

IROWG – Update

Co-Chairs: Axel von Engel (EUMETSAT), Dave Ector (UCAR)
Rapporteur: Tony Mannucci (JPL)

Overview

- CGMS-40
 - Working Papers
 - IROWG related actions/recommendations
- IROWG Activities

CGMS-40: Working Papers

Three Working Papers provided

1. Report from the 2nd International Radio Occultation Workshop, CGMS-40 EUM-WP-01
2. Status of the global Radio Occultation Observing System, CGMS-40 EUM-WP-02
3. Climate related Processing and Potential of Radio Occultation Data, CGMS-40 EUM-WP-03

1. Report from the 2nd International Radio Occultation Workshop (was Mar/Apr 2012)

Report from the 2nd International Radio Occultation Workshop

Three main recommendations:

- A need for an operational continuity plan for radio occultation – including troposphere and ionosphere – to provide a daily availability of at least 10,000 occultations;
- An urgent need for data gap filling using research / opportunity satellites, or commercial sources (if available) is required for the near term, but this is not a replacement for a long-term continuity plan to provide operational GNSS radio occultation data;
- The potential of GNSS radio occultation for anchoring climate re-analysis needs to be further addressed, this also requires updated laboratory measurements of refractivity coefficients.

Report from the 2nd International Radio Occultation Workshop

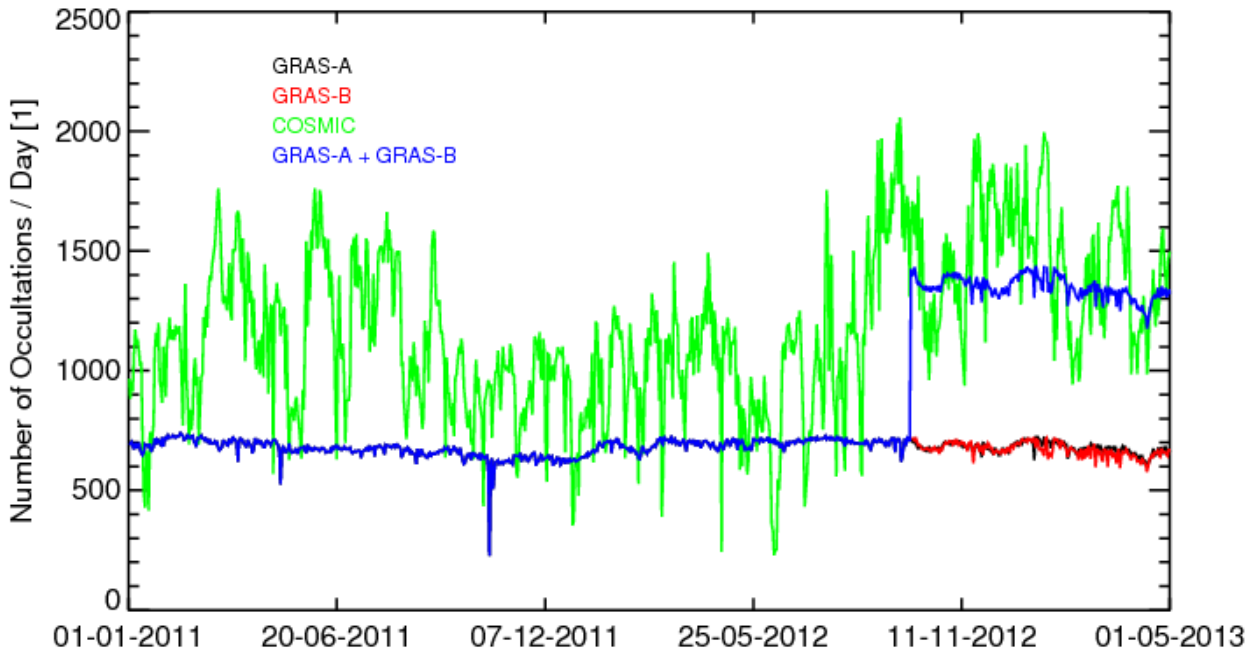
Further recommendations:

- Options to fly radio occultation instruments on opportunity missions should be further pursued;
- Assure that GNSS operators are aware of the needs of radio occultation applications, providing sufficient signal strength on the Earth limb;
- Support research towards implementing a LEO-LEO mission to fully explore the climate capabilities of radio occultation;
- Engage CGMS agencies to organize a workshop to foster closer collaboration between the ionospheric and neutral atmospheric researchers.

