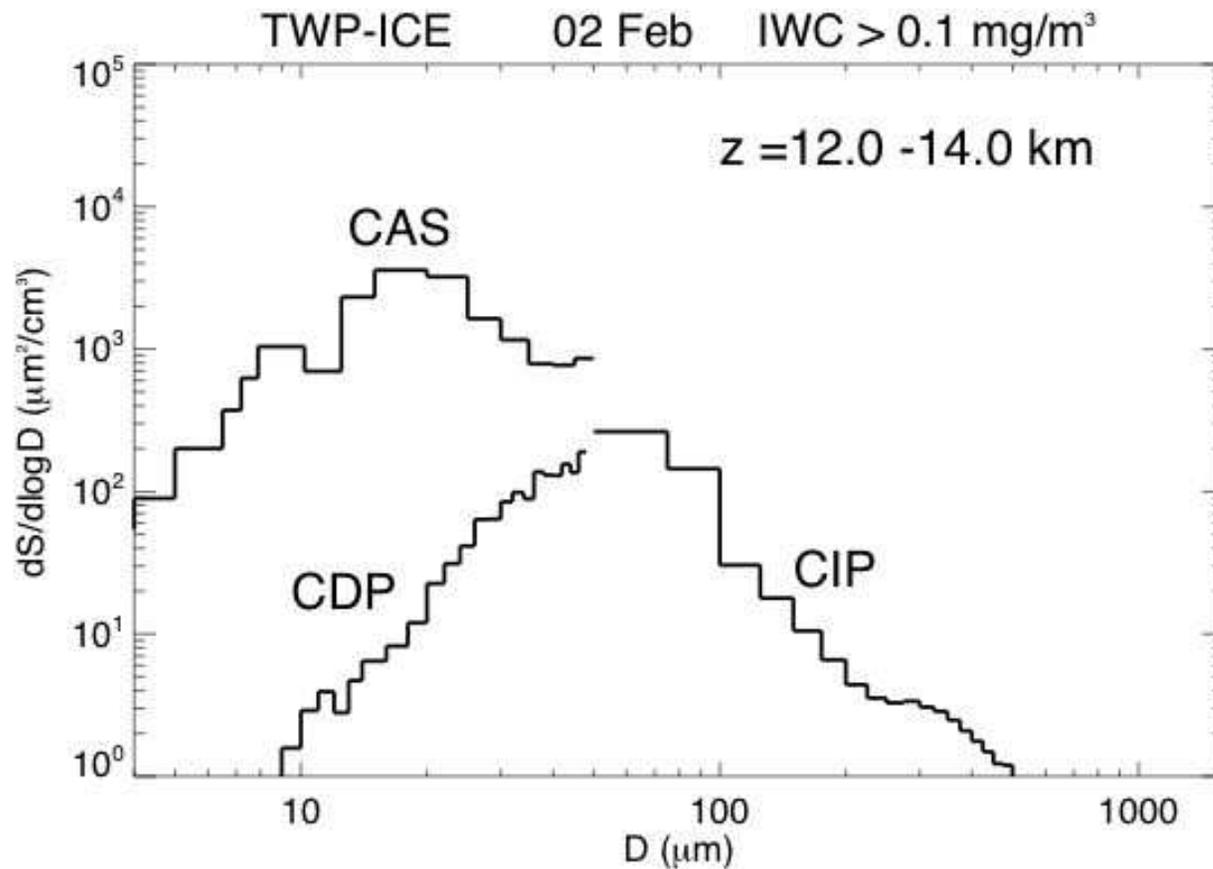


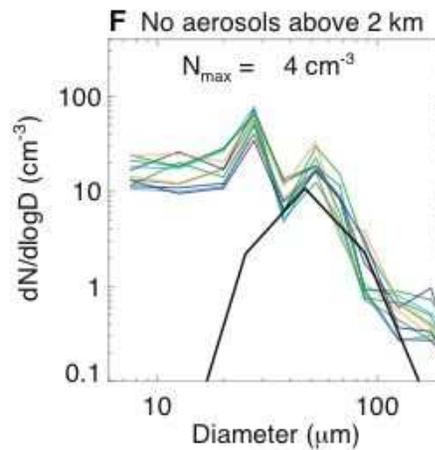
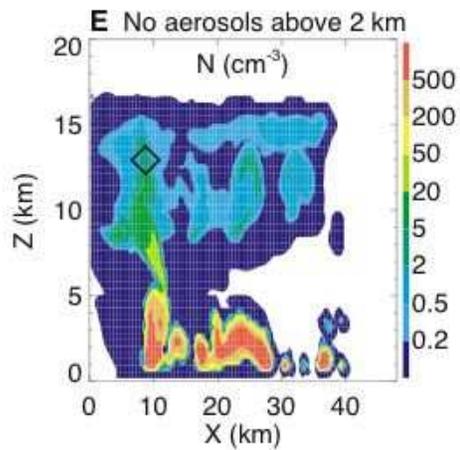
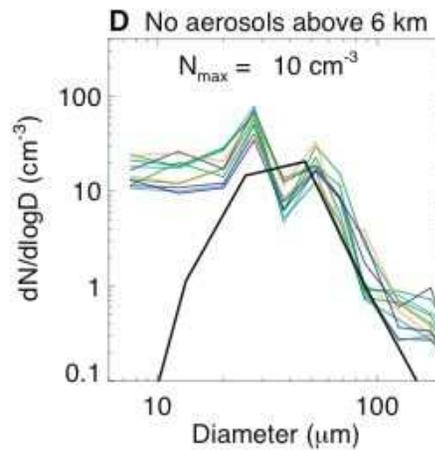
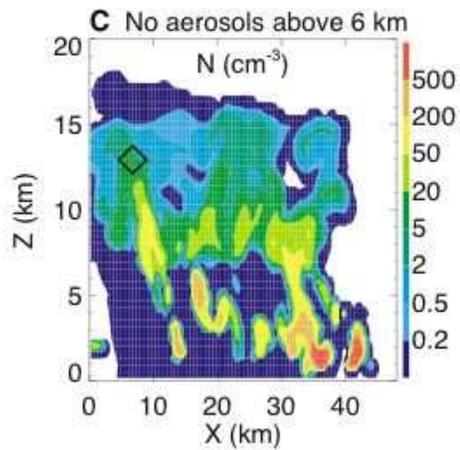
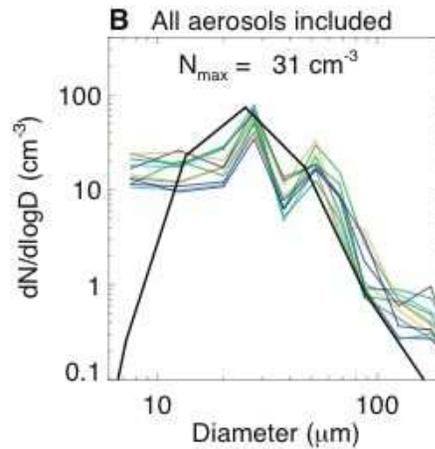
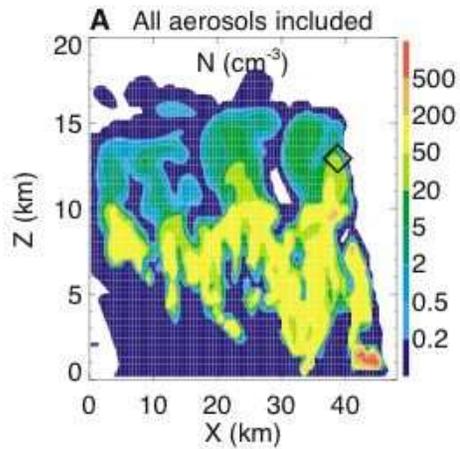
## 1. How Prevalent are Small Particles in Tropical Cirrus?



- Open-path instruments (CDP, 2D-S) allow measurements of ice crystal size distributions free of shattering artifacts



- Shattering artifacts can suggest small crystals dominate extinction
- Important for development of GCM cirrus parameterizations



Fridlind et al. [2004]

Without shattering artifacts, BL aerosols may account for anvil ice concentrations.

## Mission strategy

- Gather CAPS, CDP, 2D-S, and bulk cloud properties in cirrus under as wide a range of conditions as possible
  - temperature
  - altitude
  - anvil and in situ
  - maritime and continental
- CPI measurements of crystal habit

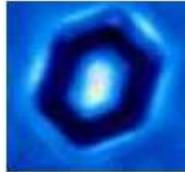
## 2. What Physical Processes Control Anvil Evolution?

- entrainment of dry air
- precipitation
- radiatively driven mixing
- meso/synoptic-scale dynamics

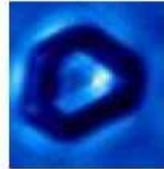
## Mission strategy

- Measure anvil cirrus properties, RHI, turbulence, and tracers in both young and aged anvil cirrus.
