

Observing Ice Formation at warm temperatures

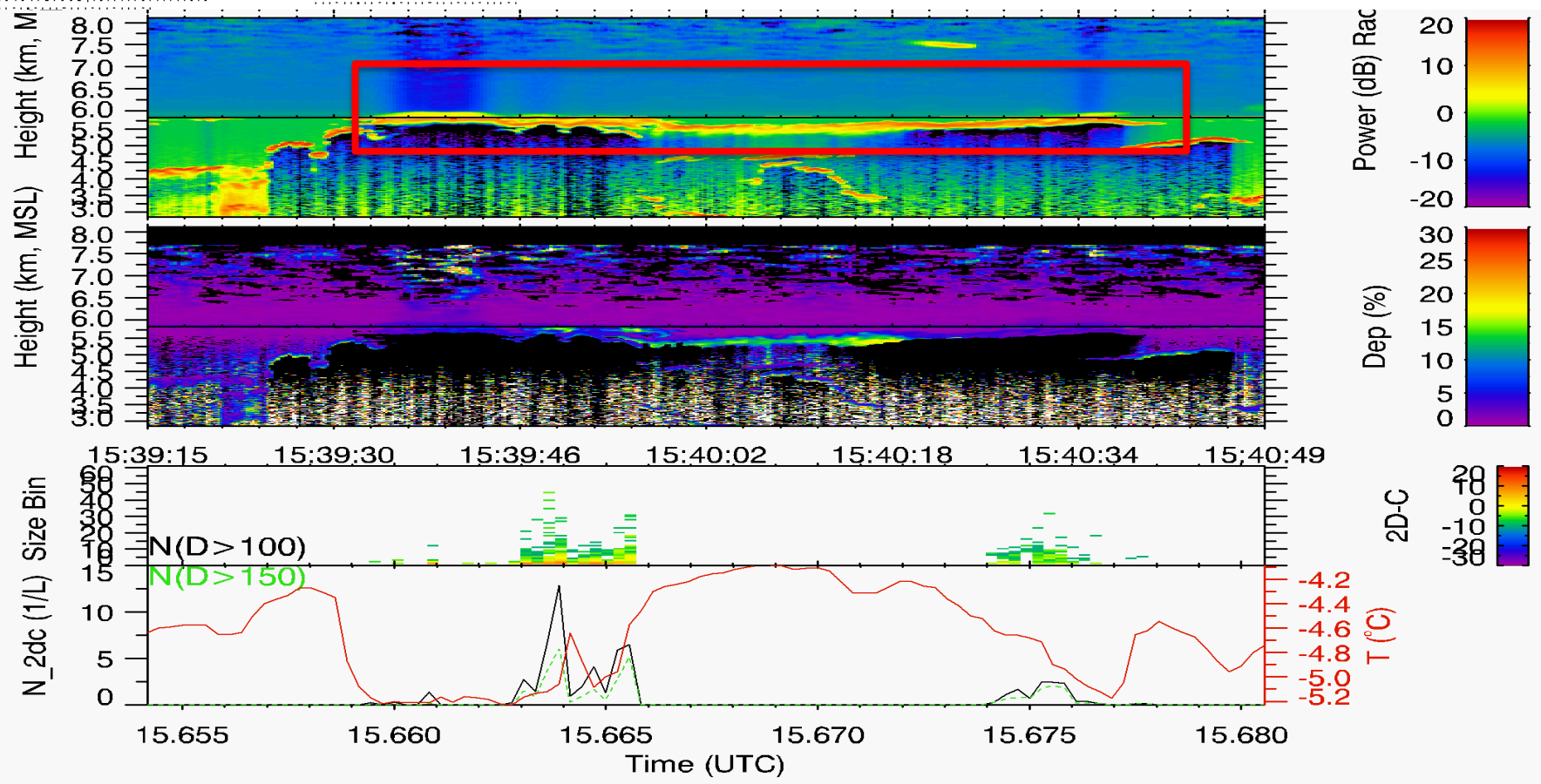
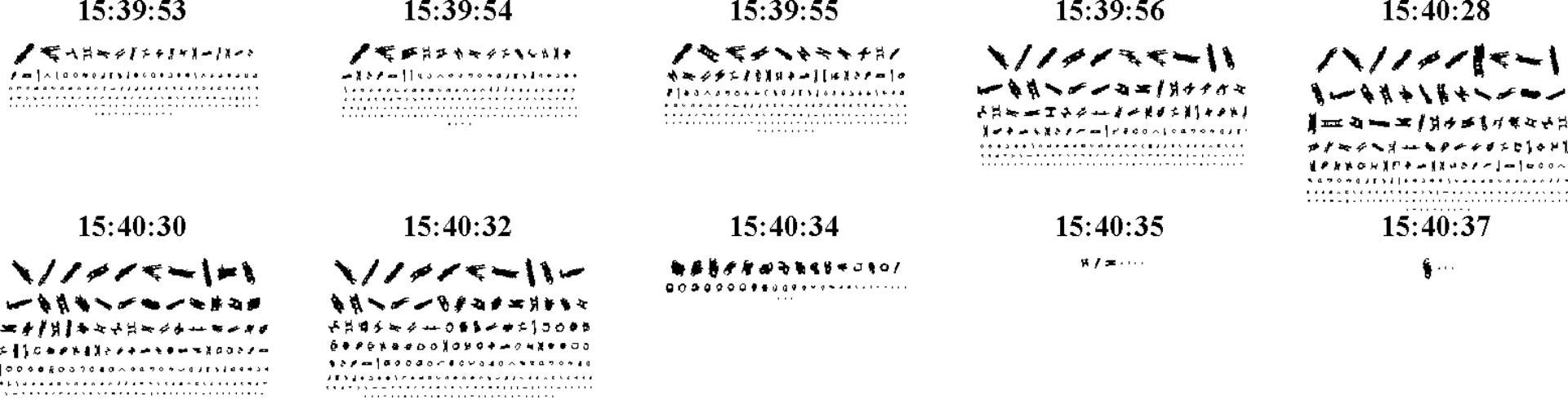
The importance of biological IN

