**Aerosols, Clouds, Precipitation and Climate (ACPC)
Workshop, 13-15 April 2016, University of Oxford**

<u>Attachments</u>

- Participants list
- Programme
- Revised roadmaps deep and shallow clouds

(These documents, as well as copies of the presentations, can be found at
https://drive.google.com/folderview?id=0Bz3p795E9yJcM0ZOSWdCakNteGc&usp=drive_web)

<u>1. Science plans</u>

- The roadmap plans for deep and shallow clouds will be pursued.

- On the basis of the impressive progress in the last year, and the manifold discussions, contributions and model results, the roadmaps will be revised and expanded (lead: Ann Fridlind and Sue van den Heever[1] for deep clouds; Rob Wood (regional modelling aspects) and Graham Feingold (LES aspects) for shallow clouds).

- Continued aim at establishing and explaining aerosol signatures in clouds from the observations (Houston: satellite (Danny Rosenfeld et al.); radar (Marcus Van Lier-Walqui, Ann Fridlind, Jiaxi Hu, Danny Rosenfeld, Jeff Snyder, Alexander Ryzhkov); shallow: guidance from modelling results with perturbed aerosols).

- The LES aspect in the VOCALS study shall be expanded. A Largangian forcing setup will be developed on the basis of a WRF, possibly also a COSMO simulation (Rob Wood, Graham Feingold, Tom Goren, Ann Fridlind, Andy Ackerman et al.). The effect here is more subtle, and in the form of the rate of self cleansing of the clouds, comparing observations to simulations. Interested teams include Graham Feingold and colleagues at NOAA, and Ilona Riipinen and the Stockholm group. Other groups are invited to join in.

- The diagnostics of observables is key for a joint analysis of models. A list of classes of observables is given in the appendix. The team at University of Oxford will explore the possibility of doing off-line diagnostics of satellite observables (COSP simulator) from standard model output by the different modelling groups (Duncan Watson-Parris, Philip Stier).

- Beyond the VOCALS and Houston cases, ACPC is interested in relevant results from on-going studies. Promising modelling results were shown for Southwest England (Leeds/Met Office group), Central Europe (German HD(CP)[2] project), various regimes including Barbados and Arctic clouds (BACCHUS EU project). Relevant field campaigns include ORACLES/CLARIFY, SOCRATES, EUREC4A, CAMP2EX, and ACE-SPACE). The developing continued ARM routine LES simulations at the SGP site and existing long-term effort at Cabauw are very promising since they generate large statistics. ACPC will invite reports on these activities for the 2017 workshop.

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1   Under discussion, Sue might take more of a lead since modelling aspects are becoming more important.

2. Publications plans

- No overarching BAMS paper yet (revisit when first results are available)

- Deep clouds:
a) Paper on the observational aerosol-cloud hypotheses (Daniel Rosenfeld, Jiaxi Hu, Jeff Snyder, Alexander Ryzhkov, et al.)
b) Paper on polarimetric radar and forward-simulation results (Ann Fridlind, Marcus van Lier-Walqui, Jiwen Fan, Sue van den Heever, Alexander Ryzhkovet al.)
c) BAMS paper on the Houston case (obs + modelling)

- Shallow clouds: No immediate plans decided on. Publication plans will be developed until the next workshop (if not earlier); coordination: Rob Wood.

3. Pursuit of funding

- The possibility of deploying the ARM mobile facility to Houston should be explored. An AMF deployment would generate possibilities for ASR science funding to exploit the data. A particular need is for spatially distributed aerosol observations. People with links to ARM start lobbying (Jiwen Fan, Sue van den Heever, et al.)

- Further individual funding proposals can be useful (e.g. Johannes Quaas/Daniel Rosenfeld proposal in an Israeli-German funding scheme)

4. Specific actions

- A facility to share model output and data would be highly useful. Philip Stier will explore possibilities for this at BADC.

- Satellite cloud droplet concentration retrievals are of particular relevance. An important challenge to be addressed is the accuracy in broken clouds, because of the possible sensitivity of the cloud cover effect to drop concentrations. Johannes Quaas will organise follow-up discussions on this (with Rob Wood, Dan Grosvenor, Graham Feingold, Jan Cermak, Minghuai Wang, Daniel Rosenfeld, Johannes Mülmenstädt, Edward Gryspeerdt, Dipu Sudhakar, Philip Stier)

- Polarimetric radar data are highly promising. The community should gain more experience with this. A suggestion is that Alexander Ryzhkov, Jeff Snyder, Ann Fridlind, Marcus van Lier-Walqui, Philip Stier and Sue van den Heever organize some sample data (netcdf format) and interpretation recipe for others to start analyzing the data.

- CRM data may be very useful to investigate the sampling problems for model-data comparison (observation networks vs. domain statistics, aerosol – cloud retrieval incompatibilities/co-location problems; flight strategy issues, construction of ACI metrics). Nick Schutgens will lead work on this topic.

- Radiative transfer simulations on the basis of satellite retrievals and closure with top-of-atmosphere CERES radiation retrievals may help understand the relevance of measurement errors and signal-to-noise ratios. Matt Christensen could assess from his radiative transfer modelling, the extent to which perturbations in droplet concentrations, reff or LWP might be detectable by CERES. ACPC should consider involving the JPL/Caltech team at some point.

5. Formalities and announcements

- The website will be updated (Johannes Quaas with ileaps IPO)

- We intend to publish a meeting report in an upcoming GEWEX newsletter.

- ACPC may consider organizing a session at the September 2017 ileaps conference in Oxford (but also at the 2017 AGU meeting).

- The next workshop will be held in Bad Honnef (near Bonn, Germany; approx 1 ½ h from Frankfurt airport), Sunday 2 April evening – Thursday 6 April 2017 morning; local expenses are fully covered by a science-support foundation; travel support is also available from the foundation.

Appendix

List of observables classes

- CFADs
- reff-T profiles
- Radar – COD phase space (Contoured Frequency by Optical Depth Diagram, CFODD), drizzle onset
- POP susceptibility
- polarimetric radar (3D rain DSD parameter and precipitation rate retrievals?)
- ACI metrics; satellite simulator diagnostics
- PDFs (e.g. proper cloud cover definition)
- Satellite retrieved cloud properties and CCN(S)
- Surface and satellite based measurements of albedo, cloud fraction, and CRE as higher level constraints
  to accompany ACI metrics.