IDS AWG

Meeting minutes

IDS AWG - London

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1. Introduction

The last International DORIS Service Analysis Working Group (IDS-AWG), from May 22 to May 23 2017, was hosted in the University College of London thanks to our guest Marek Ziebart.
The main objectives of this meeting were:

- ACs and CC feedback on the TRF2014 (ITRF, DTRF and JTRF2014) evaluation
- to discuss about the switch to the ITRF2014 for IDS operational products
- to discuss about the open issues following ITRF2014 realization
- ACs status and schedule on the DORIS RINEX data processing
- to take into account the sensitivity to SAA of the DORIS USO of the Jason-2 and Jason-3 satellites
- to show the next GDR-F POD Standards
- on the IDS studies, the DORIS-based polar motion determination for the MOE orbit solutions by Eva Jalabert from CNES
- to discuss about the mean pole model

First, we give the highlights of this meeting. In the following part, an abstract with the main conclusions of each oral presentation is given. Finally, we list the actions in progress and the news actions from this AWG.
All the slides displayed during this meeting are available at:
https://ids-doris.org/ids/reports-mails/meeting-presentations.html#ids-awg-05-2017

2. Highlights of the AWG

The meeting started with the activity reports of four of the six Analysis Centers (AC): Geodetic Observatory Pecny (GOP, P. Stepanek), Goddard Space Flight Center (GFC, F. Lemoine), Institut national de l'information Géographique et forestière français (IGN, P. Willis), and Groupe de Recherche de Géodésie Spatiale (GRG, H. Capdeville); and with the report of the IDS Combination Center (IDS CC, G. Moreaux).

A session was then devoted to the assessment of the three realizations of the Terrestrial Reference Frame: the ITRF2014 (IGN), DTRF2014 (DGFI) and JTRF2014 (JPL). While ITRF2014 and DTRF2014 are formally similar, differing mainly by the Post Seismic Deformation model (PSD) which has been introduced in the IGN solution, the JPL solution is quite different, being a time series of weekly solutions obtained through a Kalman filter process. Due to a more aggressive data editing, the JPL solution contains less stations at a given time than the two others, particularly at the beginning of the processed period in 1993. The three TRF realizations have been evaluated in terms of DORIS observation residuals, orbit overlaps and transformation parameters of the DORIS network. All the TRF realizations represent a clear improvement over the previous realization, ITRF2008. Based on the different criteria used for the evaluation, it has been shown that it is the ITRF2014 which presents the best overall performances. It is this model that will serve as a basis for the operational processing of the future IDS products. For that purpose, the ITRF2014 needs to be supplemented (new DORIS stations not present in the ITRF2014 solutions, if necessary correction of the position and velocity for the stations which had a short observation interval in the ITRF2014). The extension of the ITRF2014 for the DORIS network, called DPOD2014, consists in an update of the position/velocity of all the DORIS stations and aligned to the ITRF2014, leading to possible minor adjustment of older stations. The first version of the DPOD2014 built by the IDS CC (G. Moreaux) was validated by a POD group (P. Willis, F. Lemoine, A. Couhert, N. Zelensky and Ait Lakbir Hanane) and tested by the GRG AC. The DPOD2014 solution will be updated twice a year and the second version will be available in July 2017. IDS ACs could switch to ITRF2014 by using the DPOD2014 solution for their IDS operational products for the next delivery.

In the rest of the IDS AWG, various topics were discussed. About Cryosat-2 POD at TU Delft, the study indicates that there may be DORIS anomalies over South America region related to the SAA effect. E. Jalabert showed that it is possible to estimate the pole using only DORIS measurements as also presented by C. Jayles previously with DIODE software. H. Ait Lakbir showed that a – 4.7 cm DORIS radial offset is observed for HY-2A and this bias may affect the scale factor and the estimated heights of the DORIS stations. J. Saunier gave a report on the status of the DORIS network and P. Ferrage on the current and foreseen DORIS missions.

Some discussions took place on the choice of the mean pole model. An overview of the DORIS RINEX data processing has been done, and it remains a priority for the ACs in order to process the Jason-3 and Sentinel-3A data. We also discussed about the DORIS scale variations in particular to find a solution to remove the high scale of HY-2A.

