects for observation. For example, in a short journey from the coast inland or from lower to higher country one may notice that the inland or higher ponds are frozen over while the others are still too warm for the first ice.

Here is a shallow pond that is but half frozen over on a cold morning after windy weather. The frozen half is the western portion not ruffled by the offshore breeze that played on it till so recently. Of course, it was not the lack of motion as such that permitted freezing, but the lack of mixing of a cool thin surface layer with warmer water below. During the day the wind blows some more and the thin skim of ice melts. Then comes a quiet cold night. The next morning the northern instead of the western half of the pond is frozen over. A quiet flow of cold air has drained off an open campus sloping toward the pond from the north.

It is rather surprising how quickly ice will form on a pond after temperatures of the water have been up in the forties. Under the influence of a cold wind the temperature slowly falls to 39, the temperature of maximum density of fresh water. As the surface layer is cooled it becomes denser than the water below, and promptly descends, pushing warmer water to the surface. But when the temperature of the whole body of water has reached 39, further cooling of the surface expands the water, making it lighter, so it stays on top. Further extraction of heat takes place from the surface layer only, therefore, it cools quickly to the freezing point.

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