

# Annual cycle of ice nucleating particles (INPs) in the central Arctic during MOSAiC

Jessie Creamean

Kevin Barry, Thomas Hill, Carson Hume, Paul DeMott, Matthew Shupe, Sandro Dahlke, Sascha Willmes, Julia Schmale, Ivo Beck, Clara Hoppe, Allison Fong, Emelia Chamberlain, Jeff Bowman, Randall Scharien, Ola Persson, and the MOSAiC field team

Colorado  
State  
University



**No INP annual cycle in the central Arctic before MOSAiC**

**Overarching objective: Improve understanding of the sources, efficiency, and abundance of INPs in the central Arctic over a full annual cycle.**

**Targeted questions:**

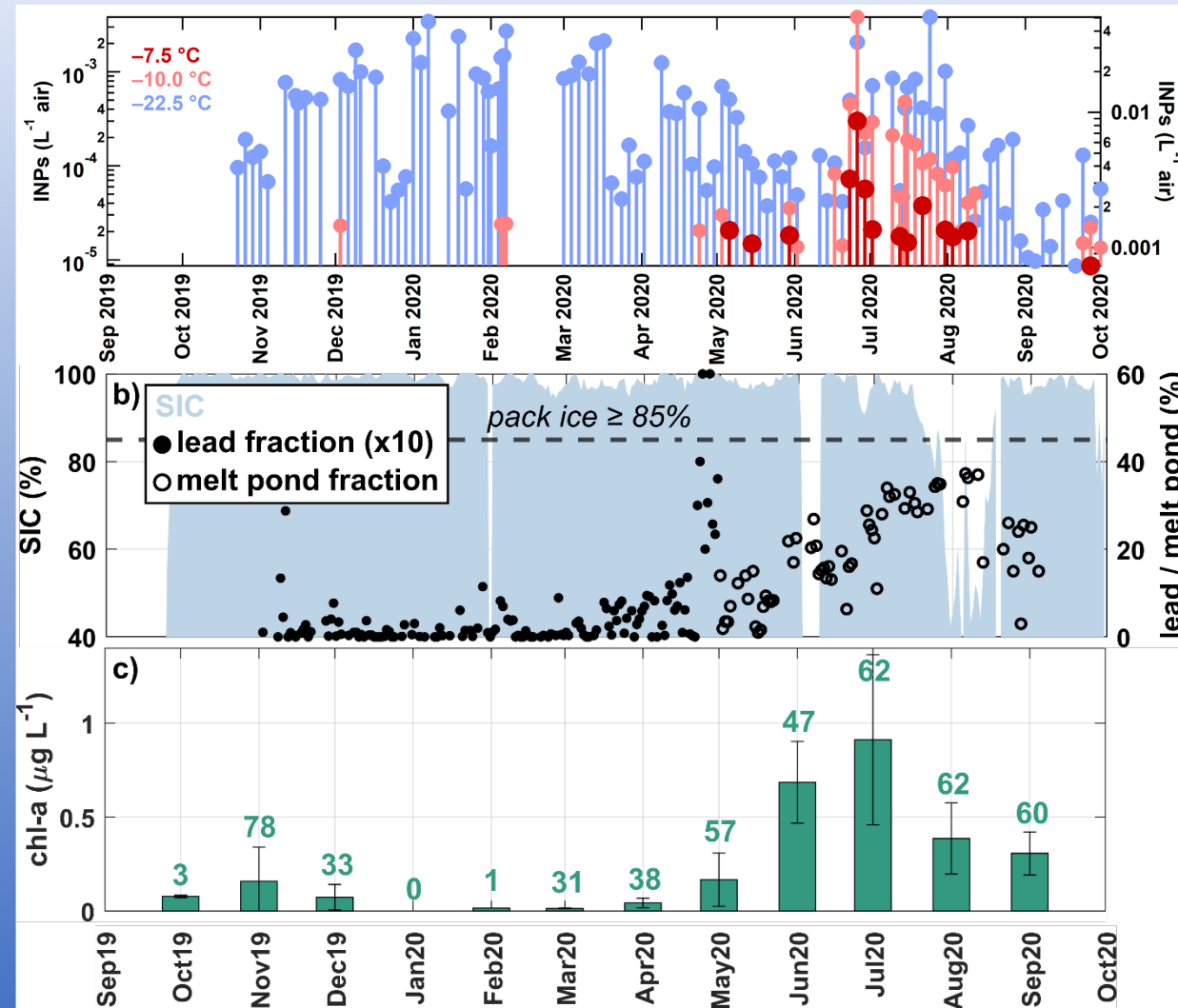
1. How do seasonal changes in sea ice and air masses influence INPs?
2. Is marine and sea ice biology a significant source of INPs vs. terrestrial sources?
3. Are leads and melt ponds viable sources of INPs and do they exchange INPs with the atmosphere?