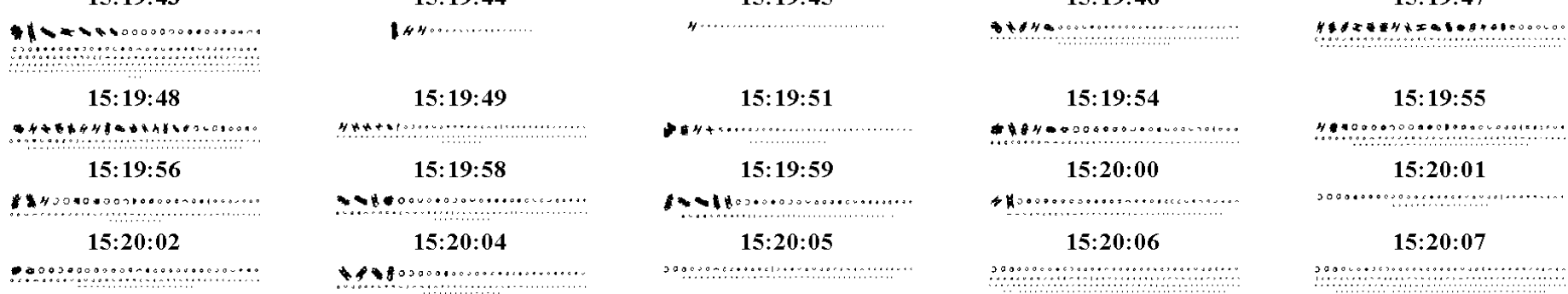
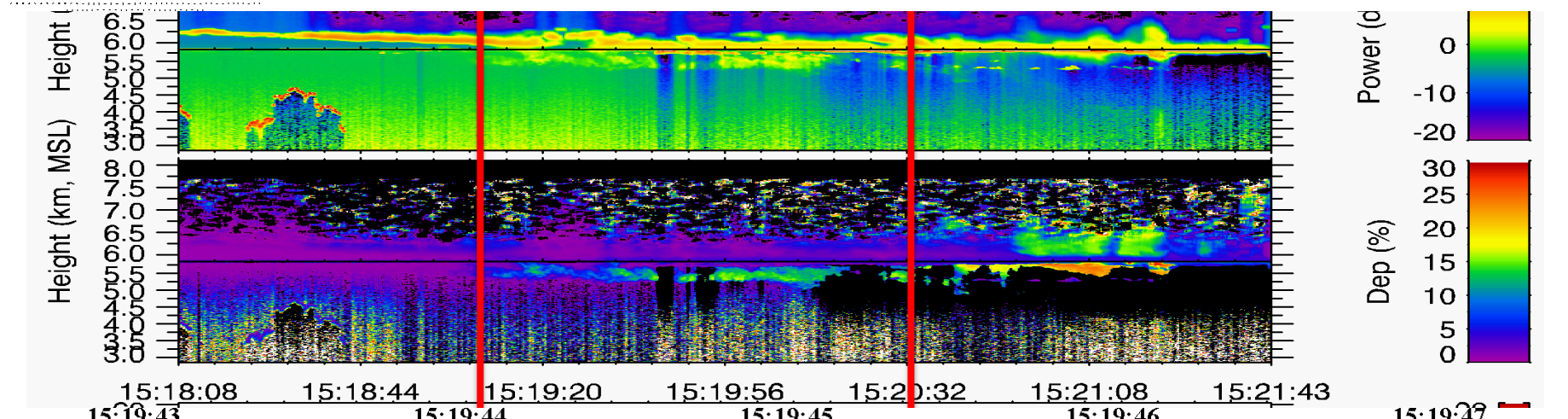
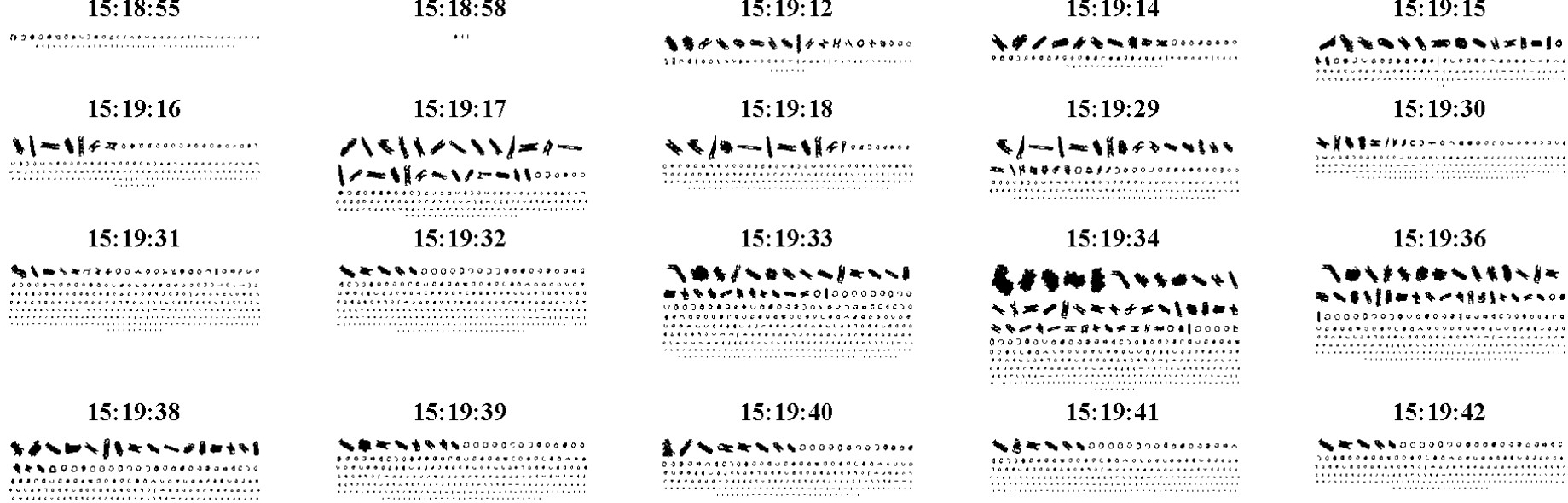
Zhien Wang

Tao Luo, Damao Zhang, Kaitlyn Suski,
Andy Heymsfield, Kim Prather, Jeff
Snider, and Dave Leon

Outline

- ICE-T observation evidences
- The role of biological IN?
- The potential global significance
- Discussion





