

Second PSCi Meeting

- Held at ISSI-Bern 24-28 October 2016
- Attended by 14 PSCi team members
- Objectives:
 - Review recent work to quantify sensitivity/detection limits of satellite instruments and retrieve higher order PSC data products (i.e. surface area density; volume density)
 - Present initial ideas on content of PSC review paper
- Outcomes:
 - Extensive discussions on measurement sensitivities/detection limits
 - Identified remaining papers to be completed on individual data records that will feed into review paper
 - Confirmed review paper chapter leads and defined content of all chapters
 - Agreed on timeline for developing detailed outlines and identifying key figures for each chapter and subsequent submission to Review of Geophysics



PSC Review Paper Draft Outline

Coordinating Authors: Michael Pitts and Ines Tritscher

Section leads

Co-authors

1. Historical Overview

History of PSCs from first sightings until present. Will include discussion of historical datasets (e.g. long-term solar occultation satellite). May include table showing measurement datasets as a function of time, including pros/cons of each.

Tom Peter

2. Spatial/Temporal Distribution, Composition, and Microphysical Properties

Summary of new information from contemporary satellite (CALIOP, MIPAS, MLS), ground-based lidar, in situ, and aircraft measurements with respect to PSC spatial/temporal distribution and particle microphysical characteristics and in both the Arctic and Antarctic. Chapter will include comparisons of different instruments together with a collection of details such as detection limits/sensitivity and resolution. Examples of reference data records for PSC composition/phase, surface area density, and volume density will be shown.

Michael Pitts, Terry Deshler, Lamont Poole, Alyn Lambert, Michael Höpfner, Reinhold Spang, Francesco Cairo

3. Nucleation Pathways

Discussion of our current understanding of PSC nucleation pathways, including the new heterogeneous NAT and ice nucleation mechanisms. Show supporting evidence from CALIOP, MLS, and MIPAS observations.

**Ines Tritscher,
Tom Peter**

PSC Review/Research Paper (2)

4. Dynamical Forcing

Review and discuss key observational and model/forecast/reanalysis results on dynamically-forced PSC formation such as adiabatic cooling by mountain waves, non-orographic waves, and synoptic-scale tropospheric forcing. Discussions of cooling rates and the representation of orographic waves in model and reanalyses will be included.

Simon Alexander,
Andreas Dörnbrack, Beiping Luo,
Dan Murphy, Andrew Orr

5. Chemical Processing

Review of the role of PSCs in chlorine activation including the effect of denitrification and dehydration, highlighting differences between Arctic and Antarctic.

Ross Salawitch,
Michelle Santee, Jens-Uwe Groöß

6. PSCs in Global Models (CTMs, CCMs and ESMs)

Summary of how PSCs and PSC processes are parameterized in global models, including formation, nucleation, and uptake; heterogeneous reactions; and sedimentation. Will include a list of PSC parameterization schemes of all models and provide rationale/motivation for more detailed PSC parameterization.