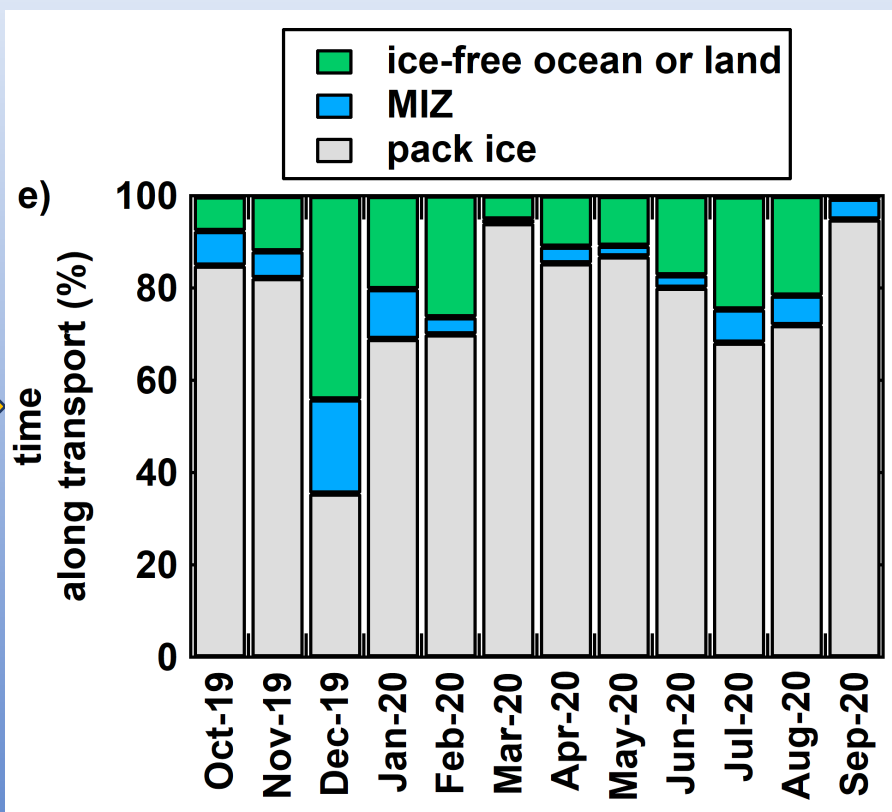
