
**Introduction**

Photographs of ice accumulation on the unpainted leading edge of the aircraft’s wing during a 9 April 2009 research flight in central Saudi Arabia indicated a color change in the accumulated ice. Specifically, the ice color changed from white, during periods where low droplet number concentrations were encountered, to brown, during periods where high droplet number concentrations were encountered. Through a combination of aircraft observations, radar scans and in-progress modeling studies, we are examining the hypothesis that the high droplet number concentrations observed (as well as other changes in the convective cloud properties that were documented) are associated with the ingestion of a large condensation of aerosols into the convective cloud.

**Aircraft Sampling Methodology**

The King Air 200 aircraft used for airborne measurements had an Aircraft-Integrated Meteorological Measurement System (AIMMS), 2DC, PCASP, FSSP, Cloud Condensation Nuclei Counter (CCNC), Liquid Water Content (LWC) probe, and a Temperature (Temp) probe.

**Visual Observations**

![Image](image)

**Soundings**

1200 UTC Riyadh Rawinsonde
1240 UTC Aircraft Ascent to Southwest

**Cloud Properties**

Time series (1 Hz) of cloud properties at 18,000 ft on the 9 April 2009 flight in Saudi Arabia. Droplet concentration and mean diameter are measured with an FSSP; while liquid water content (LWC) is measured with a DMT hot wire probe. The blue and red lines correspond to sampling different cloud cells.

**Relationship between cloud droplet concentration and mean droplet diameter between 13:20–13:35 9 April 2009. Only measurements with ≥ 1 Hz hot wire probe liquid water measurements above 1 g/m³ are included in the analysis.**

**Conclusion**

The ‘brown’ cloud had very high droplet concentrations (up to 1200 cm⁻³) and reduced average mean droplet diameters compared to a normal cell. These high droplet concentrations do not appear to be associated with a narrower spectrum at a smaller mean diameter but instead suggest an additional mode of droplets superposed on the previously encountered distribution.

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**Radar Observations**

Preliminary WRF Modeling

We plan to utilize the Weather Research and Forecasting Model system to examine in detail the processes of this storm relative to our hypothesis. The preliminary runs (a free forecast and nudging data assimilation) are establishing the ability of the WRF system to reproduce the convection in this case with sufficient fidelity to warrant detailed experiments incorporating realistic Arabian dust aerosol/CCN interactions with WRF-Chem.