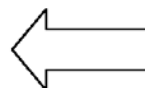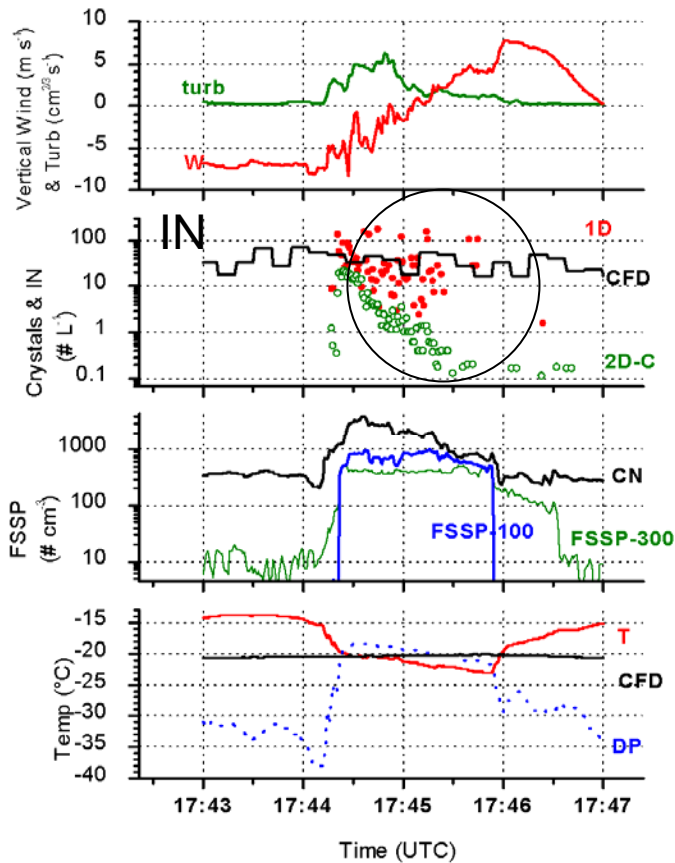# Cloud Properties Measurements for Validating Understanding of Ice Formation Processes
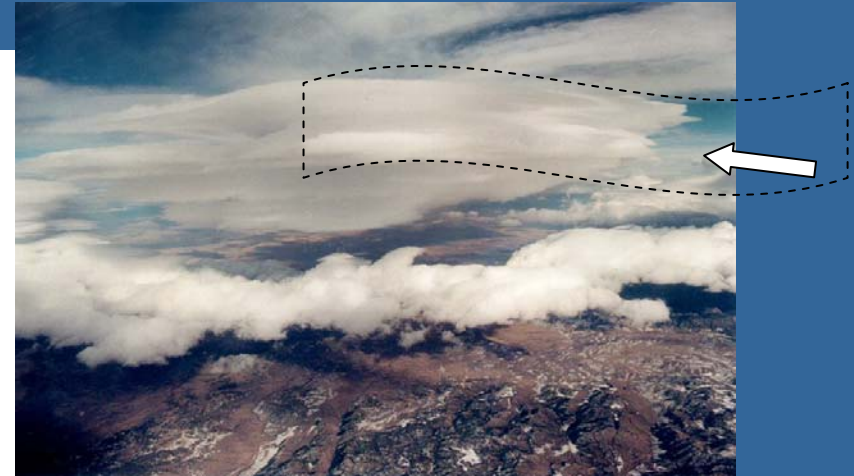
Paul J. DeMott

Measure of ice nuclei with CSU Continuous Flow Diffusion Chamber

Prior cases for IN = primary initial ice formation: studies in/around orographic wave clouds

(WAVEICE, CO-WY, Wyoming King Air, March 2000)

