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GLOBAL CLIMATE OBSERVING  
SYSTEM (GCOS)

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**12th GRUAN Implementation-  
Coordination Meeting (ICM-12)**

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Session 1

Virtual

16 - 20 November 2020

## Task Team Progress Report for November 2020 – GNSS-PW

*(Submitted by Kalev Rannat and Jonathan Jones)*

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### **Summary and Purpose of this Document**

Progress report from the task team on GNSS Precipitable Water (GNSS-PW).

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The GNSS TT has worked on topics listed on the GRUAN Master Action Item list (last checked November 2020) and action items re-scheduled after ICM-11.

GNSS PW Omnibus Finished (it was ready for ICM-11, but finalized and published 2019-08-21)

Work continues with GRUAN GNSS data product certification and improving the GRUAN GNSS data flow.

## **Action items left after ICM-11**

### **#B3 GNSS-IWV GDP certification (*deadline by the end of 2020*)**

In progress. GNSS-TT is investigating systematic offsets between GNSS and radiosondes. Extensive experimental work has been done for comparing GNSS IPW with independent techniques for supporting LC in certification process.

### **#C5 Augment of GNSS-IWVGNSS-IWV data flow**

In continuous progress.

### **GNSS stations in automated PW processing chain for GRUAN at GFZ (the status 09th November 2020):**

- Lindenberg (LDB2 and LDB0, which has been relocated and renamed to LIN0 on October 1st, 2020)
- Ny-Ålesund (NYA2)
- Sodankyla\* (SODF, additionally IGS site SODA has been included into processing in July 2020)
- Lauder (LDRZ)
- Barrow (UTQI)
- Payerne\* (PAYE)
- Lamont (SGPO)
- Singapore (MSS1)
- Tateno (TATN and TSK2 since January 2020)
- Ross Island (SCTB)

\*) GNSS data processing operational, but (still no) meteo data for conversion of GNSS ZTDs to PW

Validation of GNSS PW with NWM ERA of ECMWF shows a very good agreement for all GRUAN stations in PW processing, e.g.: [ftp://ftp.gfz-potsdam.de/GNSS/products/nrttrop/MONITORING\\_IFS/LDB2\\_pic.jpg](ftp://ftp.gfz-potsdam.de/GNSS/products/nrttrop/MONITORING_IFS/LDB2_pic.jpg)

### **New GNSS stations since ICM11:**

- Graciosa (enao): in processing since August 27, 2019
- Cabauw (CBW1): in processing since August 27, 2019
- Tsukuba (TSK2): in processing since January 30, 2020
- Sodankyla (SODA): in processing since July 3, 2020
- Potenza (TITO): first data started to come to GFZ in October 2020, some issues should be solved
- Neumayer (NMSH): some technical issues with data transfer should be solved

### **Lindenberg**

GFZ GNSS station in Lindenberg (LDB0) has been relocated on the 1st of October 2020 (last measurements as LDB0). Starting from October 2nd, GFZ receiver (named LIN0) delivers the data from the new location, which is closer to the radiosondes launches.

### **Boulder**

GNSS station in Boulder (TMS3) has been closed, last measurements were in October 2018. GFZ has negotiated about a new location of a GFZ receiver as a GRUAN GNSS site. The location is fixed, but some administrative issues have not yet been resolved regarding a special agreement for installing the equipment. Negotiations continue.

### **Tateno**

Tateno (TATN) does not deliver data in real-time, but in larger batches. GFZ negotiates how to get the data with a shorter delay. At GFZ everything is ready for the operational processing chain. However, GFZ included into processing another GNSS site TSK2 (Tsukuba), which is close to Tateno.

### **Planned GNSS sites in operational processing:**

- Beltsville: installation of GNSS site is in preparation and close to finishing. Hardware has been tested at GFZ, a special box for the GNSS receiver will be manufactured at GFZ. The whole equipment will be shipped to Beltsville in the first quarter of 2021.
- Tenerife: plans to install their own GNSS receiver, however no progress since ICM-11. GFZ stays in contact.
- Suriname: GFZ continues negotiations, planned visit to Suriname in June 2020 has been cancelled due to COVID19.

### **The status of GNSS data products**

The estimation of GNSS PW uncertainties after the Tong Ning algorithm (T. Ning et al., AMT, 2016) has been added to the automated processing chain in April 2019. The GRUAN PW products are available both in COST716 and TRO-SINEX formats at GFZ ftp. All products are also delivered to the GRUAN LC at Lindenberg. NetCDF format is in planning. The data (currently not certified, but experimental) is made available at ftp.gfz-potsdam.de for GRUAN sites: **cbw1, enao, ldb2, ldrz, lin0** (instead of **ldb0**), **mss1, nya2, paye, setb, sgpo, soda, sodf, tsk2, utqi**

**#C12 Metrological closure of GNSS-IWV and radiosondes (*deadline: initial results to be presented at ICM-12*).**

Delayed.