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**5th GRUAN Implementation-
Coordination Meeting (ICM-5)**

Session 3

De Bilt, Netherlands

25 February – 1 March 2013

Task Team 2 (GNSS-PW) progress report 01/2013

(Submitted by June Wang and Kalev Rannat)

Summary and Purpose of Document

Progress report from the task team 2 (GNSS-PW) covering period from 09/2012 till 01/2013.

Task Team progress report for February 2013 – GNSS-PW TT

SUMMARY

Besides working on the tasks #4 ... #7 and the data flow listed below, the GNSS-PW TT has also been involved in the following activities:

1. Efforts have been made by the TT and LC on finding candidates for GNSS-data Central Processing. Three institutes expressing interests in hosting the central processing, NOAA (from Seth Gutman), UCAR/COSMIC (from John Braun) and GFZ (from Galina and Jens). A side meeting is set up at ICM5 to discuss this and try to make the decision. The TT thinks that beside the central processing center, it is also good to have individual analysis center to process GRUAN data for comparisons, similar to the structures in IGS and E-GVAP.
2. Jonathan Jones from UK Met office is a Chair of a new COST proposal, "GNSS applications to extreme weather and climate". The action has officially started, with TT-members participating.
3. The TT helps Lauder site with advice and to process and validate their GNSS PW data. The TT and Dan Smale from Lauder site have close collaborations. The Lauder Trimble NetR9/zephyr2 GNSS system has been operating continuously since May 2012 with no faults or data quality issues. Yoshinori Shoji processed the data and created the ZTD product. The work is underway to inter-compare with the FPH and FTIR data and the nearby GNSS and radiosonde PW data.
4. A TT conference call was held on February 7, 2013. Besides discussing the tasks we are working on, the TT also discussed the future of the TT after finishing the tasks listed in the ToR. We agreed that we all are willing to continue to serve (at minimum) until the "GRUAN GNSS-PW" data become available, are inter-compared with other GRUAN data and are used for other applications.
5. The TT is working on updating the GNSS-PW site survey table by including a new site, Ny Alesund.

PROGRESS ON TASKS REPORTED ON THE PREVIOUS REPORT

You have two options for this section:

- 1) *Update your TT action items in the master action item list at <https://docs.google.com/spreadsheet/ccc?key=0Aq9hAcrcg9GtdEjDZkRWdGtUQXZ1YjZQNjJTLUUYyUE> and then I will transcribe those into your report.*
- 2) *Just provide the details on tasks by repeating the template below, as you have done before.*

Task #4 in ToR: *"To develop guidance on the type, amount, format, temporal resolution and latency of data and associated metadata needed to be stored from the ground-based GNSS measurements and other auxiliary data sources, and data archive and dissemination methods."*

Main Contact: Yoshinori/John/Seth **Due Date:** 9/30/2012 **Status:** almost finished

Milestone: "GRUAN GNSS Data and Product Table" & "Format Specification for COST-716 Processed GPS Data"

Progress: The TT reaches the consensus that GRUAN should adopt the E-GVAP format, which is detailed in ""Format Specification for COST-716 Processed GPS Data". The "GRUAN GNSS Data and Product Table" is a summary of the former document and only needs a clean-up to remove the comments.

Issues:

Task #5 in ToR: *"To identify best practices in making and verifying GNSS observations for GRUAN and other climate applications defined in Task 1"*

Main Contact: *Kalev/Galina/Jens/Jonathan* **Due Date:** *before ICM5* **Status:** *Almost done*

Milestone: *A document*

Progress: Johathan and Siebren de Haan are currently working on a revised document which will be a joint WMO CIMO/GRUAN doc. An updated version (which can take into account anyone's input) can be available in a week or two's time (i.e. in time for everyone to review prior to the ICM5).

Issues:

Task #6 in ToR: *"To follow the guidance on reference quality upper-air measurements outlined in Immler et al. (2010) and provide guidelines for GNSS-PW uncertainty analysis including ways to calculate uncertainties for each data point as required by GRUAN and include them in the final data products"*

Main Contact: *Gunnar/June/Tong/John* **Due Date:** *before ICM5* **Status:** *Moving along*

Milestone: *A document and later a journal paper*

Progress: This task is based on Tong Ning's thesis work. Additional work is to develop algorithm to estimate the uncertainty of zenith tropospheric delay. The TT acknowledges that the first priority is to understand, quantify and correct the systematic errors (biases) in ZTD. John has an idea to use the ZTD measurements within a "reprocessing" of the coordinates at the same time interval that you have estimated the ZTD value. If you would use the previously estimated ZTD as the apriori in a solution that only calculates the height (maybe lat/lon/height) then you might be able to capture the error sources that are significant for the individual ZTD time window.

Issues: This would not capture the errors with spectra with periods longer than a day, and needs to be tested and validated.

Task #7 in ToR: *"To address the question of how to better manage changes applied to ground-based GNSS measurements in both hardware and software and to make sure that the changes will be taken into account for long-term data analysis."*

Main Contact: *Geroge/Kalev/June* **Due Date:** *before ICM5* **Status:** *Moving along*

Milestone: *A document describing recommended practices on managing change in GNSS-PW measurements*

Progress: A draft document is prepared.

Issues: Need to shorten it, add more specific requirements, and get TT members' consensus on this.

Task in GNSS-PW data flow: *"To report on discussions with LC and others on starting the GNSS-PW data flow. Data collection client requirement? Central processing facility?"*

Main Contact: *Kalev/June and others* **Due Date:** *before ICM5* **Status:** *Moving*

Milestone: *The sites send the raw data (RINEX files) to the LC*

Progress: The TT reaches the consensus that the RINEX files should be sent to the LC and centrally archived. So the TT members can analyze and evaluate the data, and publish the results.

Issues: We need to ask the LC to send the data flow document to the sites. Then the sites will start to implement it to submit the data to the LC.