

Session: Simulators and evaluations

Rapporteurs: Yuhi Nakamura and Takamichi Iguchi

1. Tempei Hashino (Kouchi Tech. Univ.)

Uncertainty in the simulated cloud radar signals from GCMs

- Introduction of Joint Simulator for Satellite Sensors (J-SIM) and its new features.
- Uncertainties of subgrid generator is estimated with NICAM. SCOPS overestimates precipitating subgrid ratio.
- Uncertainties of subgrid value determination. Generalized Gamma distribution would be better for precipitation mass flux.

2. Robert Pincus (Columbia University)

Observation proxies for high-resolution simulation and satellite observation

- The Cloud Feedback Model Intercomparison Project Observational Simulator Package (COSP) was originally developed as proxies for (coarse-resolution) model assessment.
- Relationship between the proxies and simulators, and proxy precision and underlying uncertainty were introduced.
- Data assimilation approach is effective to understand the underlying uncertainty.
- COSP application to km-scale models, the source of potential error and uncertainty are discussed.

3. Pavlos Kollias (Stony Brook Univ.)

Harmonizing Simulated and Observed Views of Convective Dynamics: EarthCARE, INCUS and AOS and the Role of Instrument Simulators

- Introduction of instrumental simulators for EarthCARE and AOS/PMM radars, aimed for GSRMs.
- Retrieval of doppler velocity is improved using 'Particle sedimentation rate'
- How about upward motion in cumulus?: TIWP helps to estimate, but attenuation and sampling are problem.
- Comparison between CPR and PMM simulations, instrumental specifications such as footprint, make difference.

4. Silke Gross (DLR, Oberpfaffenhofen)

Preparing for EarthCARE – active remote sensing measurement onboard the HALO aircraft

- The demonstration is discussed in EarthCARE-like aircraft observation: HALO field campaign.
- Combination of the lidar, radar, doppler, and imager in the EarthCARE mission will allow process study for vertical structure and horizontal distribution of cloud and aerosols on global scales.
- Small-scale structures are underestimated in (relatively) coarse resolution of EarthCARE.
- Future plan of field campaign for validation is also introduced.

5. Florian Ewald (DLR)

Preparing for EarthCARE – Representativity of air- and spaceborne radar-lidar measurements

- Discussion on the representativity of data obtained in local validation campaigns as well as global spaceborne observations and difference among instrumental platforms.
- Comprehensive analysis across HALO/ERA5/A-Train with different horizontal resolutions was presented.
- Specifically, retrieved ice cloud statistics such as ice water content and particle sizes were focused on.

6. Mario Mech (U. Cologne)

Passive and Active Microwave Transfer (PAMTRA): a tool to simulate observations from space, air, and ground

- A new simulator PAMTRA: more accurate hydrometeors, more detailed absorption and scattering, more user friendly
- Doppler spectrum and polarized brightness temperature can be estimated.
- This was applied to a case of cold outbreak streak clouds over ocean, discussed together with LES simulations and aircraft observations.

Session summary, discussion, and take-home messages

- 1. How to use space-borne Doppler velocity with noise?**
 - For GCMs (coarse-resolution with much subgrid process), climatological approach.
 - For GSRMs (fine-resolution with less subgrid process), event based approach.
 - Simulator is the bridge among process study, observation and GCM/GSRMs.
- 2. Uncertainty in simulator: size distribution, fall velocity, subgrid process ...**
 - How should the model and simulator be consistent?
 - How should the subgrid generator be constructed?
- 3. How to validate the retrieval procedures?**
 - How can we maximize the validation of the EarthCARE mission field campaign datasets, especially with aircraft observations?
 - To what extent are the observations representative of the real world?
- 4. Is Machine Learning useful?** (optional)
 - 'Fast emulator/simulator' is proposed (by Pavlos, and Arlindo day2)
 - What other uses are possible?