2. Status of the global Radio Occultation Observing System

In response to CGMS Action 39.03: IROWG to review the status of the global RO system and report to CGMS-40.

Status of the global Radio Occultation Observing System



The main providers of data are COSMIC & Metops:

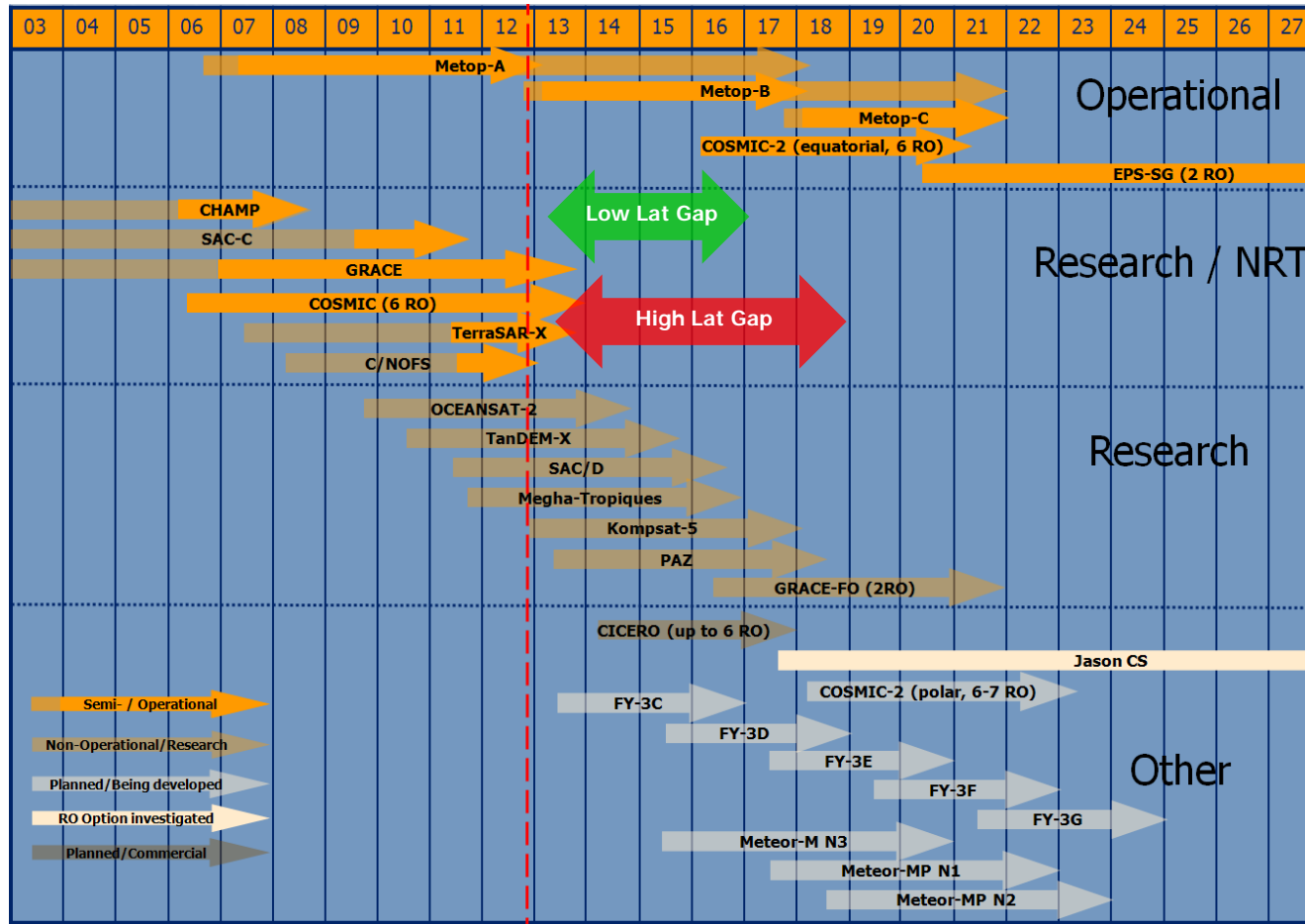
- COSMIC is showing degradations (beyond initial life-time, 1 out of 6 satellites lost, all others have issues; although recently improvement with battery charging optimization was achieved)

