Experimental Simulation of Cellular Convection with Miso Soup

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When cold air outbreak occurs, honeycomb-like patterns called cellular clouds often display widely on satellite images. They appear frequently in winter, but receive little attention in research. We noticed cellular clouds usually occur in specific regions and that cellular clouds develop into two different patterns in which the cloud coverage area are apparently opposites. Open cellular cloud has cloud on the border, while closed cellular cloud has cloud in the center. In awe and amazement, we aim to find out the forming mechanisms. We assume that the interaction between sea and air is the key factor to cellular cloud formation. We spotted the same kind of pattern when we came across a remaining pot of miso soup. We assume miso soup and cellular clouds share the same mechanism. In this experiment, we use miso soup to simulate the formation of cellular clouds to observe the different patterns including convectional size by adjusting its thickness and temperature. We found that when miso soup is heated at low temperature, it forms open cells, and when it's heated at high temperature, it forms closed cells. The ratio of ascending and descending flow manages its patterns. We also found that when the thickness of fluid grows, not only the size of cell increase but also urge the formation of closed cells earlier. We conclude that the formation of open cells, closed cells and even the shifting between open cellular cloud and closed cellular cloud are related to the heat contained in the convectional layer. In this case, we can get a great improvement in weather forecast and meteorology, helping accurate weather prediction in temperate area, and be applied in further research such as rainfall variation in cold front invasion.

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