3. Oral presentations abstracts

3.1. Day1 – May 22th

3.1.1. ACs and CC Status

GOP (By P. Stepanek)

The GOP activities include the routine data processing and the DORIS scientific experiments. The DORIS data have been processed until end of 2016 and the corresponding SINEX files were uploaded to the IDS data center. The recent experiments are based on the LOD estimation and on the development of the RINEX data processing, as well as on the update of the preprocessing and data downweighting strategy.
Our results show that the estimation of C_{20} together with LOD has not an important effect on the LOD estimation accuracy (in contrary to some SLR papers).
Our new experimental series 50 are compared to the series 4X, being the recent GOP standard. In the series 50, in contrary to series 4X, the CNES preprocessing is not employed and the COS (Z) downweighting law is applied. For the time span from the middle of 2015 to the end of 2016, the Series 50 express improvements in weekly station repeatability (15.7 mm vs. 18.6 mm) and the reduction of the Scale w.r.t. ITRF (46 mm vs. 25 mm).
RINEX data processing is recently under development with the top priority for the second half of 2017, so far we have developed reading routines, transformation to Bernese internal observation data format and the estimation of the onboard clocks from pseudorange measurement.

GSC (By F. Lemoine)

1. Current operational series is gscwd28 (complete through 2016-December 31. This series models the solar array motion w. quaternions on Jason-2. Sentinel-3, Jason-3 have not been processed yet for SINEX applications.

2. Analysis of the empirical accelerations as quality control revealed some anomalies with SPOT-5 that were traced to non-application of solar array pitch for arcs from mid-2013 to end of 2015. The fix was identified and as of May 31, 2017, the corrected arcs have been resubmitted.(c.f. see DORISREPORT 4315, 31-May-2017, 17:29:37 UTC)

3. Analysis of the empirical accelerations for SPOT-4 and HY2A shows that we could improve the macromodel by adjusting some of the parameters solar array reflectivity or Cr. This will be attempted later this year.

4. A comparison of the RMS of fit for gscwd28 revealed that the RMS of fit for ENvISAT and SPOT-4 were out of family. This was traced to use of an edit multiplier of 6.0 instead of 4.0. All arcs involving Envisat and SPOT-4 will need to be reprocessed to ensure the processing is consistent. This means all arcs 2002-2013. We will have to decide when to implement this update - as this involves a large amount of SINEX files to regenerate. In terms of priorities, there are other work (e.g. SAA tests on Jason-2, switch to DPOD2014) that are more important.

IGN (By P. Willis)

Urgent actions:
– Continue ignwd15 submission using GIPSY/OASIS II (as it is).
– Finalize DORIS/RINEX data processing for Jason-2 (developements done in parallel with GIPSY/OASIS II and GipsyX)
Long term
– Reprocess 1 year of recent DORIS/RINEX data with GipsyX (preliminary tests and then a new ignwd16?)
– Complete reprocessing of DORIS data with GipsyX (2018)

GRG (By H. Capdeville)

GRG AC computed DORIS data with 3.5-day arcs and a cut-off angle of 12° using ITRF2014 configuration until December 2016 for satellites available JASON-2, CRYOSAT2, HY-2A, SARAL. The DORIS and SLR RMS of fit of the orbit determination and the OPR Acceleration Amplitude are similar to those obtained previously. For the next delivery to CC we plan to introduce Jason-3 and Sentinel-3A DORIS data in the GRG DORIS processing. For that, we are going to use DORIS RINEX data processing for all satellites (GRG pre-processing). We will also switch to the

ITRF/DPOD2014 and process DORIS-only orbits and make evaluation by SLR processing. To take into account the SAA effect, we will apply a strategy to minimize the SAA impact on the positioning for Jason-2 and Jason-3.

IDS CC Status of the routine evaluation/combination (By G. Moreaux)
That presentation deals with the evaluation (Helmert parameters, station position residuals) of the latest IDS AC and CC solutions with respect to the ITRF2014 and with respect to the IERS C04 series. These results show a scale offset of nearly 14mm between the GOP series 43 and 50 which differ by the use of the DORIS data indicators and the elevation downweighting. The analysis of the Y pole differences wrt IERS C04 series shows a reduction of the std by around 20% around 2016 doy 322. So far, we have no explanation for such a reduction.

