IDS AWG

Meeting minutes

Minutes of IDS AWG @CNES, PARIS - September 30- October 1, 2019

Dec.02, 2019

Participants:

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Hugues Capdeville (CLS)	Frank G. Lemoine (NASA/GSFC)	Petr Štěpánek (GOP)
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Distribution:

Participants and AWG IDS list

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1. Introduction 3

2. Oral presentations abstracts 3

2.1. IDS news (L. Soudarin) 3

2.2. DORIS System Status (P. Ferrage) 4

2.3. DORIS Network Status (J. Saunier) 4

2.4. Status of the combination (G. Moreaux) 4

2.5. New models and standards recommended by IERS and IDS (J.M. Lemoine) 4

2.6. Attempt to mitigate the non-conservative force model error on satellites (F. Lemoine) 4

2.7. South Atlantic mitigation (G. Moreaux) 5

2.8. Scale (P. Štěpánek) 5

3. Discussions 5

3.1. Preparation for the next ITRF 5

3.2. IDS processing schedule proposal for the next ITRF 6

4. Next Meeting 6

1. Introduction

The last International DORIS Service Analysis Working Group (IDS-AWG) was hosted in Paris @CNES on September 30 – October 1, 2019 thanks to our host Pascale Ferrage.
The first part of the meeting was devoted to the general IDS presentations, while the second part focused on the most important topics relevant for ITRF 2020 reprocessing. As usual, we started with IDS News (L. Soudarin) and DORIS system status (P. Ferrage), followed by DORIS Network status (J. Saunier). The general IDS part of the presentation was closed by Status of the combination, presented by G. Moreaux. The ITRF-2020 reprocessing part of the meeting was divided into four general presentations. J.M. Lemoine presented New models and standards recommended by IERS and IDS, focused on time-variable gravity field modeling, ocean tides and de-aliasing products. F. Lemoine presented Attempt to mitigate the non-conservative force model error on satellites, including mitigation of TOPEX/Jason 117 days draconitic signal, Solar radiation pressure Cr estimation strategy, Earth radiation modelling and discussion on thermosphere models. G. Moreaux presented South Atlantic mitigation, including several methods how to deal with SAA. The last presentation by P. Štěpánek was devoted to the DORIS scale and its dependence on elevation cut off and data downweighting, as well as to comparison of GOP and LCA single- and multi- satellite solutions in context of the scale.
All the slides displayed during this meeting are available at:
https://ids-doris.org/ids/reports-mails/meeting-presentations.html#ids-awg-09-2019

2. Oral presentations abstracts

First, an abstract with the main conclusions of each oral presentation is given.

2.1. IDS news (L. Soudarin)

Data/products/information:
• The Central Bureau proceeded to the inventory of the Data Centers with the aim to check that the data and products necessary for the operational processing of the IDS analysis Centres are available at CDDIS and Saint-Mandé IGN ftp sites. The corrections of the anomalies found are in progress. An automatic weekly check between SSALTO routine deposit and IDS DCs archive has been implemented.

• The change to POE-F standard for the routine orbits as well as the re-delivery of full file set has been made for Sentinel-3A&B, Jason-3, Saral and Cryosat-2.

• The anomaly impacting the files of Jason-1 solar panel angles from June 13, 2012 to June 2, 2013 has been identified and a new file set created.

• The DORIS data archive in SSALTO format (orbit, RINEX/DORIS, RINEX/GPS of altimetry missions) has been moved from anonymous ftp AVISO (SEF CNES) to the authenticated ftp AVISO (CLS). The registration on Aviso website is now required to get access credentials.

IDS life:

• The IDS activity report 2018 is ready and available on the on IDS web site at https://ids-doris.org/documents/report/IDS_Report_2018.pdf

• Forthcoming IDS events in 2020:

-Date and place of the next AWG meeting(s) are to be defined.

-the IDS workshop will be held in conjunction of the next OSTST meeting, in October.

-DORIS will turn 30 years in February 2020

• IDS is preparing the future. The topics of discussions underway are: delivery of NRT data; organization of a training school; be active on the social media; extending the network.

2.2. **DORIS System Status (P. Ferrage)**

Currently 7 satellites contribute to IDS. Many futures missions are planned (7 to 10). The new type of antenna (STAREC- D) has started to be deployed, the first in St Johns. The 4th generation of beacons (B4G) has also started to be deployed on 4 sites, and this will continue at a sustained rate.

2.3. **DORIS Network Status (J. Saunier)**

The current DORIS network has 58 operating stations. We maintained at least 80% of them in working order since the beginning of 2019, despite numerous equipment failures. The 4th generation beacon deployment from mid 2019 arrives on time to replace the previous generation at the end of its life.

Mangilao, one of the two stations dedicated to IDS, is now part of the permanent network in view of its significant contribution to the Pacific coverage.

In the coming months, we may expect the commissioning of Santa-Cruz after a long long outage, the restarting of the two Russian stations pending frequency clearance, antenna relocation at La Réunion and the continuation of the 4th generation beacon deployment.

Finally, as regards the DORIS network contribution to ITRF2020, we have 8 additional sites, 2 renovated sites, 16 sites equipped with Starec C type antenna with enhanced features, and a new delivery of DORIS tie vectors is under preparation.

2.4. **Status of the combination (G. Moreaux)**

That presentation introduces the forthcoming next version (4.0) of the DPOD2014 as well as the new IDS combined series (ids 14) developed for the latest IDS position and velocity cumulative solution used for the realization of the DPOD2014 version 4.0. Finally, we present the new version of the coordinate time series plots delivered to the IDS Data Centers. In addition to the coordinate time series, these plots indicate date and origin of geophysical (ex: seism) and technical (ex: antenna change) events which may explain the position and/or velocity discontinuities.

