

Other GNSS Data Applications – Status in Europe

Presented to CGMS-52 Plenary session, CGMS-52-joint-ESA/EUM-WP-01

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Executive summary of the WP

We describe recent and future activities focusing on GNSS-based remote sensing techniques other than RO in Europe. Highlights are:

- HydroGNSS: A 2-satellite near-Nadir GNSS-R mission focusing on land applications (but with ocean products as well) to be launched in late 2024
- Studies on the impact of GNSS-R and –PRO data in NWP have been kicked off or are under discussion

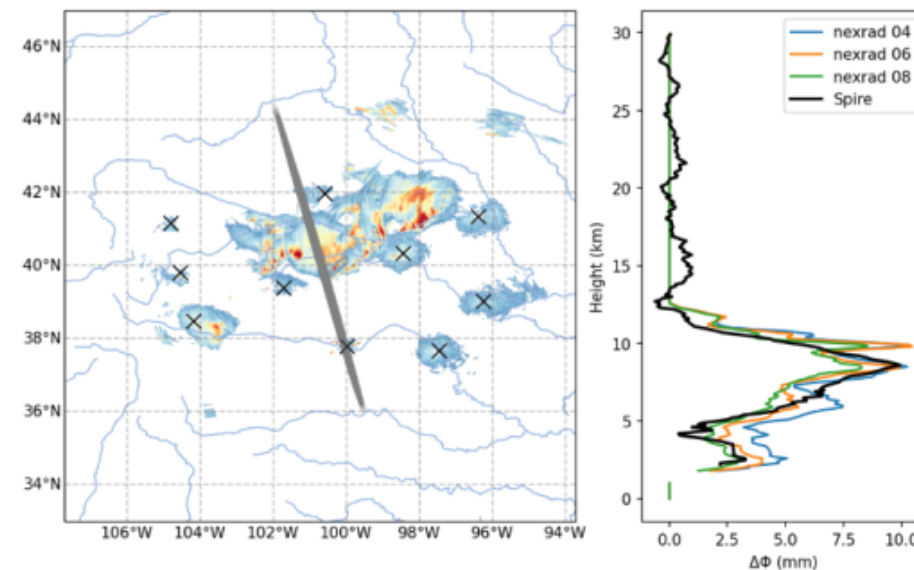
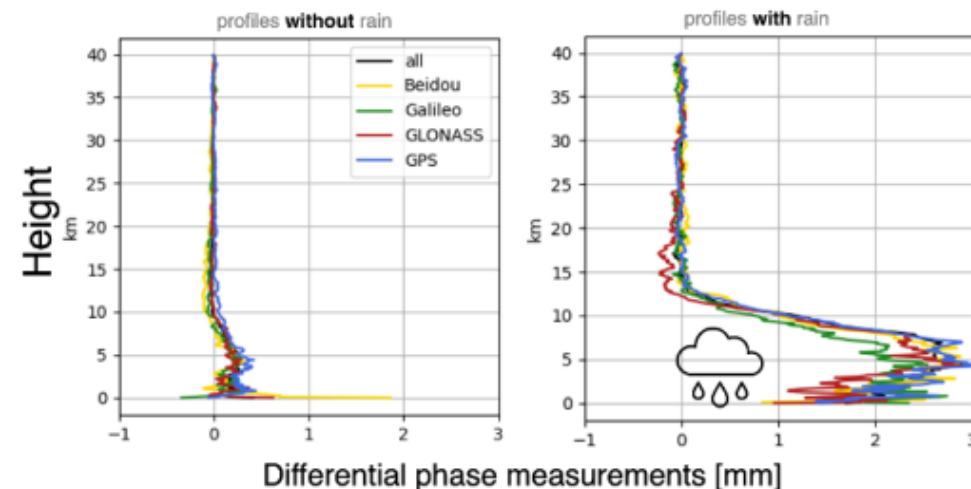
GNSS-PRO

ESA

- PROGRES - Polarimetric Radio Occultation for Global Rain Estimation (co-funding via InCubed; completed)
 - Development of a 3U nanosatellite equipped with an innovative Polarimetric Radio Occultation (PRO) demonstration sensor to detect and characterise precipitation for multiple GNSS constellation signals (FM166 launched in Jan 2023)
 - Spire added two more satellites with PRO capabilities (FM167 and FM170 in Feb 2023)
 - One satellite reached end-of-life in late Apr 2024; the remaining two will continue to provide data for another 3-5 months
 - Extensive data validation by Padullés & Cardellach (IEEC)

<https://incubed.esa.int/portfolio/progres/>

2+ months of **hdrPhs** product demonstrating the clear effect of rain!



GNSS-PRO (cont'd)

EUMETSAT ROM SAF

- Implementation of a forward operator for GNSS-PRO data assimilation ongoing (at ECMWF);
- Once completed, the code will be shared with the Jedi community.

ESA

- Study to complete the assimilation and analyse the impact of GNSS-PRO data at ECMWF under discussion

EUMETSAT

- Plans to implement low-level PRO processing for Spire data in support of the above study;
- Accepts Spire PRO data as ordinary RO data since May, to allow Spire to deliver more RO data to other customers.