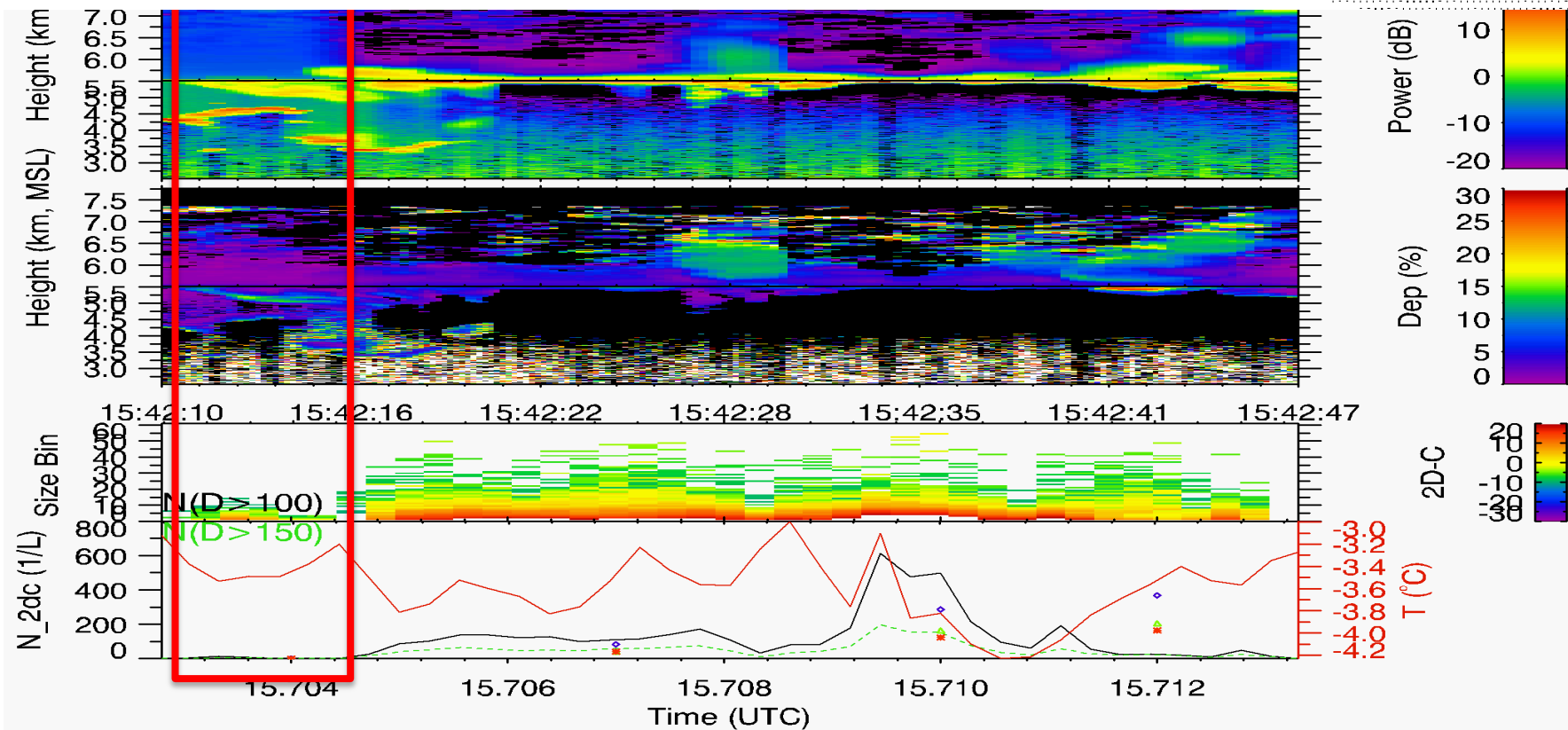
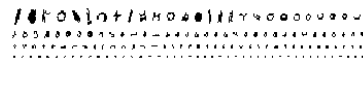
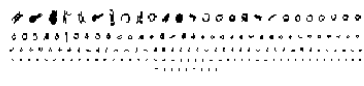
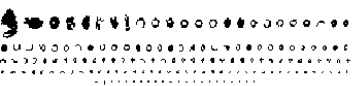