2.5. **New models and standards recommended by IERS and IDS (J.M. Lemoine)**

The presentation consists of 3 topics: gravity filed including TVG, Ocean tides modeling and De-aliasing products. For gravity field a new EIGEN RL04 is recommended as one of the relevant possibilities, with necessity to use a consistent definition of the Mean pole. For de-aliasing, AOD1B product is available for non-tidal loading as well as for the atmosphere tides. Ocean tides model FES2014b is now available with corrected Msf wave.

2.6. **Attempt to mitigate the non-conservative force model error on satellites (F. Lemoine)**

Atmosphere density and Atmospheric density and the computation of atmospheric drag is a limiting error source for the DORIS satellites near 800 km altitude, when the s/c are near Solar Maximum. There are no new models available now (in 2019) relevant for this altitude. Another accuracy limit is the lack of quaternions for some of the satellites. We discuss in details a thermal radiation modelling, planetary pressure perturbations and we present a re-evalution of the total Solar irradiance including the possibilities of improvement ("UCL-type" modelling, use of quaternions, retune micromodel parameters, adjust C_d per arc). Finally, the improvements in recent GSC modelling are described.

2.7. **South Atlantic mitigation (G. Moreaux)**

That presentation deals with the analysis of the impact of the South Atlantic Anomaly mitigation strategy applied on Jason-2 and Jason-3 missions by two IDS analysis centers (GRG and GSC). The impact is evaluated in terms of Helmert parameters (scale and translations), positioning and Earth orientation parameters. Each AC delivered at least two multi-satellite series: one without Jason-2 and Jason-3 (that series will be used as reference since it does not include the missions impacted by the SAA) and one including Jaso-2 and Jason-3 with the SAA mitigation strategy applied.

2.8. **Scale (P. Štěpánek)**

The recent operational series show very good agreement of GSC and GRG scale. GOP is about 5-10 mm higher and IGN + INA are more than 10 mm higher. GOP residual analysis show systematic effects in post-fit observation residuals, dependent on the observation elevation. The single-satellite solutions result in better mutual scale agreement for elevation cut off 10 deg than for elevation cut off 7 deg. This agreement is also improved by data elevation dependent downweighting.

GOP experiments presentation was followed by combination center (CC) results for time period 2018.0-2019.0. Sinex files of single- and multi-satellite solution from analysis center GOP and GRG were processed by standard routines of CC. The scale for single-satellite solutions was within 7.4 mm for GOP and 7.6 mm for GRG. For multi-satellite solution, GOP scale reached 8.07±1.43 mm and GRG scale reached 3.50± 1.20 mm.

3. Discussions

3.1. **Preparation for the next ITRF**

Modelling for ITRF 2020 reprocessing

- TVG, compatible with applied mean pole. Possible recommendation of recent IERS Mean/Secular pole
- New subdaily pole model Desai & Sibois
- ITRF2014b for OT (or ITRF2014c if available)
- Apply de-aliasing model ?
- SAA compensation (see below)
- Use Quaternions if available (for Sentinels quaternions exist but not available, IDS will try to get it)
- Adjust SRP C_r per arc for Jason/Topex and for sun-synchronous satellites (recommended by Frank)
- Use more complex Earth radiation model then Knocke.

South Atlantic Anomaly compensation

- Strategies of using SAA stations only for orbit and/or estimate linear frequency per pass, as well as estimating linear frequency instead of constant are to be used in ITRF reprocessing.
- Pascal recommended to exclude or downweight the observations for SAA stations and sensitive satellites
- Petr proposed to test the strategies for one year for new satellites and one year for SPOT-5/Jason-1
- Availability of A. Belli corrective model for Jason-2 is not yet confirmed.

Scale, Data downweighting and elevation cut off

- There are several proofs of profit applying downweighting

- According to the discussion, the best way would be not to recommend "hard" value of elevation cut of and data downweighting function. The best choice could be just to recommend data elevation downweighting using any of relevant functions and to recommend the range of reasonable elevation cut off (e.g. 7-10 deg)

ACs to participate in ITRF 2020 reprocessing

- GSC, GRG, GOP confirmed
- ESA – to be discussed with responsible people in ESA
- INA, IGN – full participation not confirmed, depends on the status of software availability.
- Associated ACs – Guilhem recommended to ask them for participation, even if limited for some periods and satellites. Their results could be used in combination with weaker weighting or just for comparison/evaluation.

The Jason-3, Sentinel-3A and Sentinel-3B satellites have to be added in the DORIS processing chain of IDS ACs. Currently, only 4 ACs (ESA, GSC, GOP and GRG) could do that because they are able to process RINEX data format. The others ACs have to complete their DORIS/RINEX data processing implementation in order to take into account the data from these new satellites. About the priority to RINEX if both formats available, ACs have to use necessary the same format for the same satellite.

3.2. IDS processing schedule proposal for the next ITRF

- Request from Guilhem to have all the SINEX files in September 2020 (except last months of 2020, of course)
- Zuheir encouraged ACs to start the reprocessing as soon as possible
- Different strategies (to start with oldest data, with last data or in the middle) were discussed. Guilhem recommends to start with the oldest data.
- Different time needed for data processing (e.g. GSC can process all the data in 2 months, GOP needs about 5 months)
- **The final processing schedule and IDS recommendations for ITRF reprocessing will follow this document soon**

4. Next Meeting

The next IDS AWG meeting is planned at spring 2020. The date and place are not defined yet, but will be discussed after AGU Fall meeting in December.