3.1.2. TRF2014/DPOD2014 Evaluation and Discussions

DPOD2014 status (G. Moreaux)
These slides begin by remembering the features of the new DORIS complement of the ITRF2014 for Precise Orbit Determination. Then, the IDS CC presents the new blocks of the DPOD2014 solution files and proposes a strategy to easily identify in the forthcoming solutions the stations with non-negligible position or velocity changes. Finally, the IDS CC gives some news on the time schedule of the second version of the DPOD2014.

DORIS evaluation of the DGFI, IGN and JPL ITRF2014 solutions (G. Moreaux)
The IDS CC presents the latest results of the IDS 09 series (IDS contribution to ITRF2014) evaluation with respect to the D,I,J TRF2014 solutions. After a brief presentation of these three solutions, we show the map of the DTRF2014 and ITRF2014 horizontal and vertical mean velocities at the DORIS sites. Then, the analyses of the scale and translation differences show more stable parameters with ITRF2014. The comparison between the estimated and ground DORIS-to-DORIS ties gives also better results with ITRF2014.

Evaluation of 2014 TRF solutions in POD by CNES/CLS IDS AC (H. Capdeville)
The three realizations (ITRF2014/IGN, DTRF2014/DGFI and JTRF2014/JPL) are evaluated by DORIS and SLR data processing for TOPEX, Jason-1, and Jason-2 satellites by comparison to the ITRF/DPOD2008 solution (Willis et al., 2016). The DORIS post-fit residuals (global and per stations) and the SLR residuals on DORIS-only orbits are analyzed. We also show some orbits comparison in particular the RMS of radial differences and the mean of z-component orbit differences. Overall, all 2014 TRF realizations represent a low but significant improvement over the previous realization, ITRF/DPOD2008 solution. The differences are at a very low level in particular for the Jason-1 and Jason-2 results. For the ITRF2014 and DTRF2014 solutions, the most significant improvements are obtained for years from 1992 to 1998 and from 2010 to 2014, probably due to the improvement of the estimation of the station velocities compared to those estimated in the DPOD2008 solution realization. We have also evaluated the ITRF2014 solution with annual and semi-annual signals on the station coordinates and the DTRF2014 solution with loading adding atmospheric and hydrologic non-tidal loading. The impact of these solutions on the POD is not significant. Based on the different criteria used for evaluation, it has been shown this is the ITRF2014 solution which presents the best overall performance. This realization will be used for the DPOD2014 solution which will be used for the operational processing of DORIS data.

Evaluation of ITRF2014 for Altimeter Satellite POD (F. Lemoine)
1. Following 2009/2010 ITRF2008 DORIS/SLR extrapolation error dominates comparison with ITRF2014 complements.
2. Altimeter crossovers show statistically significant improvements for all ITRF2014-based orbits starting in 2002, increasing in time.
3. For Jason-3 only DPOD2014 shows statistically significant improvement in performance; this is due to the completeness of the station complement.
4. The JPL JTRF2014 series implicitly includes non-tidal ocean and geocenter motion with a total peak-to-peak amplitude of 15 mm annual variation in Z (on Jason-2).

SLR evaluation of ITRF2014/DTRF2014 by NSGF AC. Preliminary results (J. Rodriguez)
We performed a comparison of ITRF2014 and DTRF2014 using laser ranging observations of LAGEOS-1 and LAGEOS-2. We computed weekly orbital solutions to these two satellites for the period 2000-2017.3, examining the solution

statistics in terms of data quantity, WRMS and trends in station residuals. We also performed 7-parameter Helmert transformations between both frames and the combined ILRS solution computed by the primary ILRS combination centre ASI as an input for the latest TRF (ILRS-A). In terms of number of stations and normal point data accepted in each solution, we found the differences to be small, with ITRF2014 being marginally superior in both counts. Differences in the station coordinates modeled by these two ITRS realisations are at the level of a few mm in some cases, significant for some applications. The presence of trends in the averaged SLR residuals suggests inaccuracies in the heights of some stations in both frames. Both the mean residuals (or alternatively the mean estimated range errors) and the Helmert transformations between ILRS-A and ITRF/DTRF point to a scale difference between the two frames. Somewhat surprisingly, we find zero scale difference between the combined laser solution and DTRF2014.