- Remote-sensing measurements of anvil structure and evolution
- Modeling studies will be needed

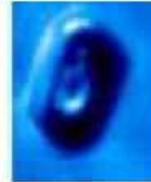
### 3. Microphysical Properties of Boreal Summertime TTL Cirrus



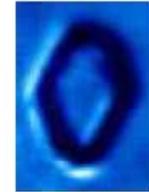
87  $\mu\text{m}$



85  $\mu\text{m}$



90  $\mu\text{m}$



96  $\mu\text{m}$

- CRAVE provided a wealth of data for cold, wintertime TTL cirrus
- Boreal summertime TTL cirrus may be very different
  - higher temperatures
  - more water available
  - different aerosol compositions

## Mission strategy

- Use DC-8 lidar to identify the presence and altitude of thin TTL cirrus layers.
- Porpoise through entire depth of cloud layers using CAPS back-seater display as a guide.
- Water isotope measurements can be used to distinguish in situ cirrus from anvil remnants.

## 4. Aerosol Nucleation in the Upper Troposphere

- CRYSTAL-FACE provided evidence for new particle formation within anvil cirrus
- What conditions (temperature, relative humidity, pre-existing aerosol surface area, time of day, etc.) favor new particle formation?

## Mission strategy

- Sample aerosol size distributions, cloud properties, and tracers in different types of clouds as well as clear air.
- Sample convectively influenced air with a range of times since convective injection.