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Session 4

Task Team Progress Report for March 2024 – Satellites

(Submitted by Lori Borg, Axel von Engeln, and task team members)

Summary and Purpose of this Document

Progress report from the task team on Satellite-based remote sensing measurements.

Task Team Structure

The current members of the task team are listed on the GRUAN TT-SAT page `https://www.gruan.org/network/task-teams/tt-satellite`.

One new team member joined the group, working on GSICS and microwave observations at EUMETSAT. Two team members changed affiliation, they are continuing their participation in TT-SAT. A prospective new team member, working in metrology at NIST, did not respond to invitations.

TT-SAT Telecon, 20 November 2023

In total, 9 people attended. Main points from this telecon are below.

- Discussion on options to support EUMETSAT Cal/Val activities for EPS-SG with radio sondes, including short discussion on EUMETSAT run study VICIRS (see also below, will be further discussed at ICM-15).
- Presentation on on-going work to compare radio occultation directly with radio sondes in bending angle space. Some biases found, investigation on-going. Presentation at ICM-15 will show updated results.
- NPROVS update to include reprocessed GRUAN RS41 sondes (vendor stored if GRUAN processed not available within 14-days); allows some assessment of vendor vs. GRUAN data quality.
- ICM-9 action on Satellite data collocations with RS92/41 pairs (A2) was again discussed (see also separate entry below).
- Justification for high ascent attainment was further discussed, B. Ingleby gave an NWP impact assessment, found primarily wind impact at high altitudes. Masatomos manuscript was also discussed, J. Eyre reviewed it after the telecon (see also entry below).
- The WMO 2022 Upper-Air Instrument Inter-comparison Campaign at Lindenberg, work on-going. Satellite overpass information available, though only a few collocations. Sonde radiative transfer calculations could be beneficial.
- ICM-15 was briefly discussed, encouraged task team members to participate / provide a science talk.

A TT-SAT organizational telecon was also held on 15 February 2024.

Progress with provision of satellite based ancillary measurements to RS92/RS41 colocation database (A2, initially raised at ICM-9)

The satellite task team (TT-SAT) was tasked to provide the Lead Centre (LC) collocated satellite measurements with the historical RS92/41 database. When this action was raised, it was considered to be a rather clearly formulated task. Discussions since, at several ICMs and telecons, have shown that various factors do make fulfilling this action complex (generally satellite data is very complex: (1) can require large storage volume; (2) is frequently being reprocessed; (3) unclear what collocated data to use, as footprint can be large; (4) which frequency channels should be stored). It was again discussed at the 20th November 2023 telecon.

The potential to provide satellite meta data only was also discussed at ICM-14 and TT-SAT telecons, examples of radio occultations were made available to LC. SNPP and METOPB meta data was recently produced for the RS92-RS41 soundings at GRUAN sites and sent to the LC. Further discussion is needed to determine how to best move forward with this effort.

Other points to consider are the on-going EUMETSAT VICIRS study (a summary will be presented at ICM-15), as well as EUMETSATs plan to launch collocated radio sondes with EPS-SG satellite overpasses.

Discussions will continue at the ICM-15.

Radio Sonde support to EUMETSAT Satellite Instruments

On-going at EUMETSAT, Statement of Work in preparation, aiming at a GRUAN / extended GRUAN support service that is planned to be coordinated at CNR. Further discussions and presentation at ICM-15.

Justification for high ascent attainment (C7)

M. Fujiwara's manuscript, that outlines the advantages of high ascent radio sondes, was reviewed by several members of the TT-SAT and also partly discussed at the last telecon. Generally, it was thought that an NWP impact assessment would be best suited to show the impact of radio sonde data at higher altitudes. B. Ingleby ran some denial experiments at ECMWF, that showed the wind data of sondes to have the biggest impact. The assessment is complicated, as winter vs. summer sonde launches

reach different altitudes. The Met Office is tentatively planning some assessments by de-weighting high altitude data (by increasing the measurement covariance matrix) in the assimilation run. It was also discussed, whether an NWP model assessment is a suited measure on this, as GRUAN data is for long term climate assessments. J. Eyre also reviewed the manuscript, and suggested a modified approach along these questions: Why do we need data at high altitude? What is the best balance of different technologies? Where radiosondes are best and offer unique capability? He also pointed out that temperature information from radio occultation is plentiful, but sondes can make a strong case for wind information.

Infrared radiative transfer calculations were provided for this effort using LBLRTM v12.6 at IASI resolution. Temperature profiles from the ECMWF_83P_91L_mod dataset were truncated at 30mb and 5mb and appended with an average profile to assess differences. Additional work is needed to integrate these results into the manuscript.

Contribution of TT-SAT members to ICM-15

- Bomin Sun: On the consistency between GRUAN RAOBs and satellite hyperspectral infrared sounder measurements
- Johannes Nielsen: GRUAN radiosondes applied in preparation and validation of specific humidity profiles derived from radio occultations
- Fabien Carminati: High altitude sonde NWP experiment (tentative)
- Axel von Engeln: Update on GRUAN Radio Sondes Validation against Radio Occultation