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Task Team Progress Report for November 2022 – Scheduling

(Submitted by Tom Gardiner and Fabio Madonna)

Summary and Purpose of this Document

Progress report from the task team on Measurement Schedules and Associated Instrument-type Requirements.

Overview

Following the 2016 review by the Science Coordinators of areas of common research interest across the network it was decided to extend the scope of the scheduling task team to cover the issues surrounding measurement combination. The aim of the revised task team is to develop methodologies to optimally combine measurements of ECVs from multiple instruments to meet all GRUAN objectives including climate trend detection, satellite calibration/validation, and studies of local mesoscale processes and events.

Summary

Task team membership:

Tom Gardiner (co-chair)
Fabio Madonna (co-chair)
Dave Whiteman
Rigel Kivi
Lori Berg
Xavier Calbet Alvarez
Jordis Tradowsky
Alessandro Fassó
Tony Reale
Alexander Haefele
Richard Querel

The long-term objective for the Task Team is to develop tools to characterise the atmospheric column above each site through the combination of measurements from multiple instruments, taking into account relevant collocation effects, with a view to:

- providing the best available estimate of the vertically resolved atmospheric column above the site;
- ensuring continuous measurements of an atmospheric parameter without temporal gaps;
- understanding and better quantifying the total uncertainty budget;
- optimising the operational costs.

In terms of scientific outputs from the task team, while the activity of the team remains a voluntary one without specific funding, the outputs mainly relate to relevant work within other projects and the

main information sources are from peer-reviewed literature, GRUAN documentation, and currently unpublished studies of which the group is aware. Some limited new analyses are being undertaken by team members using existing data sets to start to address areas where critical gaps exist that prohibit scientifically defensible choices.

Although there has not been a great deal of coordinated task team activity since the last ICM, there have been a number of relevant activities by members including those described below:

- Participation in the BIPM-WMO Workshop on Metrology for Climate Action, including submission of presentations/posters on “*Estimation of uncertainties in upper air data*” and “*Determining and Reporting Uncertainty in Atmospheric Reference Networks*” as well as involvement in the preparation of the recommendations for future work that will be the main output from this event.
- Participation in the 2nd GCOS conference, including submission of presentations/posters on “*Using reference observations to improve homogenized upper-air data records and climate indices*” and “*Analysis of completeness, coherency and plausibility of ground-based ozone datasets within the Copernicus Climate Change Service*”.
- Involvement in the WMO Upper Air Instrument Intercomparison including preparation of a guidance document on the combination of multiple GRUAN Data Products to produce a reference profile to characterise the performance of different operational sondes.
- Preparation of a draft paper on “*Uncertainty reporting in reference upper atmospheric measurements*” which is currently undergoing internal review before submission. This paper aims to address the challenge of providing information on the measurement uncertainty in a way that is accessible and usable to the wide range of potential applications and interested user groups, with an example uncertainty reporting assessment of the Vaisala RS92 radiosonde temperature GDP.
- Submission of a paper on “*Uncertainties on climate extreme indices estimated from U.S. Climate Reference Network (USCRN) near-surface temperatures*” which aims to demonstrate the impact of undertaking a full measurement uncertainty assessment on atmospheric temperature measurements in order to increase confidence in the evaluation of climate indices and support the validation of reanalysis data.
- A guidance document is also in preparation to provide a “*White Paper on the Effect and Management of Error Covariance Structures in Climate Data Records*” which brings together input from Atmospheric, Earth Observation and Data Science metrological research activities on the assessment, representation and impact of correlated uncertainties within long-term climate data.