(Rogers and DeMott, 2002 AMS Conf. Cloud Phys.)
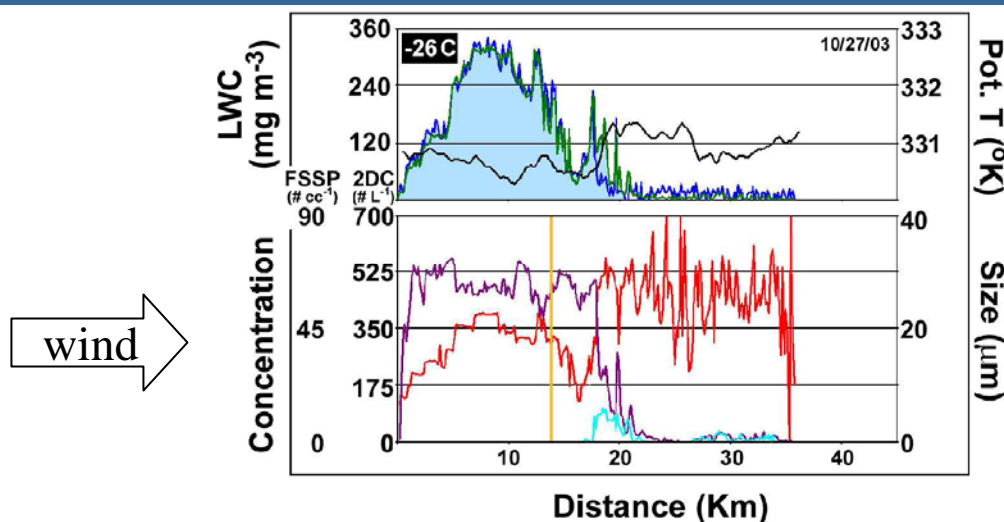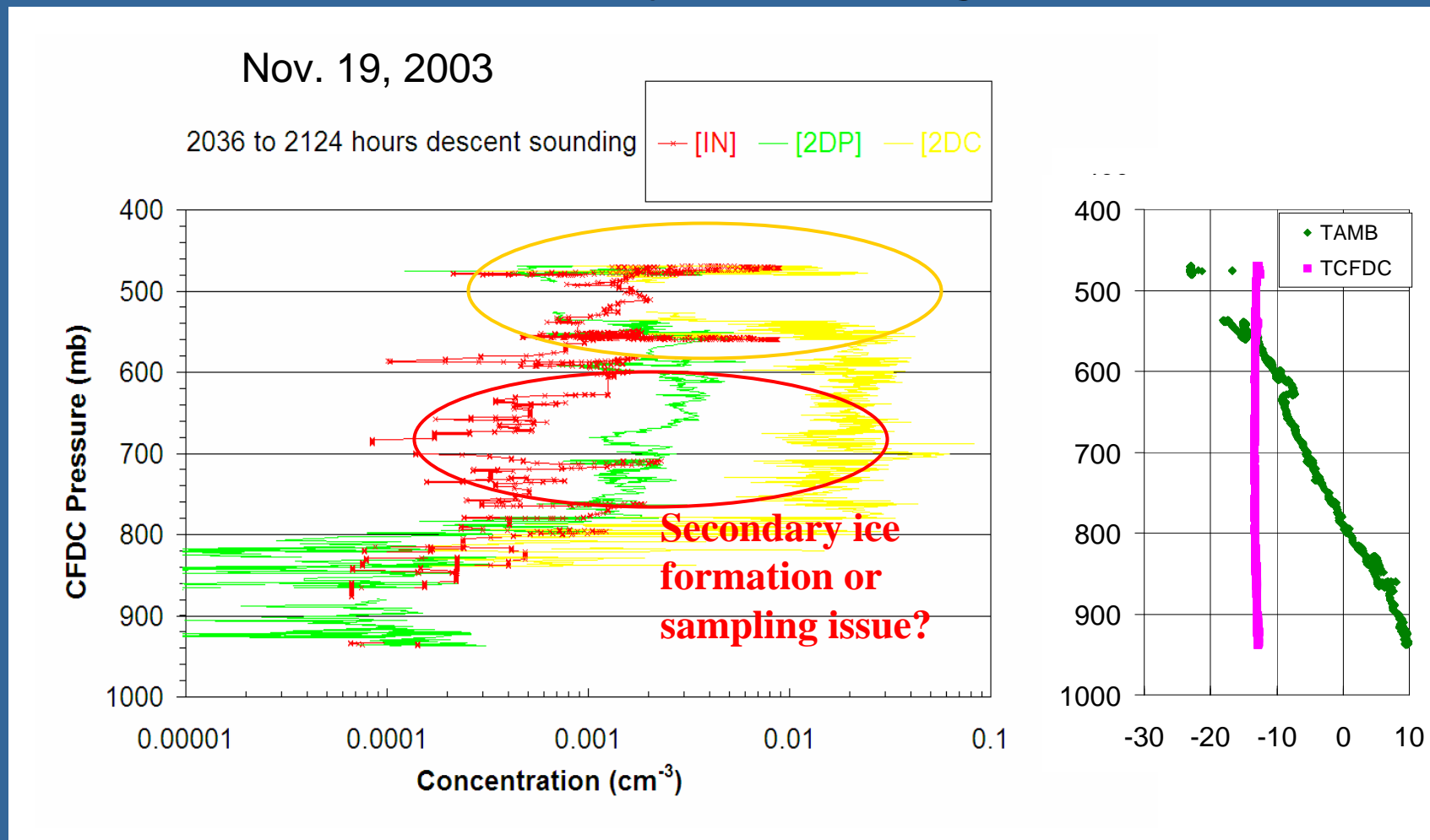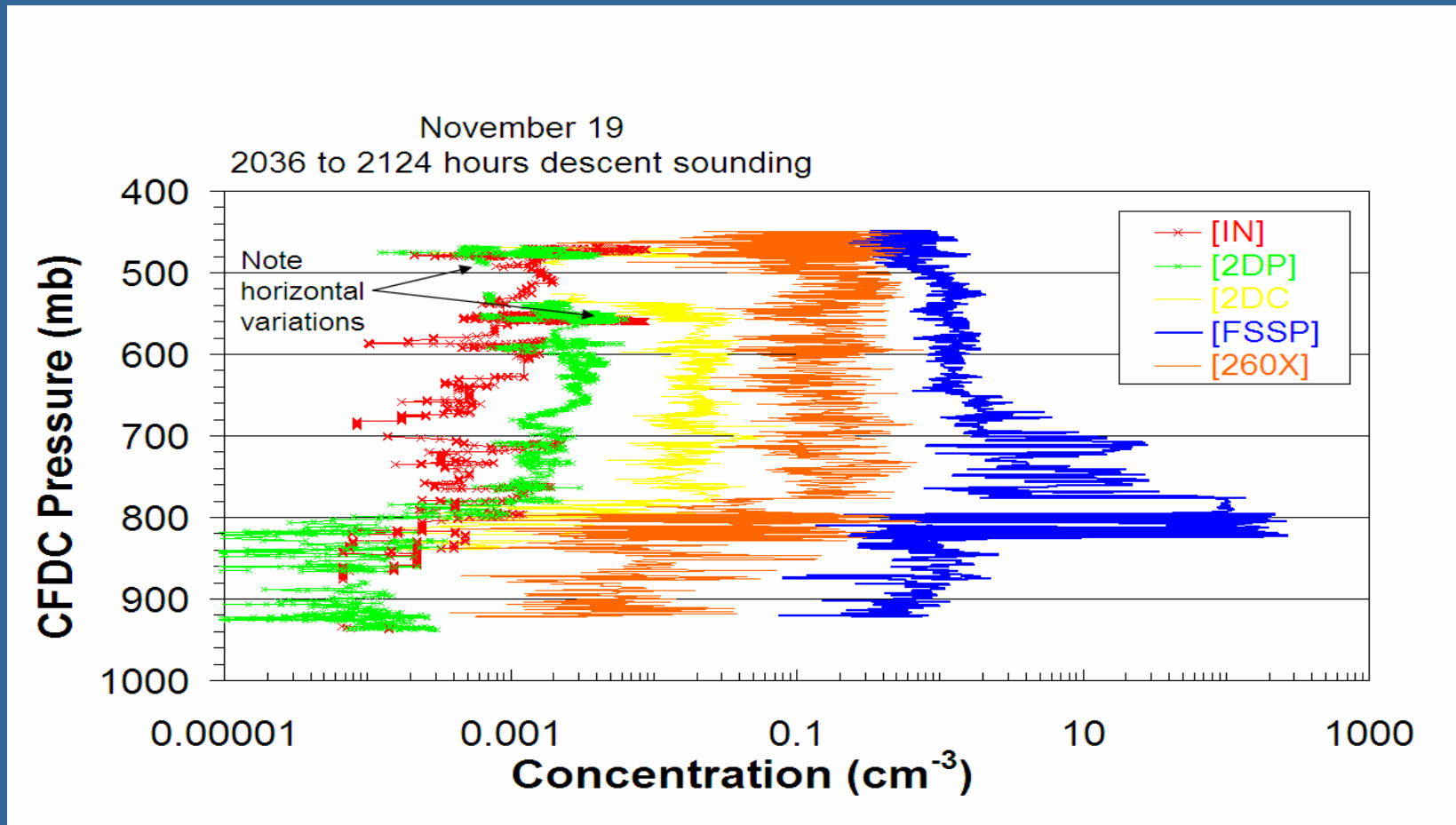
Unresolved ice formation mechanisms

