

ARISTO 2016: Ice nucleation measurements by Colorado State University

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(Visiting participation by Thea Schiebel of KIT, and Anna Miller of Reed College)

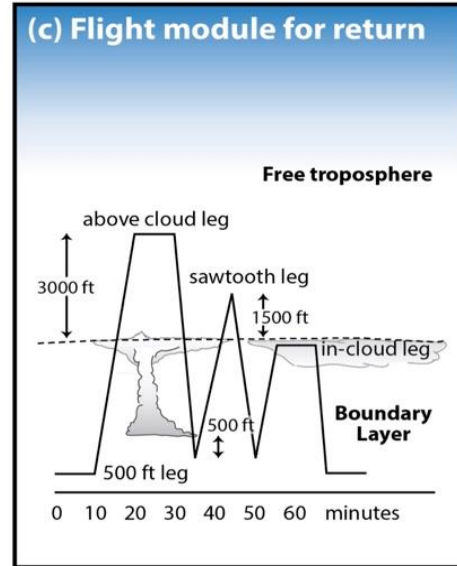
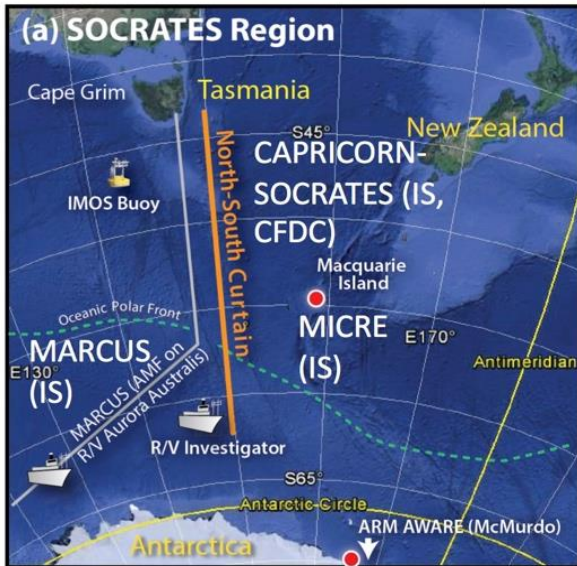
Objectives

- Complete re-certification of the HIAPER version of the CSU continuous flow diffusion chamber (CFD-1H) ice nucleation instrument for use on the G-V in proposed Southern Ocean Clouds, Radiation, Aerosol Transport Experimental Study (SOCRATES), tentatively planned for early 2018;
- Permanently add inline filter samplers (for aerosol collections for offline immersion freezing measurements via the CSU Ice spectrometer (IS)) to the CFDC-1H rack, and to achieve sample flow rates for these on the order of 10 lpm
- Test in-flight re-icing procedures and selected new automated software-based controls for the CFDC-1H that could prove vital for SOCRATES.

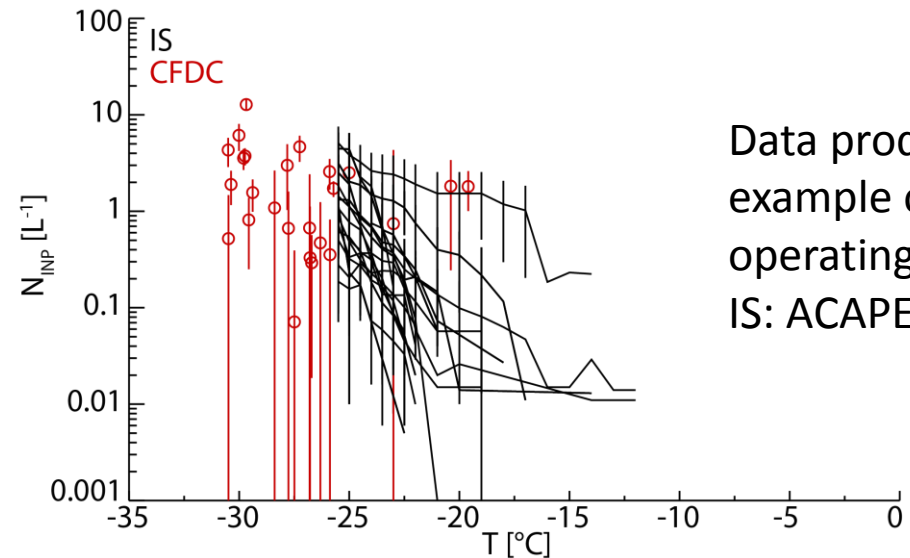
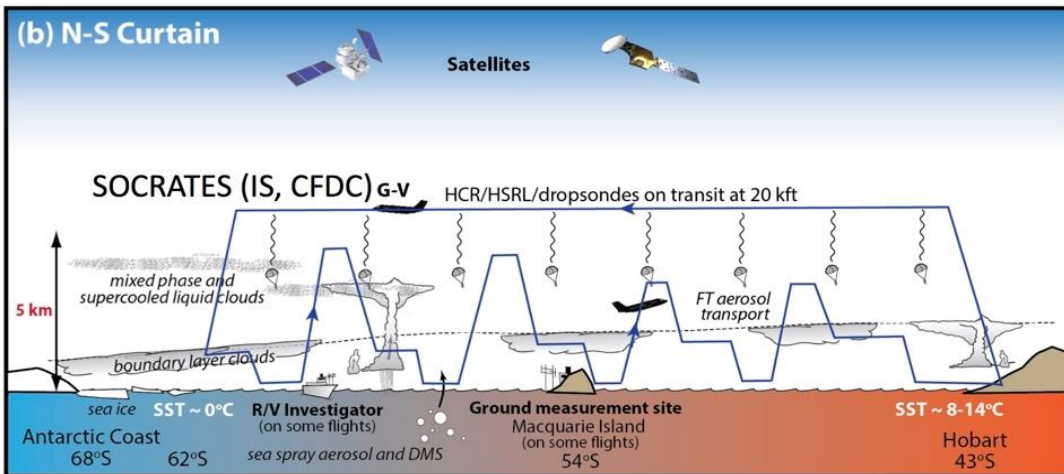
Targets

- Level flight legs of 10-20 minutes
- lower altitudes over agricultural regions, sampling of forest fire smoke plumes and sampling of urban air

SOCRATES needs are defined by flight plans



- 4-hour transits south at higher altitude prior to sampling of the marine boundary layer
 - Requires reicing due to 4-hour ice cycle
 - Suggests utility of automation of filter sampling cycles, temperature cycle control, and possible icing procedure over 8-9 hour flight period



Data product example of operating CFDC and IS: ACAPEX project

Results and issues

- Flight experience gained.
- Most recertification changes (pump covers etc...) were made and CFDC was operated successfully on some flights. One identified issue was an increase in background frost production while ascending and sampling from the HIMEL. We would like to test ways of mitigating this behavior in ARISTO-2017.
- Filter collection system tests were a stellar success, with smoke plume samples providing potential input to Gregg Schill's final NSF postdoc paper in preparation – IS immersion freezing analysis underway
- Required configuration for dumping excess cabin flow of dry gas during flight periods prevented use of standard icing procedure and led to water spills during execution of this procedure. Can be mitigated (use of compressed air, preferably).
- Primary objective not met regarded automation of CFDC operations. Matter of time for testing in laboratory.