3.2. **Day 2 – May 23th**

3.2.1. DORIS Network Status (J. Saunier)

Some delays in processing shipment of the equipment constrain the network development following the CNES internal reorganization. Many stations around South America are currently out of order causing a big coverage gap. Among the much-awaited projects, the most advanced is San Juan (Argentina) replacing Santiago (Chile) decommissioned 4 years ago. Easter has to be relocated following site closure in 2015. Very few networks events occurred since last November because most of the files are stalled for administrative reasons. However, there are good news as regards the stations dedicated to IDS: Wettzell evaluation shows good results since its commissioning last September; Guam project is on the right track with the objective to be installed before the end of this year; Papenoo (French Polynesia) complies with the GGOS requirements to become a new core site with the 4 techniques following reconnaissance and RF compatibility tests performed last March. IDS participated in the latest meeting of the GGOS Bureau of Networks and Observations held in Vienna last April.

3.2.2. DORIS mission & system news (P. Ferrage)

Six satellites contribute to IDS and many missions to come up to 2030. A new phase law of the ALCATEL antenna will be provided by CNES for tests.

3.2.3. IDS news (L. Soudarin)

The Central Bureau reports the latest news concerning the IDS. Four new members entered the Governing Board on January, 1st: Patrick Michael (DC representative), Frank Lemoine (AC rep.), Denise Dettemering (Member at large), Petr Stepanek (IAG rep.). Frank Lemoine is the new Chairman. Rolf Koenig is the new point of contact for the GFZ Associate Analysis Center. The Working Group « Near Real Time data » has been created with the objective to implement delivery of DORIS data in NRT for assimilation in ionospheric model and other potential rapid products. Denise Dettmering chairs the WG.
About Data/products, CNES decided to switch back to DIODE time tagging in the RINEX files. The storage of DPOD solutions has been reorganized at the Data Centers. The latest recommended DOPD version is in “pub/doris/products/dpod/”. The cumulative solutions produced by the Combination Center are available at the Data Centers in “doris/products/sinex_global/ids/”.
The website and the webservices have been updated. They are now accessible through the HTTPS protocol.
The Central Bureau thanks all the contributors to the activity report 2016.
The Newsletter #4 is in preparation. Contributed articles, pictures, cartoons, and feedback are welcome at any time.

3.2.4. Analysis of the Signal Content in the Coordinate Time Series of the DORIS Stations (G. Moreaux)

In the context of ITRF2014, the Combination Center (CC) of the International DORIS Service (IDS) delivered to the IERS weekly SINEX files containing DORIS stations positions from January 1993 to December 2014. The IDS series is the combination of multi-satellite weekly SINEX solutions from the six IDS Analysis Centers (ACs). Since ITRF2014, all the series were extended to December 2015 and the associated cumulative DORIS position and velocity solutions were computed by stacking all the weekly solutions. The objective of this study is to analyze the signal content of the station position residuals (difference between the coordinate time series and mean velocities) of the 71 DORIS sites from the seven solutions (6 ACs + 1 CC). Amplitudes of annual, semi-annual and draconitic periods of the DORIS satellites will be investigated. Furthermore, annual and semi-annual estimates will be compared with displacements due to atmosphere and hydrology as well as with the coefficients deduced from the ITRF2014 solution from IGN.

The IDS NEU coordinate time series show annual, semi-annual and 117.3-day (Jason satellite draconitic) periodic signals.

-Overtones (58.7 days, 29.3 days) of the Jason draconitic period are also observed in the three components (NEU).

-The Jason draconitic is most likely explained by mismodeling of the solar radiation pressure, however errors in the DORIS measurement model could also contribute at some level.

-The East component shows higher amplitudes at lower frequencies. This is most likely a consequence of the orbit configuration for the DORIS satellite constellation.

-Maps of the amplitudes of the periodic signals show geographic regional coherences (North America, West Eurasia, Europe).