Figure 3. Example showing the "evaporation glaciation signature" observed in wave clouds (from Baker and Lawson, 2005). Ice crystal concentration as measured by a 2D-C probe (light blue trace, lower panel) jumps up near the location where supercooled liquid water (shown as blue fill under the green LWC curve, upper panel) evaporates, FSSP concentration (purple trace lower panel) decreases and mean size (red) increases. The black line (upper panel) is potential temperature and the yellow vertical line is location of first ice observed by either the CPI or the 2D-C probe. The LWC and TWC (blue trace, upper panel) are from Nevzorov probe.
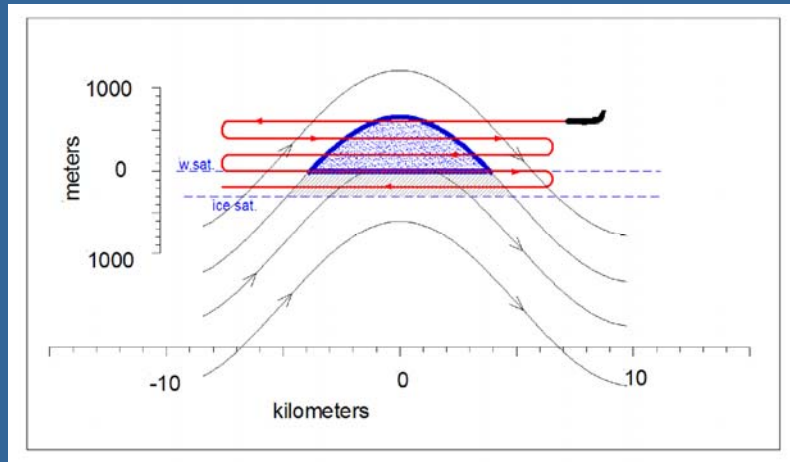
In deeper and mostly ice phase clouds:
Closest correspondence between ice and IN from CVI residuals occurs only in upper region