- EUMETSAT has just launched Metop-B

- -A and -B cover same local solar time

Daily # of occultations provided by EUMETSAT and the Taiwanese/US COSMIC constellation in Near Real Time.

Status of the global Radio Occultation Observing System



- Data gap imminent
- Strong user need for gap filling
- There are several gap filling opportunities:
 - ROSA (OC-2, SAC-D, MT; have data issues)
 - Jason-CS (RO invest.)
 - Planned commercial
 - Research satellites
 - Chinese FY-3X
 - Russian Meteor
- Will need further coordination
- **> 10,000 occs/day in the long run**

3. Climate related Processing and Potential of Radio Occultation Data

In response to CGMS Action 39.41: CGMS requests the Rapporteurs to discuss, at the upcoming Intern. Scientific Working Group meetings, the WG contributions to ECV production and reprocessing activities, and other relevant climate work.

Climate related Processing and Potential of Radio Occultation Data

Summary of Climate related RO Activities:

- climate community is “slow to adopt” RO;
- radio occultation needs no external calibration source;
- offers continuous data from 2001 onwards;
- climate variables are bending angle, refractivity, pressure, geopotential height, and temperature;
- about 6 processing centres worldwide (UCAR, GFZ, ROM SAF, EUM, JPL, WEGC);
- all centres provide re-processed data sets;
- CHAMP processing centre comparisons are ongoing (ROTrends) finding:
 - SU in trends over 7 years is $<0.03\%$ for bending angle, refractivity, pressure
 - next steps will include different instruments, focus on low altitudes, understanding structural uncertainty in temperature, etc

CGMS-40: Actions/Recommendations

CGMS-40: Actions/Recommendations (from draft report)

• Actions:

- WMO to coordinate impact studies, through the CBS, in order to update and refine its requirements for GNSS radio-occultation (e.g. number of occultations/day, distribution in space) (40.6). -> [EUMETSAT looking into funding such a study in 2014](#)
- CGMS to convene through the IROWG an ad-hoc meeting on the global GNSS-RO constellation, inviting all interested CEOS agencies (40.23). -> [Option to report early outcome of Action 40.6 at CEOS end 2014](#)

• Recommendations:

- CGMS, via the IROWG, to support the development and use of GNSS radio-occultation for ionospheric monitoring (40.41). -> [at IROWG-3 space weather sub-group meeting will discuss further steps](#)
- CGMS members are invited to participate in the 3rd workshop of the International Radio Occultation Working Group, taking place near Graz, Austria from 5 - 11 September 2013. In particular, colleagues from China, India, Russia are invited to report on their radio occultation activities (40.22). -> [China, Russia invited \(no response received\), discussion with India on possible contribution on Megha-Tropique](#)
- CGMS agencies should engage in reprocessing of radio/occultation data to maximize their utility in anchoring climate reanalyses (40.23). -> [e.g. EUMETSAT re-processing within ERA-CLIM at ECMWF](#)

IROWG Activities

IROWG Activities

- Submitted SCOPE-CM project RO-CLIM:
 - runs from 2014 for 5 years
 - aims to move ROTrends data sets to higher maturity
 - initial focus on CHAMP RO record from 2001 to 2008
 - extension to cover more recent radio occultation missions
 - project accepted by SCOPE-CM Executive Panel in March '13
- OPAC-IROWG-3 workshop:
 - Joint OPAC-5 & IROWG-3 International Workshop on Occultations for Probing Atmosphere and Climate
 - 5 - 11 September 2013, Seggau Castle, Leibnitz near Graz, Austria

Further Information

All working papers, full minute summaries of meetings, including all recommendations / actions are available at:

<http://www.irowg.org>