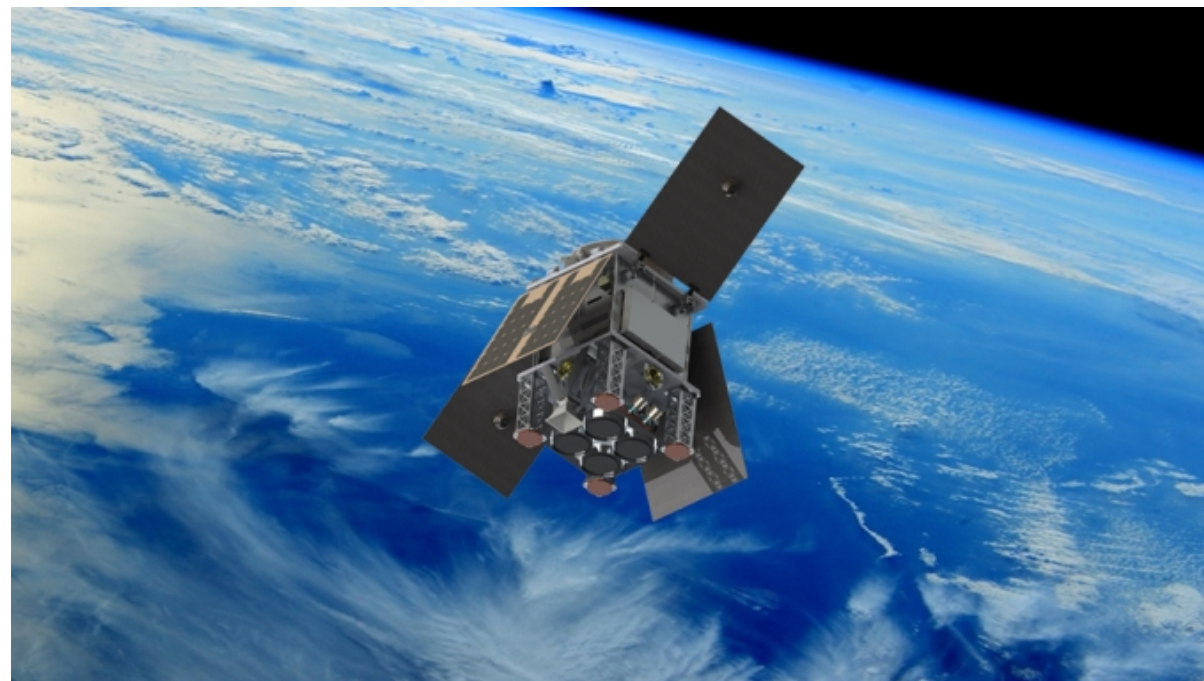
Near-Nadir GNSS-R

ESA

- HydroGNSS – an ESA Scout mission
 - 2 satellites, 50 kg each, launch in late 2024
 - Near-Nadir GNSS-R
 - Focus on land applications
 - Secondary objective ocean applications
- Study on “Impact of GNSS-R ocean surface winds in NWP Systems” with ECMWF, MetOffice, IEEC, NOC and EUMETSAT kicked off in early 2024
 - Focus on CYGNSS, but might look into Spire data if available
- Similar study on soil moisture assimilation is under discussion

EUMETSAT and study consortia members

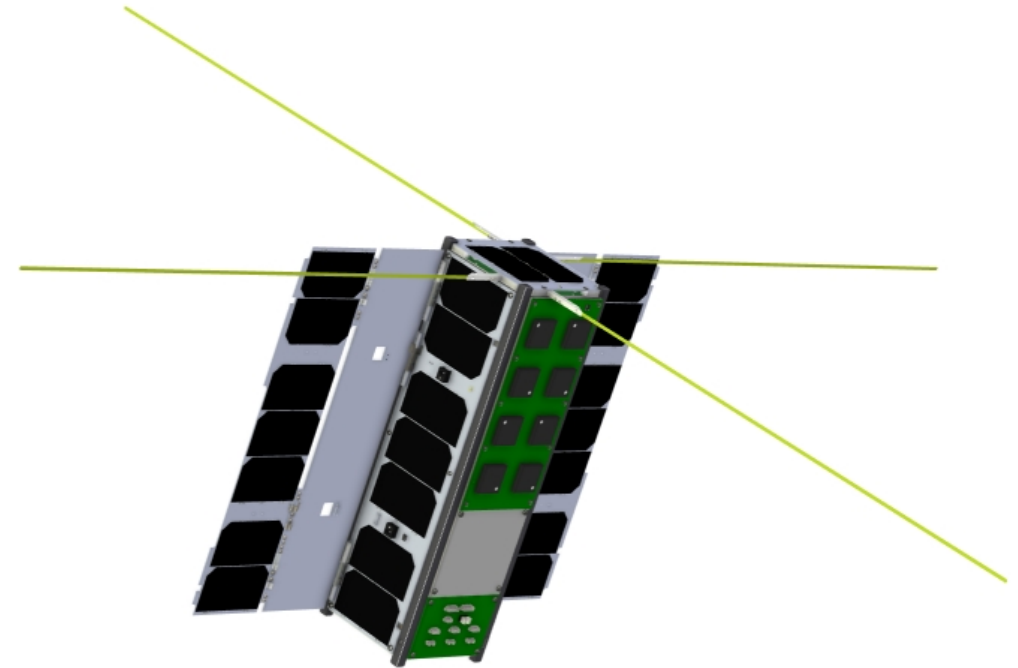
- Participating in the NOAA OSW pilot



Grazing GNSS-R

ESA

- PRETTY – Passive REflecTomeTry and dosimetrY
 - Cubesat with grazing GNSS-R, especially altimetry and sea ice applications, as prime payload
 - Launched Oct 2023, together with Triton
 - BeyondGravity and University of Graz



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- Studies on the impact of GNSS-R and –PRO data in NWP have been kicked off or are under discussion;
- European scientist collaborate on the evaluation of commercial GNSS-R data within NOAA's Ocean Surface Winds pilot procurement