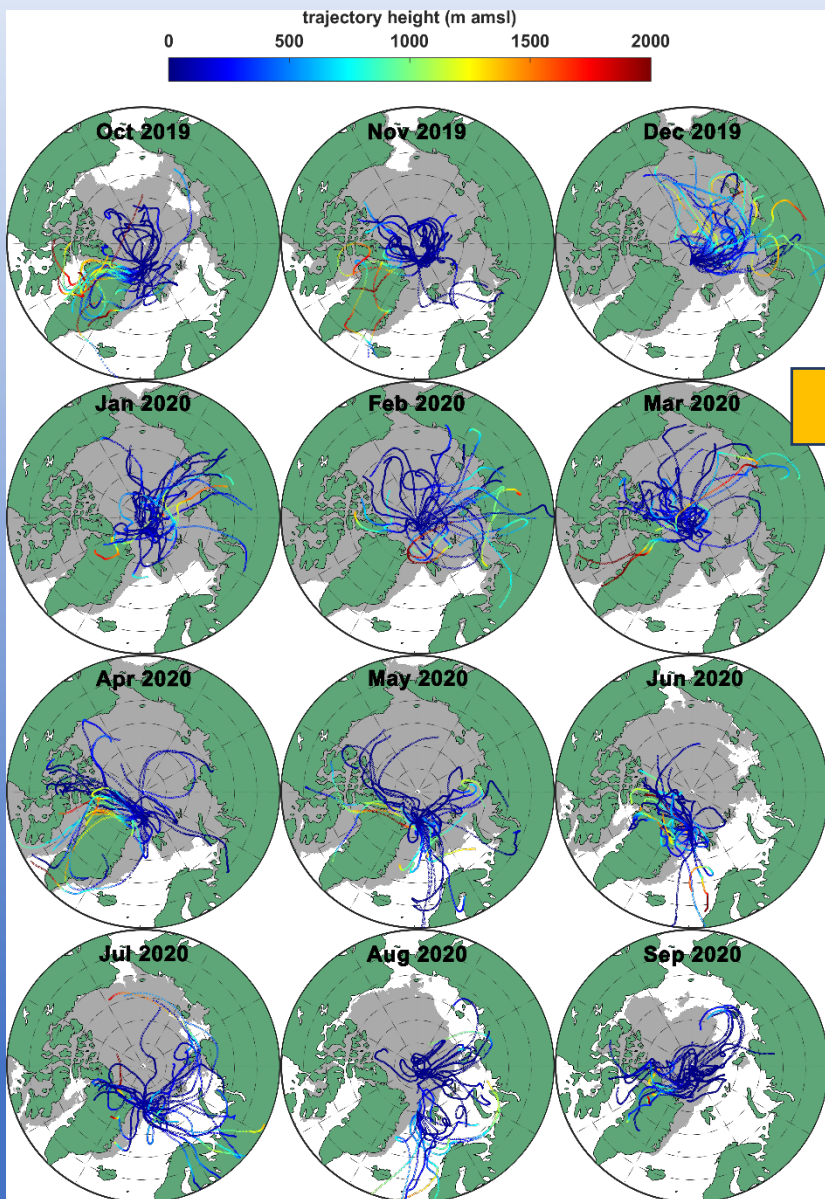
# The MOSAIC INP annual cycle