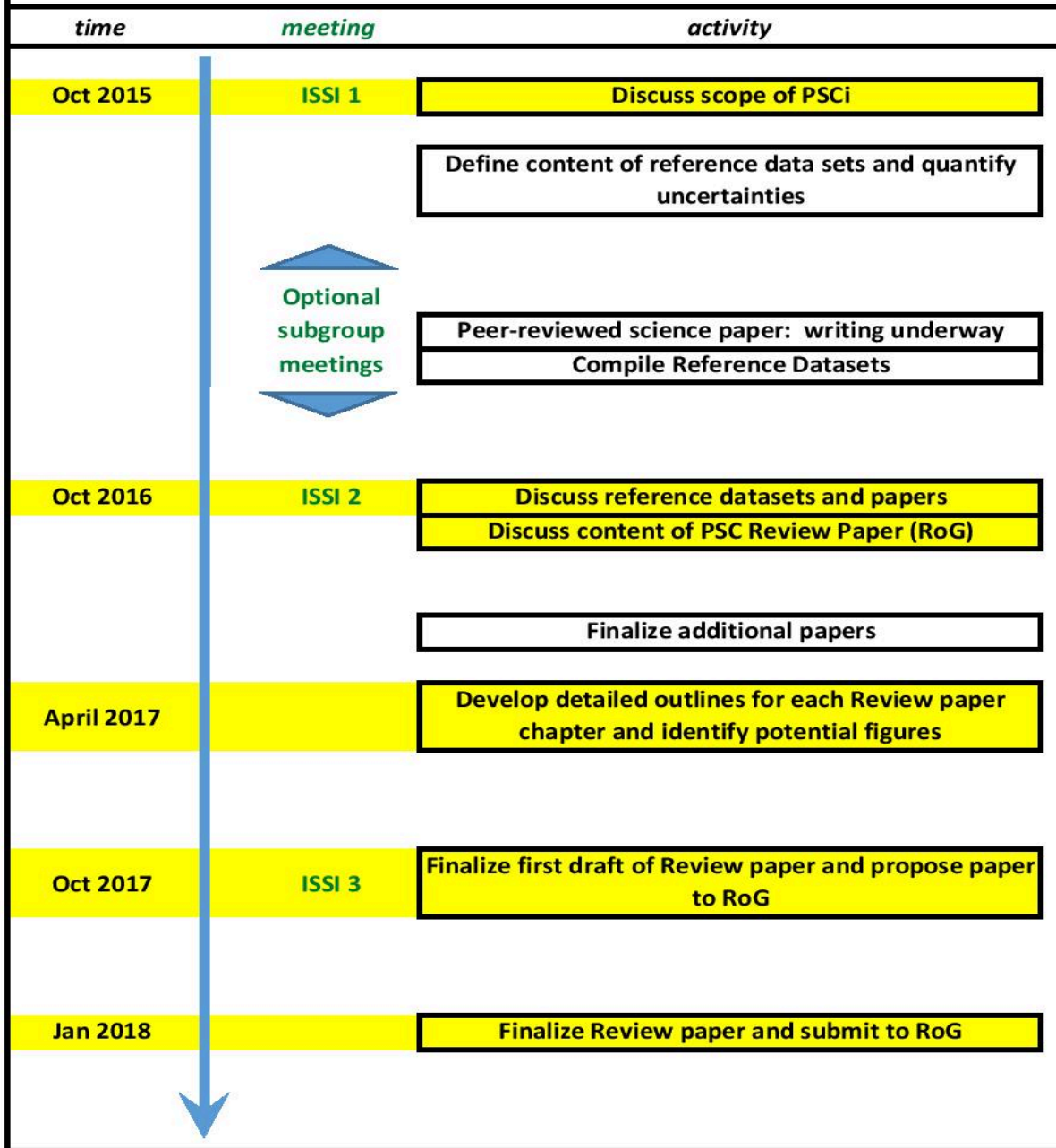
Jens-Uwe Groöß,
Francesco Cairo, Ines Tritscher

7. Conclusion / Outlook

Summary of remaining outstanding science issues related to PSCs, including a discussion about the possible future evolution of PSCs in a changing climate.

Ines Tritscher,
Michael Pitts

Potential timeline for PSC Initiative



PSCi Related Papers Published/Submitted

Spang, R., Hoffmann, L., Höpfner, M., Griessbach, S., Müller, R., Pitts, M. C., Orr, A. M. W., and Riese, M.: A multi-wavelength classification method for polar stratospheric cloud types using infrared limb spectra, *Atmos. Meas. Tech.*, 9, 3619-3639, doi:10.5194/amt-9-3619-2016, 2016.

Woiwode, W., Höpfner, M., Bi, L., Pitts, M. C., Poole, L. R., Oelhaf, H., Molleker, S., Borrmann, S., Klingebiel, M., Belyaev, G., Ebersoldt, A., Griessbach, S., Groß, J.-U., Gulde, T., Krämer, M., Maucher, G., Piesch, C., Rolf, C., Sartorius, C., Spang, R., and Orphal, J.: Spectroscopic evidence of large aspherical β -NAT particles involved in denitrification in the December 2011 Arctic stratosphere, *Atmos. Chem. Phys.*, 16, 9505-9532, doi:10.5194/acp-16-9505-2016, 2016.

Lambert, A., Santee, M. L., and Livesey, N. J.: Interannual variations of early winter Antarctic polar stratospheric cloud formation and nitric acid observed by CALIOP and MLS, *Atmos. Chem. Phys. Discuss.*, doi:10.5194/acp-2016-433, in review, 2016.

Bracaglia M., Cairo F., Snels M., and T. Deshler, A comparison between in situ microphysics and optical remote sensing of PSC in Antarctica, to be submitted January 2017.