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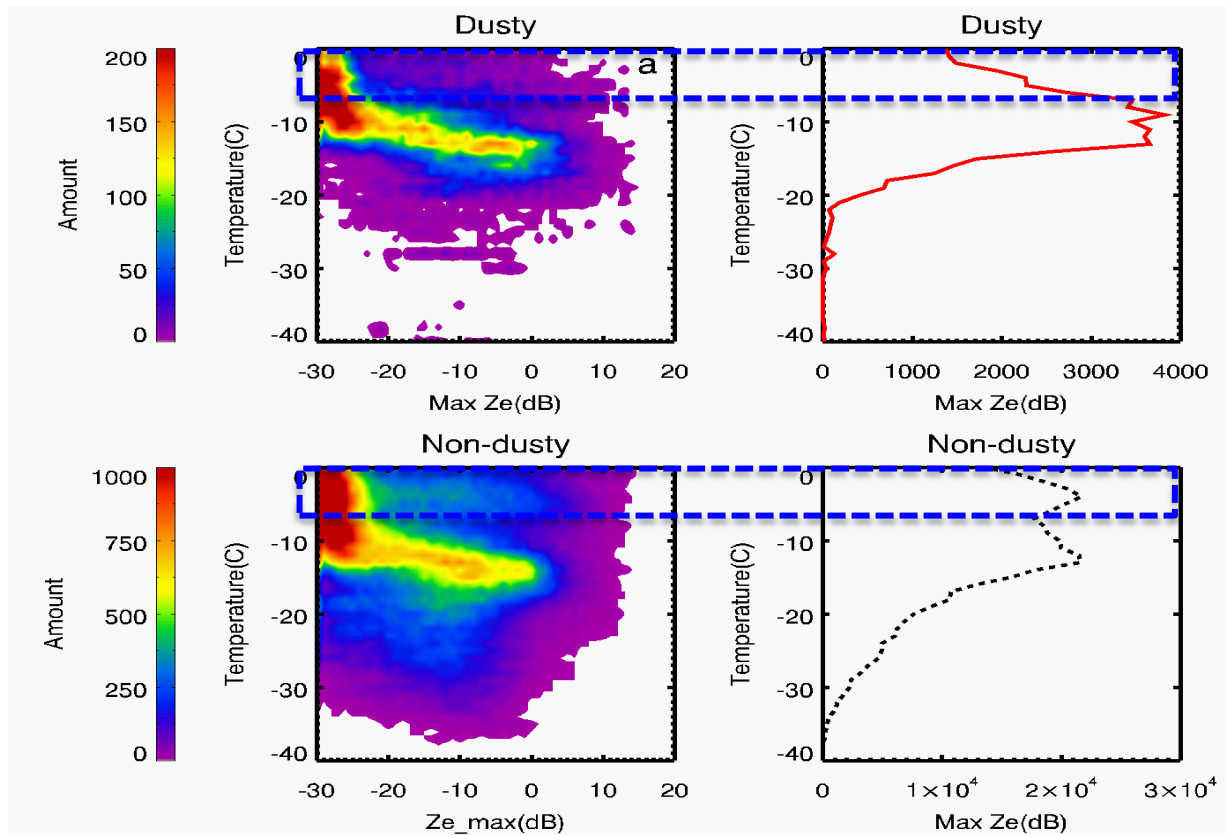
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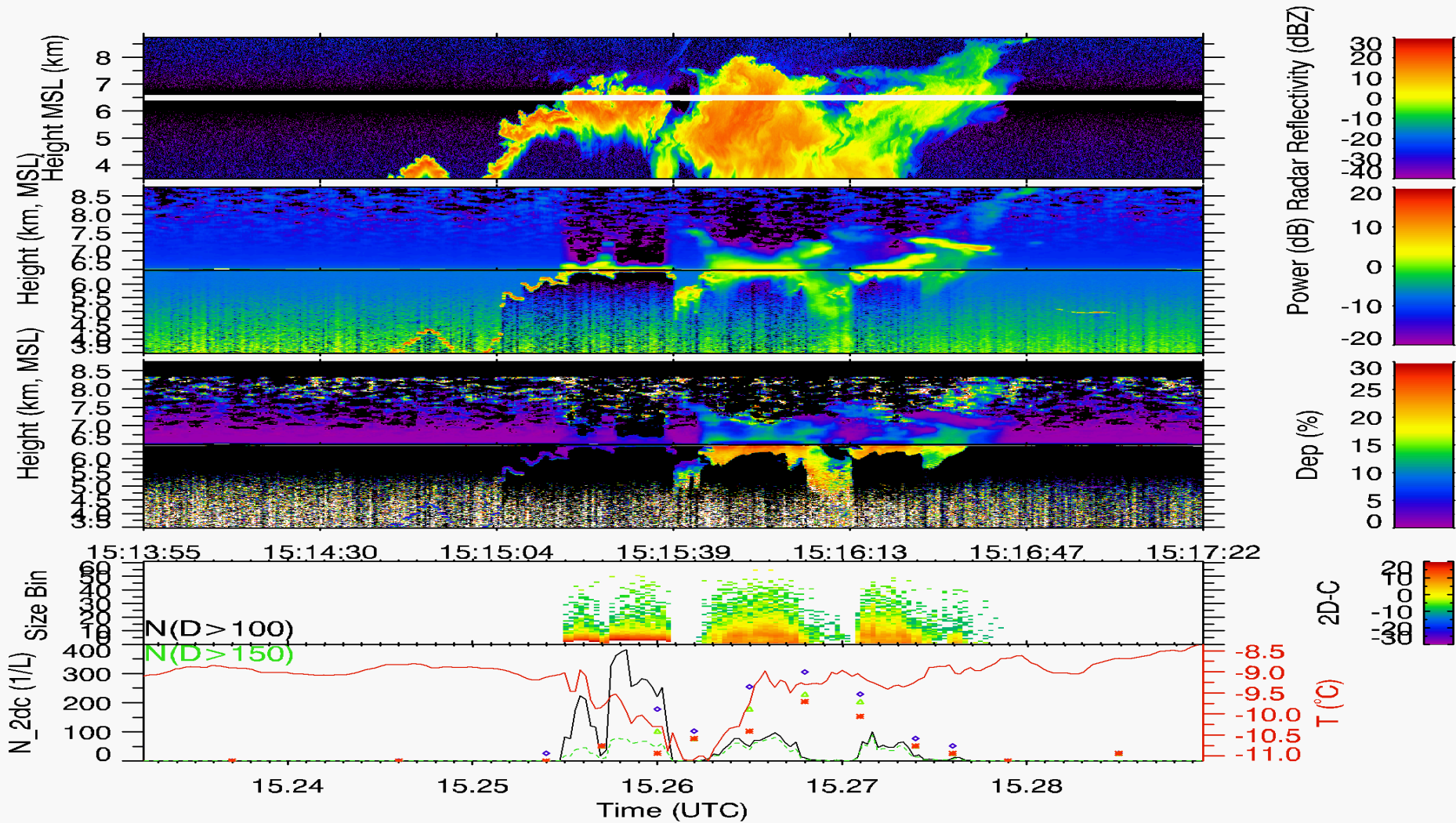