-The smallest amplitudes are obtained for the stations situated on islands.

-Coherence between IDS 09 and atmosphere and hydrologic annual signals in Yellowknife, Badary, Kitab and Krasnoyarsk. Higher amplitudes for IDS 09 in Cachoeira, Kourou, Santiago and Hartebeesthoek may be explained the South Atlantic Anomaly sensibility of SPOT-5, Jason-1 and Jason-2 Ultra Stable Oscillators.

-Differences with ITRF2014 estimations may reflect differences in the time span as well as in the estimation strategy. In ITRF2014, annual and semi-annual signals are estimated at the combination level. Part of the differences may be in the IDS 09 geocenter motion.

3.2.5. Comparison/evaluation of different atmosphere/ocean de-aliasing products using altimeter missions (J. Moyard)

There The CNES Geophysical Data Records version E integrates atmospheric gravity 6hr NCEP pressure fields model with S1 and S2 tides from Biancale-Bode. This product does not take into account high frequency atmospheric signals like wind effects. De-aliasing products update delay has improved and could be now used in CNES GDR orbits. An evaluation of the impact of several atmospheric/ocean de-aliasing products has been done. The GFZ RL06 products could be integrated in the future GDR version F CNES standards

3.2.6. Improvements in the POD processing for CS-2 (E. Schrama)

During this talk we demonstrate the implementation of ITRF2014 in the POD which was previously based on DPOD2008/SLRF2008. Also we replaced the temporal gravity model by a version that also includes atmospheric and oceanic mass changes. Furthermore we now estimate SLR offsets in the S/C reference frame. Our conclusion is that all proposed changes improve the residuals for DORIS and SLR, the empirical accelerations that we solve for and the differences to external orbits provided by the CNES. In the best case we get an rms of the radial orbit differences of 12.5 mm to the precision science orbit. The study indicates that there may be DORIS anomalies over South America region related to the SAA effect.

3.2.7. Accuracy of global satellite laser ranging observations: multi-satellite treatment (J. Rodriguez)

We briefly review the rationale for the estimation of range errors in SLR, presenting results showing the successful recovery of potential biases present in the data and the effect on satellite orbits. We computed orbital solutions using SLR normal point data to satellites LAGEOS-1, LAGEOS-2 and LARES, estimating weekly station coordinates and range errors for all stations of the network for the period 2012.2-2016.9 (since the launch of LARES). We find averaged range errors at the level of a few mm for many stations, both for LAGEOS-1/2 and LARES. Since the same model is employed to derive the centre of mass corrections (CoM) to these satellites, it is assumed that the presence of long term, averaged range errors can not be explained away by inaccurate CoM values. Further, the yearly averaged biases show evident trends and non-random behavior, with good agreement between the time series for different satellites. The magnitude and sign of the estimated biases is such that they introduce a scale change in the SLR network of about 0.7 ppb. This analysis also indicates that in general biases are of smaller magnitude in recent years, suggesting that the SLR performance is improving in terms of accuracy.

3.2.8. DORIS Simulations within Project GGOS-SIM (R. Koenig)

Within the project GGOS-SIM a tool is getting developed to answer the question how the GGOS goals of 1 mm accuracy and 0.1 mm/yr stability of the Terrestrial Reference Frame (TRF) can be met. Therefore all four space-geodetic techniques (DORIS, GNSS, SLR, VLBI) are simulated close to reality within the period 2008 to 2014. For the DORIS part the missions JASON-1, JASON-2, and ENVISAT are selected to contribute to the simulated TRF. At the time being, Precise Orbit Determination (POD) with real observations is carried out in order to evaluate the performance of the stations in terms of accuracy and availability. Some results of POD of the missions mentioned with DORIS observations in combination with SLR and altimetry cross-over observations, compared to pure DORIS POD are shown. The station network consists of 85 stations at 62 sites. In total, about 67.000.000 observations were analyzed. Based on the results of our studies the mean noise level for DORIS observations for JASON-1 and -2 can be set to 0.035 cm/s and for ENVISAT to 0.042 cm/s.