INPs were generally **colder** during fall/winter & **warmer** in the summer.

**Warmer** INPs were observed during more open water with **more biological activity**.



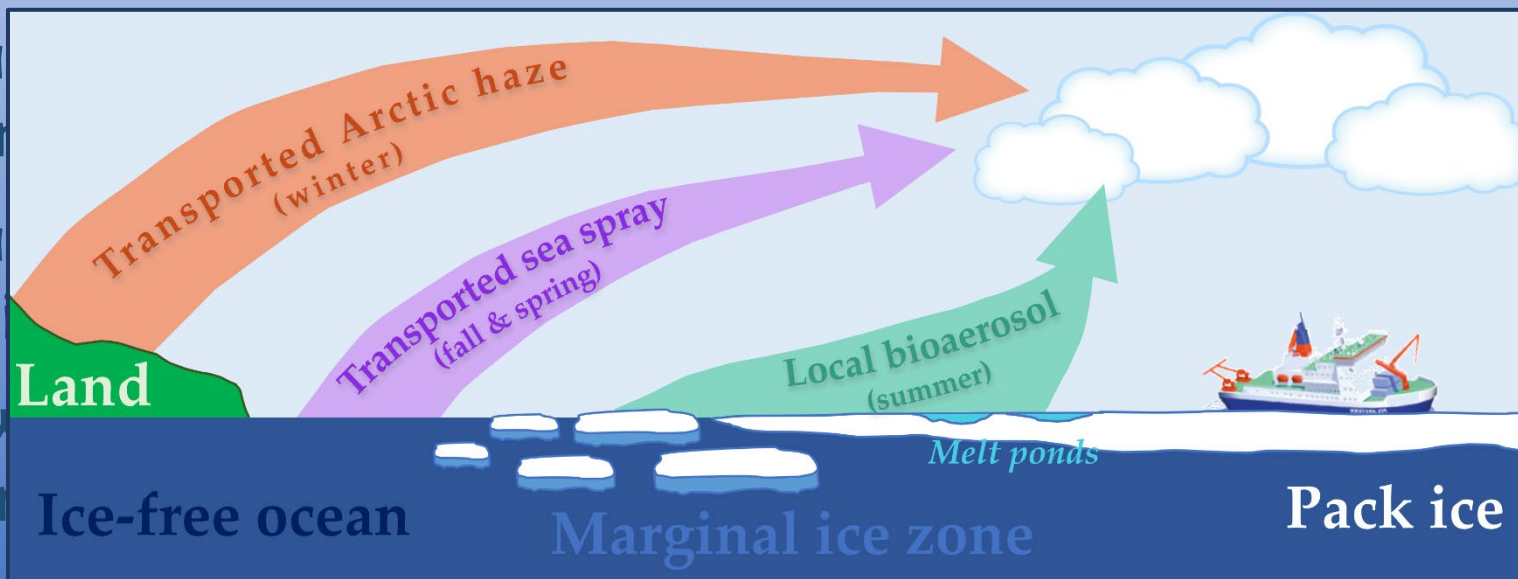
# Validating sources with transport



Most transport from over the pack ice, except during Arctic haze.

- Combo of data corroborate that INPs were likely...
  - Coarse sea spray from lower latitudes in autumn & spring
  - Submicron haze from continental sources in winter
  - Supermicron biogenic materials from local open water in summer

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- aerosol
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Thanks for  
funding &  
logistics:





**Thank you for listening!**  
[jessie.creamean@colostate.edu](mailto:jessie.creamean@colostate.edu)

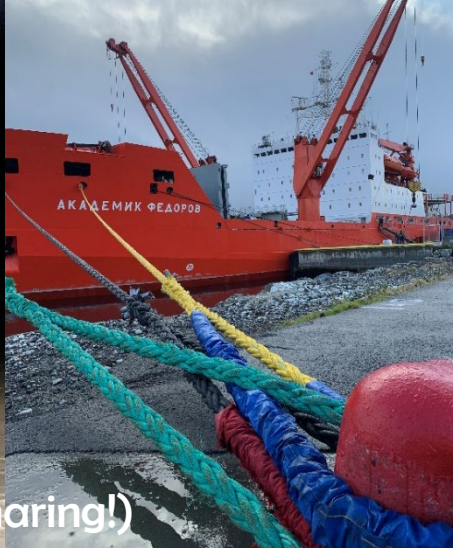


Photo credits: Esther Horvath and various field participants (thanks for sharing!)



# Discrete sample collection

~5000 samples of...