The role of biological IN ?

- Biological IN are the (only) known IN to active at warm temperature.
- Dust is not a good candidate!



Explore Clues With AMS Measurements

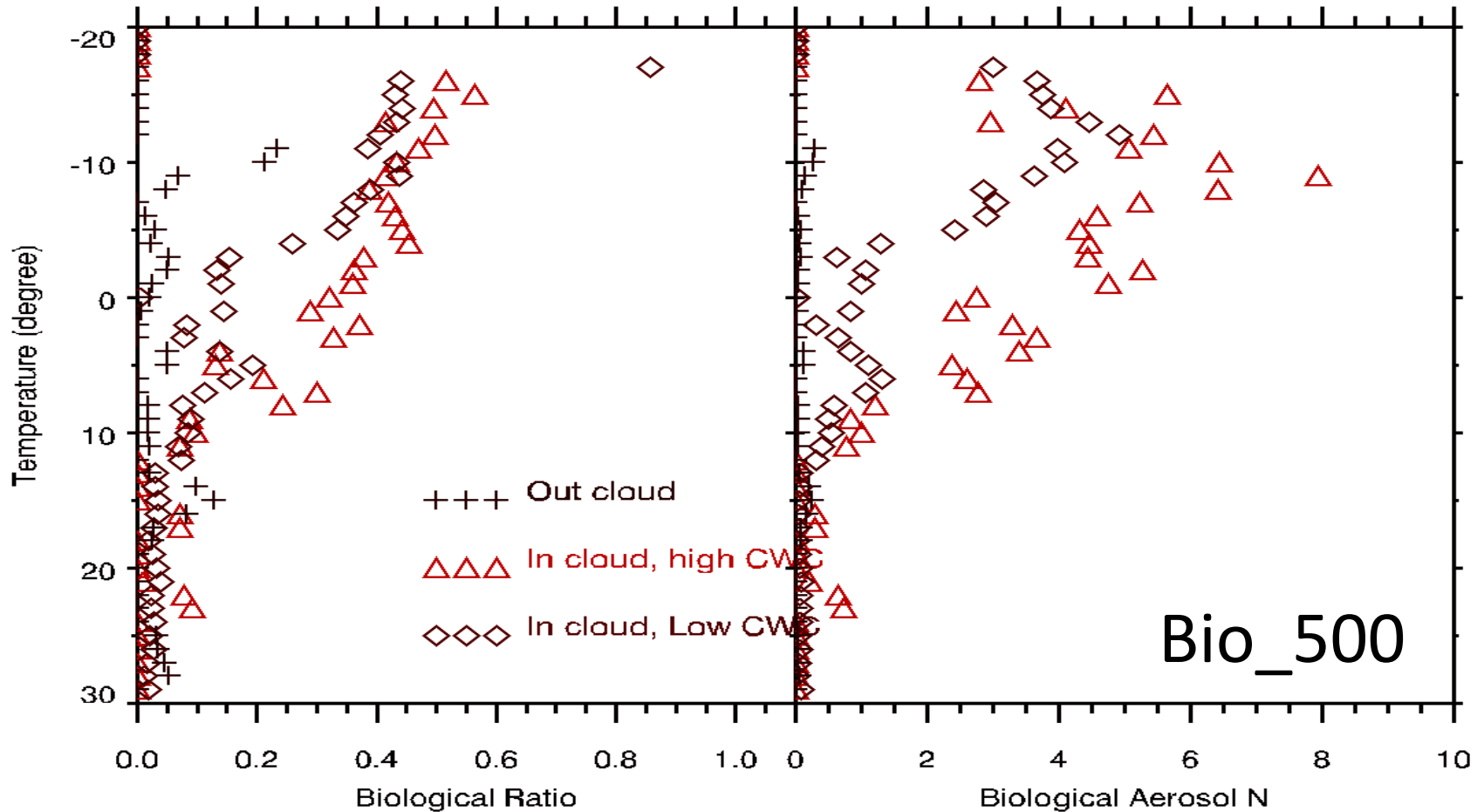


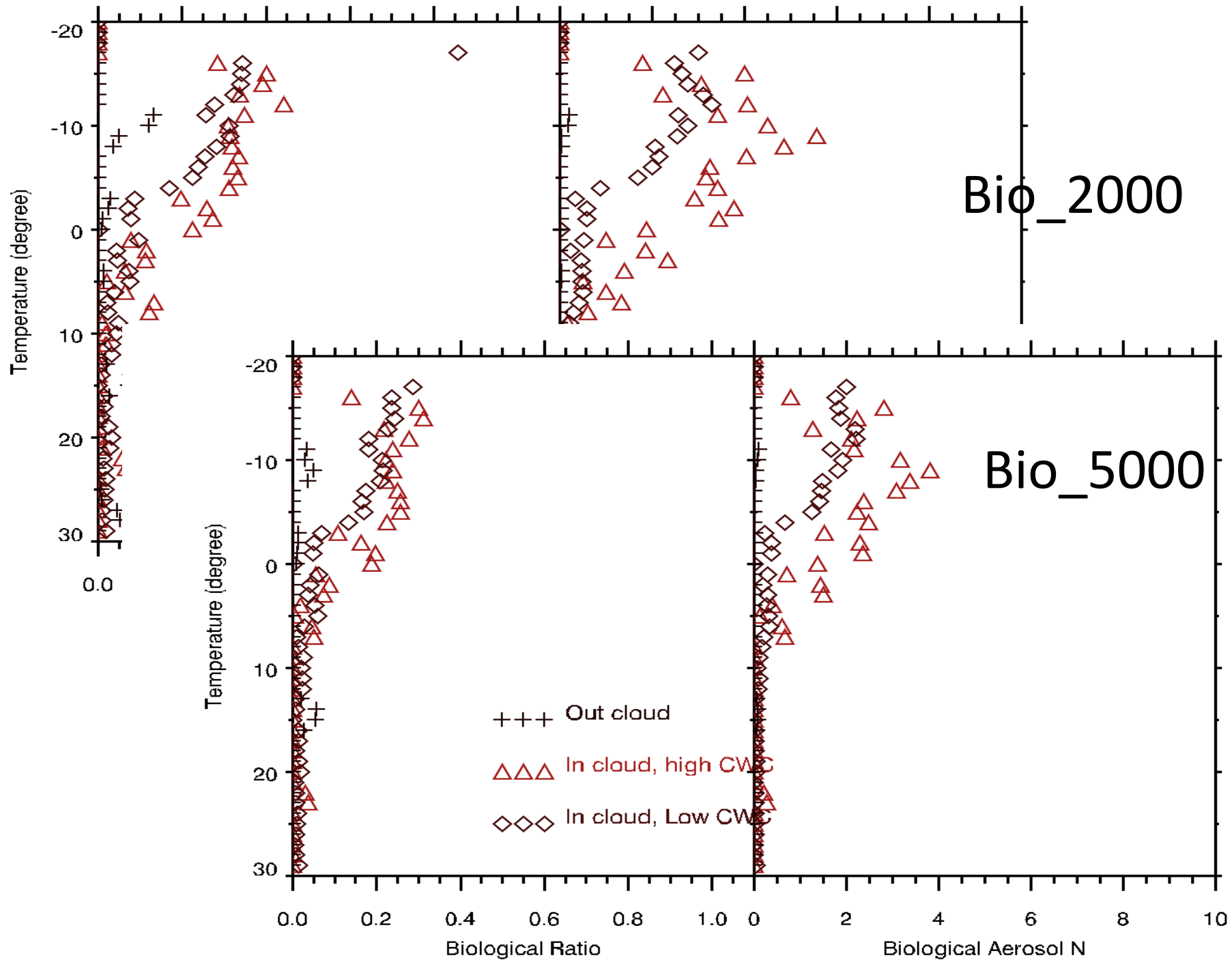
Bio_500