Nov. 19, 2003

2036 to 2124 hours descent sounding — [IN] — [2DP] — [2DC]

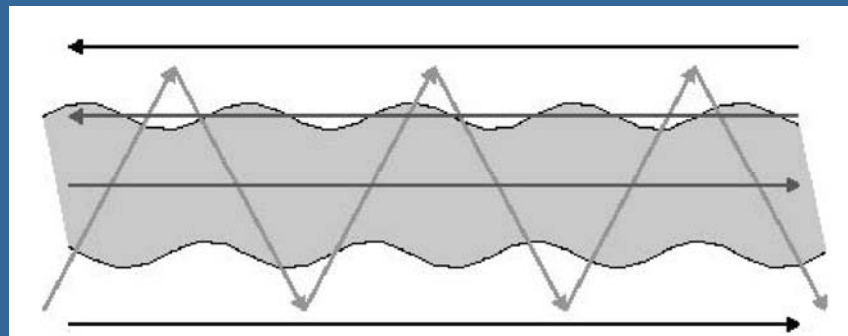Secondary ice formation or sampling issue?

TAMB TCFDC

However, great difficulty assigning true ice crystal concentrations based on particle probe data…

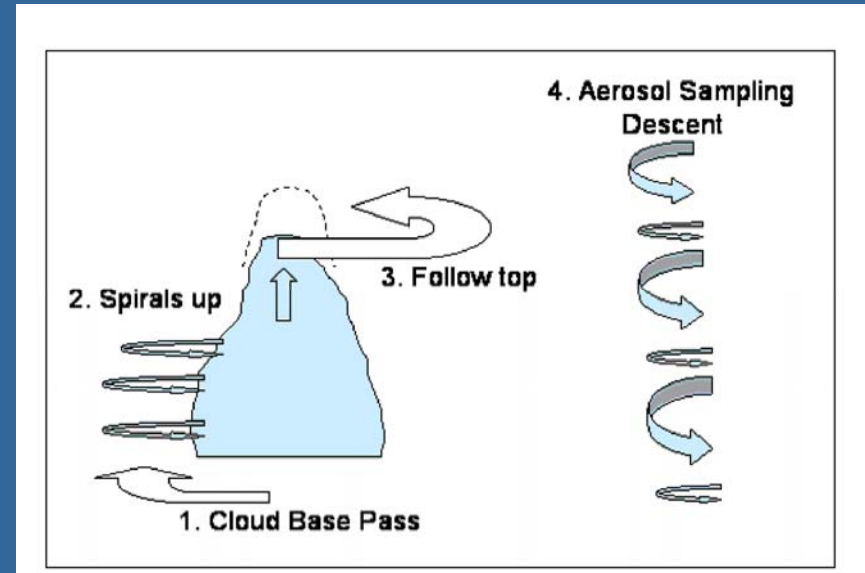# Future plans – ICE-L (Ice in Clouds Experiment – Layer clouds) with NCAR C-130 aircraft (March-April 2007)

Wave clouds

Goal: Identify ice formation mechanisms in clouds, Includes aerosol, IN, CCN measurements along with latest microphysical probes.

Cumulus clouds

Altostratus/altocumuli