daily aerosols



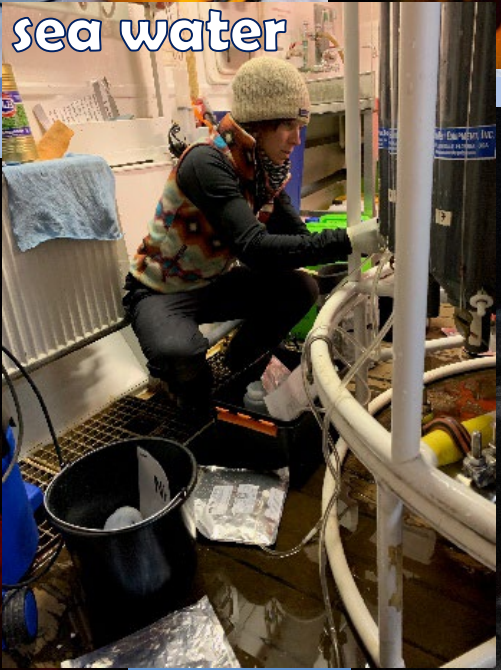
on-ice aerosols



sea ice cores



sea water



lead + melt pond water



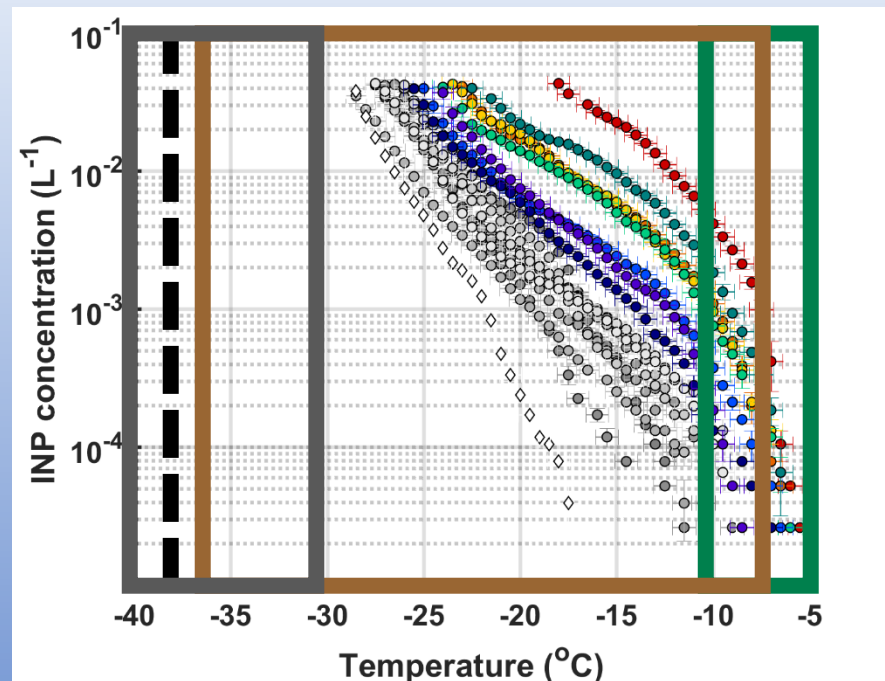
snow



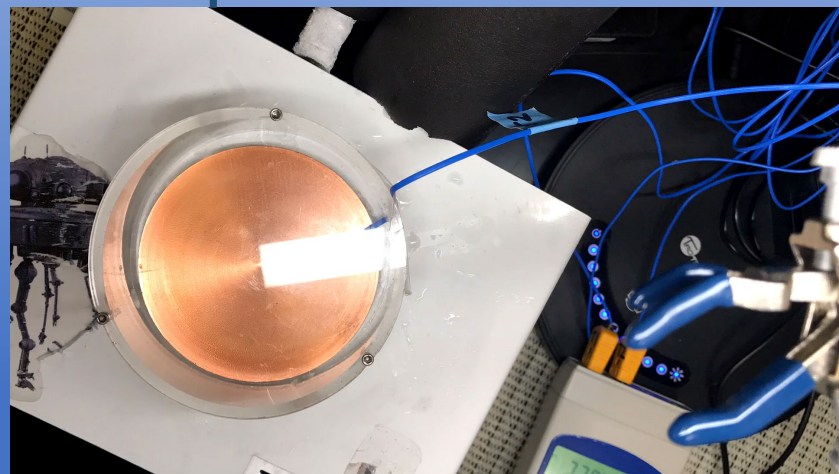


Aerosols collected on filters, seawater, melted sea ice, melted snow

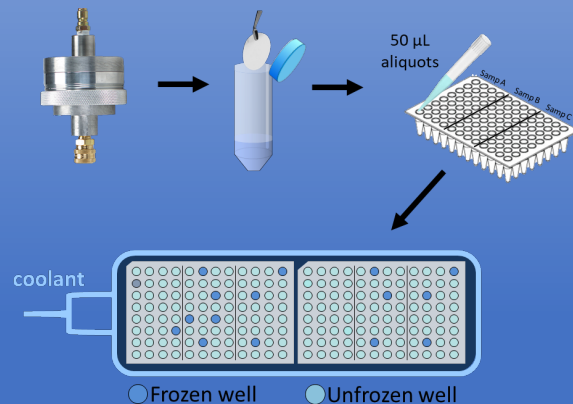