Bio_2000

Bio_5000

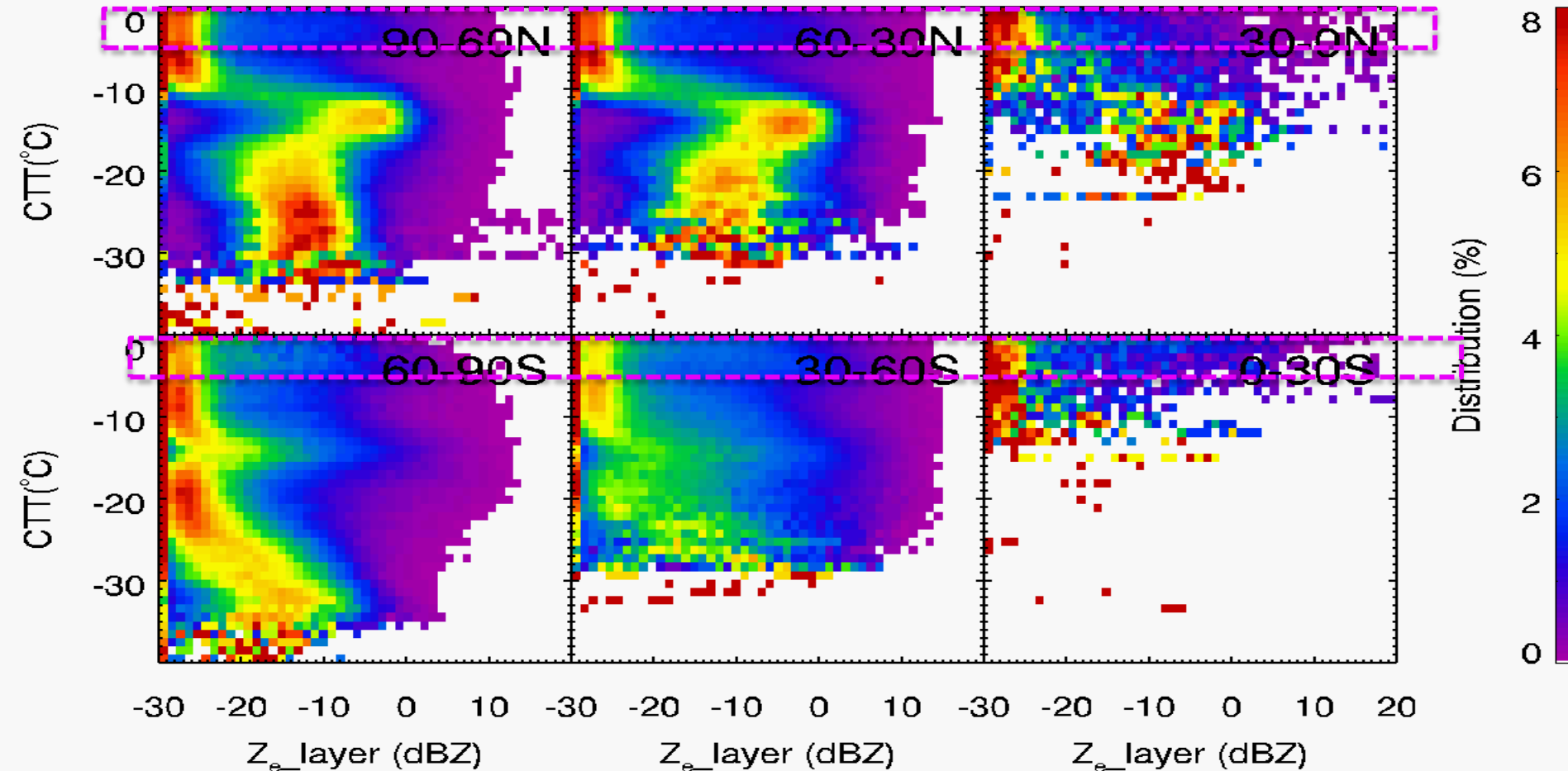
The Temperature Dependency of Biological aerosols





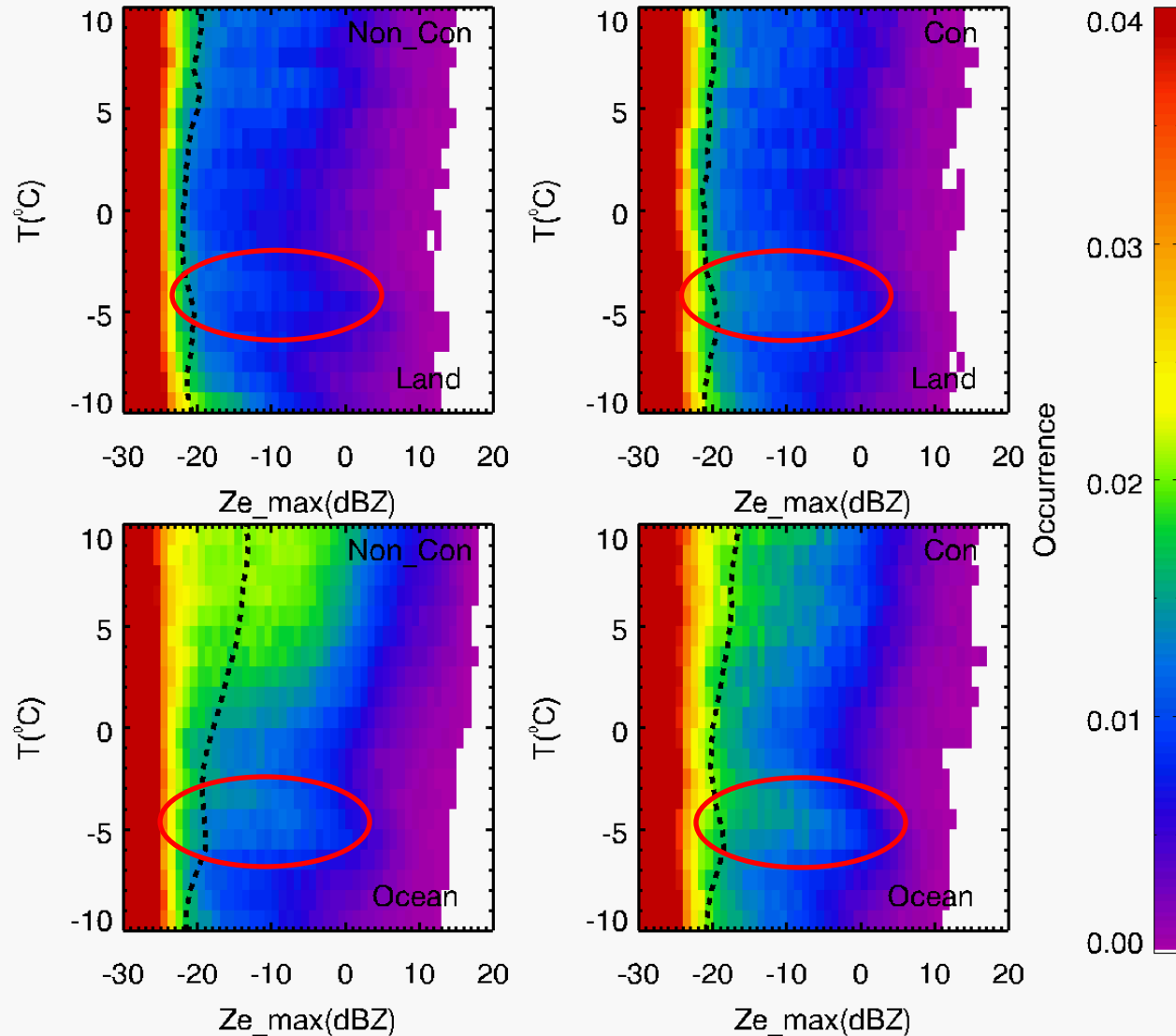
The Potential Global Significance

- CloudSat and CALIPSO data show warm ice production globally.



