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The relationship of cirrus ice water content, crystal number, and size to vertical velocity: First results from the MACPEX field campaign

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The role of ice clouds in the radiation budget of the atmosphere is difficult to determine owing to the number and variability of the microphysical, and thus radiative, properties involved, as well as the current lack of understanding of how and why some of those variations occur. The microphysical properties of an individual cirrus cloud, such as the ice crystal number, size, and water content (IWC) are vital components for determining that role. However, without the proper understanding, these properties continue to be challenging to describe and parameterize.

In this study we will present observations obtained during the 2011 Midlatitude Airborne Cirrus Properties Experiment (MACPEX) that was based in Houston, Texas. Specifically we will compare the microphysical properties of the cirrus observed during MACPEX with the extensive cirrus in situ data sets of Schiller et al. (2008), Krämer et al. (2009), and Luebke et al. (2012). A first look into the data shows that MACPEX is different from the earlier cirrus data sets: higher IWCs were observed together with higher ice crystal numbers at temperatures around 215K, while at around 225K average IWCs were found, but were accompanied by low ice crystal numbers. Further investigation of the meteorological situation and of the role of vertical velocity, freezing mechanism (heterogeneous/homogeneous ice nucleation), and sedimentation of ice crystals will be included to explain the MACPEX observations.