Observing Ice Formation at warm temperatures

The importance of biological IN

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Outline

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





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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**



### 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



## 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**



### **Biogenic Aerosols**

### with fluorescence signals



### Images from a Carl Zeiss Confocal Microscope

### Large aerosols from ocean wave break





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