**bacteria**  
**leaf litter**  
**dust**  
**algae**  
**fungi**  
**pollen**  
**viruses**  
**volcanic ash**  
**soot**

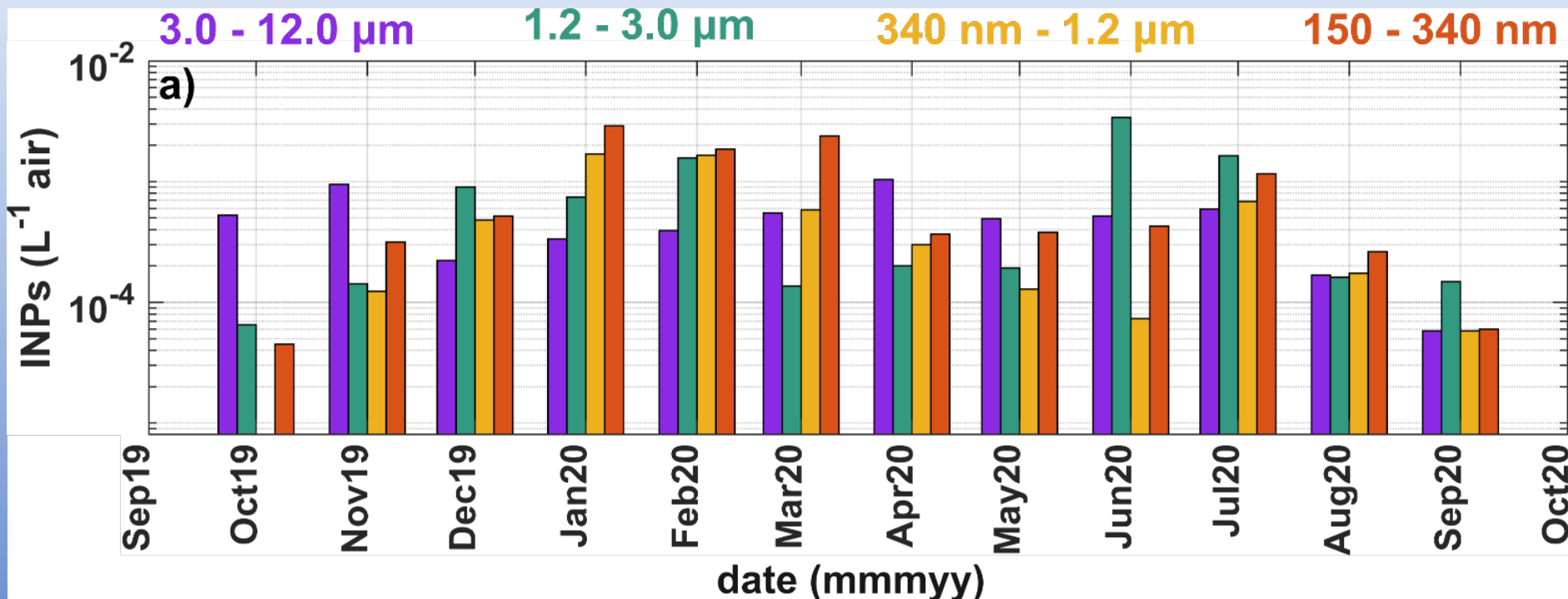


## 1. Cold plate



## 2. Ice spectrometer





Autumn / spring: coarse INPs ( $>3 \mu m$ )

Winter: submicron INPs ( $< 1 \mu m$ )

Summer: supermicron INPs ( $1-3 \mu m$ )