Part IV Ice formation in AC over Tropics

- Z_e _max do show a peak at CTT of ~ -5 C.



Discussion

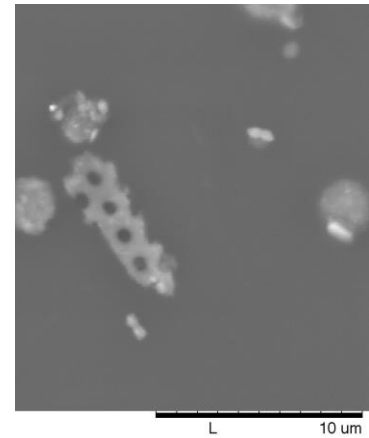
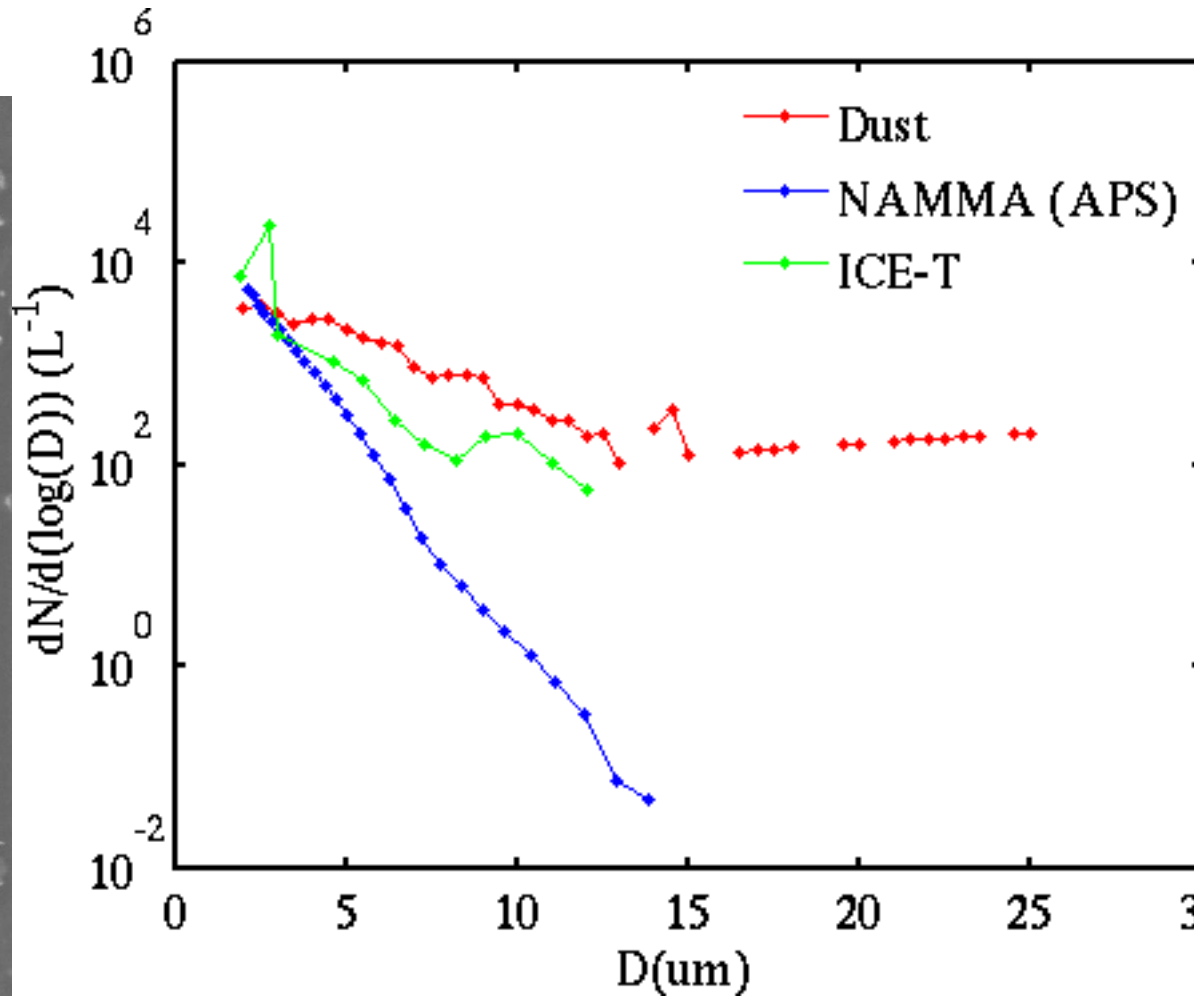
- Biological IN are very likely the candidate contributing to the observed ice generation at warm temperatures.
 - Secondary ice production
 - Charge generation within clouds
- Need more direct evidences, IN residual samples?
- How many biological IN there?