3.2.9. DORIS-based polar motion determination for the MOE orbit solutions (E. Jalabert)

In order to perform orbit determination, one needs to know the polar motion. The IERS prediction for pole values can sometimes be quite far from the actual values, and this impacts the orbit determination.
It can thus be useful to estimate the polar motion using orbit determination data, and then use this estimated pole in the actual orbit determination.
This talk shows that:

- When combining data from several satellite, the precision of the pole estimation is around 0,5 milliarcsecond (1,5 cm).
- The estimated pole can compensate for the poor IERS predictions

Outside of these poor prediction periods: the impact of estimating a DORIS pole shows a small but consistent improvement on SLR residuals and on orbit comparison.

3.2.10. DORIS/RINEX data processing with GIPSY and GipsyX, Preliminary results and plans (P. Willis)

Major problems (time tagging error) solved for DORIS/RINEX data processing with both GIPSY/OASIS II and GipsyX
Remaining problems still need to be investigated
– residuals are still too high
– Smaller time tagging problem is still present
When done, full transition for DORIS from GIPSY/OASIS II to GipsyX needs to be organized.

3.2.11. Estimation of the DORIS phase center locations for the currently flying altimeter missions (H. Ait Lakbir)

The purposes of this study are firstly to estimate the offsets between the DORIS receiver phase center and the satellite center of mass in the radial, along-track and cross-track directions, and secondly to check how consistent the DORIS system is with respect to the other tracking systems (GPS and SLR). To this end, the DORIS, GPS and SLR offsets are independently estimated in the radial and cross-track directions as well as the relative along-track offsets between two instruments. The results show a - 2.5 cm DORIS radial offset is observed for most of the missions, and for HY-2A, a radial offset of - 4.7 cm. These biases may affect the scale factor and the estimated heights of the DORIS stations. As for the along-track direction, the DORIS system shows a good consistency with GPS and SLR. Finally, there is no noticeable cross-track offset except for Sentinel-3A. The 3 tracking systems observe biases between 1.2 cm and 2.8 cm which could be explained by errors either in the model of solar radiation pressure, either in the cross-track location of the center of mass.

3.2.12. Brief presentation of the next GDR-F POD Standards (A. Couhert)

The given presentation provided an insight into the next GDR-F POD standards, where efforts have been made to better model orbits at the center of mass of the whole Earth system. To this end, a DORIS-based geocenter motion model was derived and will be applied in the following standards. Additionally, the station positions will be referenced in the last ITRF2014 reference frame, while updating (when necessary) on-board instrument phase center locations. Low-elevation DORIS data (below 10°) will be used, owing to the up-to-date troposphere correction model GPT2/VMF1, the definition of a weighting law, and the adjustment of horizontal tropospheric gradients. Data-screening of GPS data will be improved, especially to let the possibility of fixing ambiguities on Jason-3. Geopotential models (mean TVG model and atmospheric gravity) will be updated as well.

3.2.13. Discussions

- **Choice of the mean pole**

Choice of the mean pole model (JM. Lemoine)

When using the C(2,1)/S(2,1) values of a gravity field model, one must adopt the same mean pole convention as the one used for the computation of the model. Therefore this information ought to be delivered together with the gravity field model by the makers of the model. The choice of the mean pole convention is not indifferent because the pole tide corrections cannot recover gross errors in the mean pole models, since the k2 Love number that is used for the computation of the pole tides (k2=0.3077) at the annual and Chandler periods is not valid for the correction of the quasi-secular pole tide produced by the PGR. The relevant Love number for the PGR part seems to be k_pgr=0.8465. The evolution of the mean pole (and of the principal axis of inertia of the Earth system) is a combination of two contributions: the purely secular PGR part and the random long-term changes associated with climatology (i.e. polar ice mass loss at the present time). Should the mean pole model reflect only the secular part (PGR) or secular + climatology, and which Love numbers have to be associated with each?

Discussion for the mean pole (F. Mercier & A. Couhert)

The use of the IERS 2010 standards formulas for the rotational deformation due to polar motion is discussed. The mean pole to be used in the formulas must remove the frequencies outside the annual-Chandler frequency band. It is shown that moving averages are sufficient for this objective. Such a filtered value is available at IERS. However, there is still an unmodelled response which is the earth response to the remaining pluriannual signal present in the mean pole. The amplitude of this response has to be studied, and can reach millimeters values in the vertical direction. For the earth potential, the situation is different because we use now variable potential for LEO orbits computations, so it is only necessary to correct the C21,S21 values with exactly the mean pole model used for the potential identification.

