

Head in the Clouds: Is the Van der Waals Force Present in Cloud Structure?

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The primary intention of this experiment was to confirm the existence of inter-droplet Van der Waals forces within a cloud. The secondary goal was to determine if the electromagnetic forces produced enough strength to significantly change the trajectory of a cloud droplet over the course of its mean-free path. To test the hypothesis that VDW-forces hold cloud constituent droplets together, a hermetically sealed cloud chamber was constructed. The 6' x 2' x 4' deep, Plexiglas chamber simulated the environment precipitating a miniature cumulus. Two blocks of dry ice were suspended from the top of the chamber; four blocks were placed at the bottom of the chamber to interact with a piped-in steam source. The thickness and electrostatic properties were measured by an engineered electrometer consisting of two copper plates connected to a multimeter. To understand the specific characteristics of this cloud, a transmissometer was used. This project was conducted over 6 months and encountered obstacles preventing the creation of a cumulus. The main difficulty was an escalated temperature preventing the formation of droplets. Although the data was inconclusive, an increase in electric field-strength was observed. The testing led to the rejection of my initial hypothesis of inter-droplet interaction; only large masses of droplets generate the significant force to manipulate another large mass of droplets. In the future, liquid Nitrogen will be used instead of dry ice. Instead of measuring the electric field on a cloud, the electric field would be induced and its properties measured to support the hypothesis.