A dusty case collected at St Croix

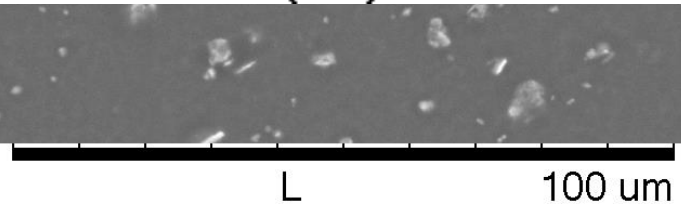


2011-07-14

Electronic Microscopy Image of Aerosols

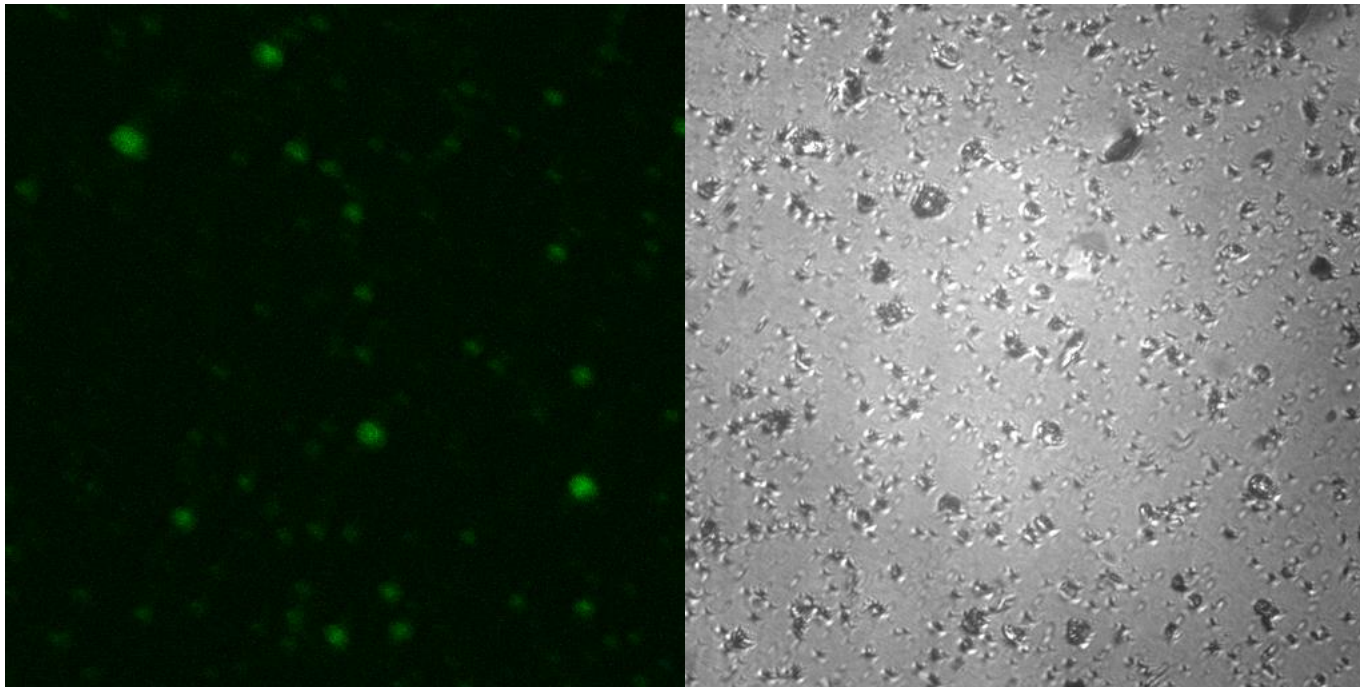


301 μm : 3200 /L
2 μm : 1800 /L



Biogenic Aerosols

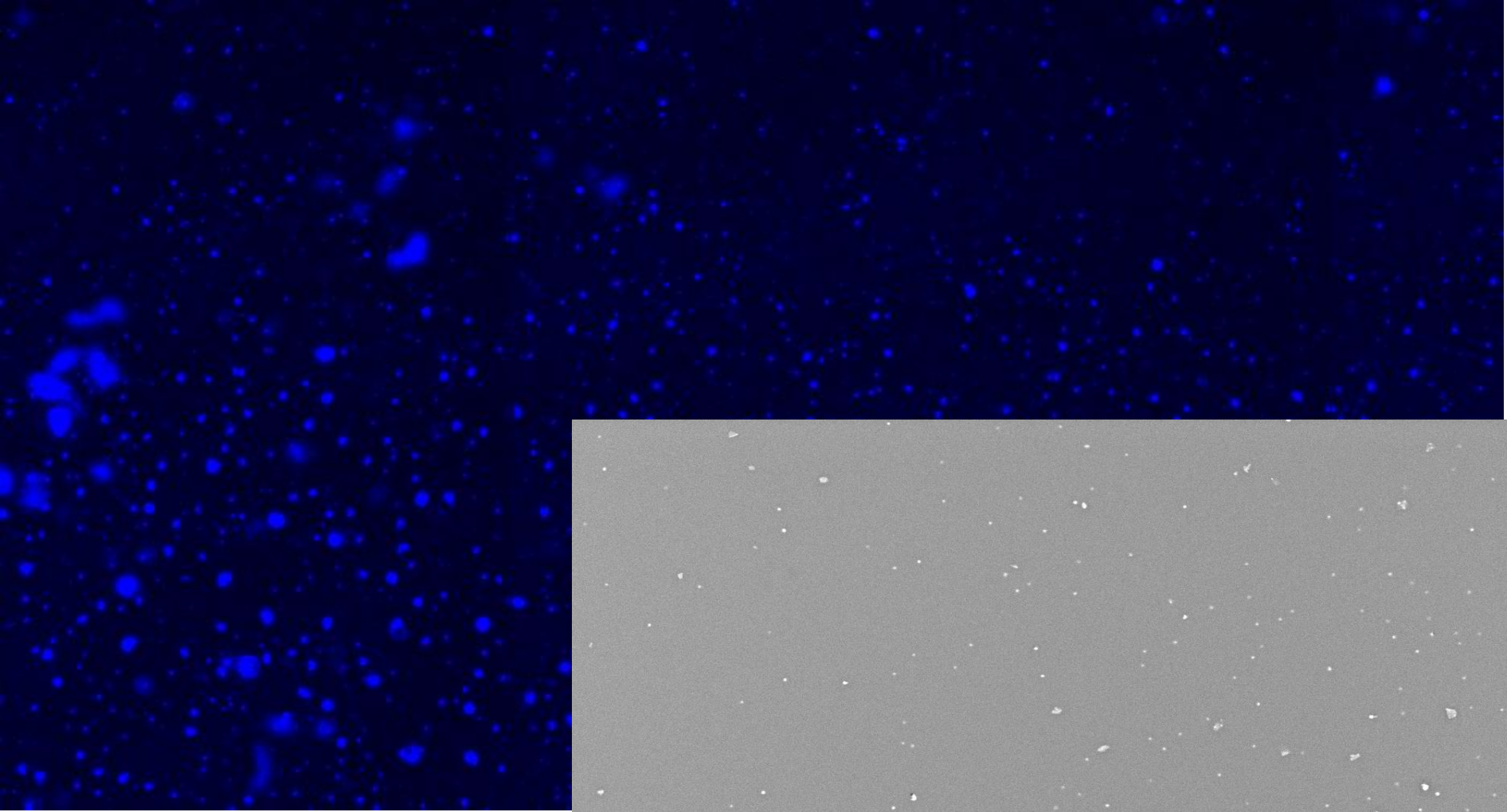
with fluorescence signals



Images from a Carl Zeiss Confocal Microscope

Large aerosols from ocean wave break





Over 50% all particles
with fluorescence
signals.

Size > 1 μm : 1160/L

Size > 2 μm : 290 /L

L x800 100 μm