



CPR L2, cloud and precipitation validation

Discussion

- CFADs of Doppler radar measurements
 - ice clouds as reference for Doppler velocity
 - at low levels to evaluate surface clutter removal
 - for different particle conditions at the surface (i.e., rimed vs unrimed snow)
- Correlation between radar reflectivity & mean Doppler velocity
 - important for antenna pointing corrections (C-APC)
- Contextual information from complementary instruments:
 - LWP from microwave radiometers
 - Precipitation measurements at the surface

Common approaches / strategies

- Collocation with EarthCARE
- quality control/calibration
- instrument limitations
 - different radar frequencies
- Use of complementary observations
 - e.g. upcoming “spectral CloudNet” products

GAPS IN SPECIFIC TARGETS

- Do we have ground-based stations or field campaigns (existing or planned) in all important climatological regimes?
- How do we supplement existing ground-based stations to enhance their value in Cal/Val activities?
 - e.g. add lower frequency profiling radars in certain sites



WHAT IS THE ROLE OF AIRBORNE MEASUREMENTS?

- How critical are direct aircraft underflights of EarthCARE?
 - CPR L2
 - Cloud
 - Precipitation
- Essential validation measurements?
 - In-situ
 - Remote-sensing
- Relationships between retrieval model parameters (i.e., covariance between number concentration and mean snow particles; scattering libraries)

WHAT IS THE ROLE OF SATELLITE OBSERVATION (PoR) IN THE CAL/VAL ACTIVITIES?

- Statistical validation & continuity with future/previous satellites?
 - CloudSat/CALIPSO
 - MODIS & other imager retrievals
 - ACCP activities?
- Direct validation with complementary satellite observations (e.g. GPM, Aeolus, microwave radiometers, imagers)

- ECMWF provision for EarthCARE
 - Cooperation with field campaigns & networks
- Data Assimilation for active instrument monitoring (c.f. Aeolus); applications to EarthCARE's CPR

VALIDATING CLOUD RETRIEVALS FROM A NON-RADAR PERSPECTIVE

- ATLID & MSI:
 - Ice optics, IR and solar radiance models
 - Passive retrievals (M-COP)
 - Lidar retrieval (A-ICE)

- ACM-RT & BBR:
 - Sensitivity of ACM-RT and radiative closure to liquid clouds not detected by ATLID

- Support is needed to develop the aforementioned data summaries and relationships from existing ground-based stations and airborne field campaigns (e.g., how do we best make sure of excellent datasets collected by the ACCP suborbital program?)
- Are the data collected by field campaigns immediately useful to L2 Cal/Val activities?
- Who is generating CFADs and statistical summaries?

FORWARD SIMULATORS: BRIDGING BOTTOM-UP AND TOP-DOWN SAMPLING

- Converting from ground-based to EarthCARE-like observations (e.g E3SIM, radar simulators, CR-SIM, FRM4Radar)
- Can synergistic L2 retrievals (ACM-CAP & ACM-COM) be used to model ground-based instruments?

HOW CAN WE USE GROUND-BASED NETWORKS?

- Precipitation validation using operational (polarimetric) weather radar networks:
 - US (NEXRAD), Europe (OPERA), Finland, UK, etc.
 - Challenge: limited overlap between in moderate precipitation seen by both W-band and weather radars?
- Networks: how to make the most use of Actris, MPLnet, ARM networks?
 - Target classification: cloud base, mixed-phase layers, etc.
 - What about validating cloud & light precipitation retrievals?

HOW DO WE MOVE FORWARD? (DO WE HAVE TO CENTRALIZE THE PROCESS?)

- Evaluation of algorithms before launch:
 - Aircraft campaigns with EarthCARE-like & EarthCARE+ payloads
 - Resources available for these activities?
- Preparations for statistical validation (before launch)
- Preparations for direct validation (commissioning phase and beyond)