- **Open points following ITRF reprocessing**

Scale issues on SPOT-5 (sawtooth pattern) / SPOT attitude

The SPOT-5-only scale clearly showed a sawtooth pattern with breaks. The discontinuities are of the order of -20 mm, so they are significant. This issue is under investigations within the IDS Analysis Working Group and is not considered as a priority.

HY-2A high scale

The high scale level of HY-2A has been mentioned and a preliminary action should be taken to solve this problem: do not use the HY2A scale in the multisatellite solution.

Scale variations
Impact of using in the doris2.2 data file of the non-flagged data:
The increase in 2012 of the scale factor for Jason-2 and Cryosat-2 is linked to the change of tropospheric model used by CNES in its POD processing (GDR standards): from CNET (GDR-C) to GPT/GMF (GRD-D). It causes a reduction of the amount of data marked as rejected in the doris2.2 file and then, an increase of the data used in GRG analysis considered to be good in CNES pre-processing. The larger number of data, especially at low elevation, could thus be the cause of the change we observe in the scale factor. So, IDS ACs need to do their own pre-processing. GRG will provide to IDS CC a solution by using its own pre-processing (by taking into account all the DORIS data even flagged data).
Impact of using in the doris2.2 data file of the corrections of CoP-CoM: GOP will provide a sufficient long serie to IDS CC with and wo using the corrections of CoP-CoM.
There is also an impact on the DORIS scale of the elevation cut off, the tropospheric model + elevation function, the downweighting law and on the choice of the CoM-CoP vector of satellites. These points will be discussed at the UAW in Paris because this can concern all the techniques.

DORIS RINEX data processing
ACs status:

- IGN AC: in progress
- GRG AC: OK
- GSC AC: OK
- GOP AC: in progress
- INA AC: depends of IGN
- ESA AC: ?

Inclusion of Jason-3 and Sentinel-3A in the multi-satellite solution: GRG will provide to IDS CC single satellite solutions for evaluation. Others volunteers ACs could also send to IDS CC their solutions.

Strategy to minimize the SAA impact on the positioning for Jason-2 and Jason-3:
Several strategies could use to minimize the SAA impact in particular:

- rename of the SAA stations in the multi-satellite solution
- adjust a frequency biais+drift for SAA stations
- remove SAA stations of the solutions of satellite impacted by SAA effect
- …

When the Jason-2 doris2.2 data corrected by the Belli model will be available, volunteers ACs could evaluate this model.

Increase of DORIS RMS of fit of the orbit determination

There is an apparent correlation (or not?) of the recent years' increase in the DORIS measurement residuals, which cannot be attributed only to the uncertainty of DPOD2008 in extrapolation mode, with the solar activity (Solar flux at F10.7). On this point, the Analysis Coordinators require the ACs who are willing to participate to provide their time series of satellite measurement residuals.

Analysis coordinators propose to do orbit comparison between all ACs. A chain of comparison is in progress but they need to have orbits in sp3 format (terrestrial frame, TAI scale). Then, on voluntary basis and for test purpose (maybe not on regular basis), ACs and associated may deliver their sp3 orbit to the CDDIS/IGN data centers in the appropriate directory.

4. Actions review

Here, we give the list of the open actions, the news actions are in red:

Action	Title	Description	who	date	status
AWG_01	SPOT5 scale issue	provide the list of suspect attitudes for SPOT satellites (apart from 2011).	F. Lemoine		open
AWG_02		plot histogram of residuals for SPOT-4/5, JASON-2 and CRYOSAT-2. See if the center moves according to the elevation	Volunteer ACs		open
AWG_03	ITRF2014 processing	IDS BC invites ACs to check the information given in the Table on the IDS website at http://ids-doris.org/contribution-itrf2013.html. The table was filled in before it was decided to include year 2014 for the ITRF.	All ACs		open
AWG_04	Increase of the DORIS residuals	Analysis Coordinators require the ACs who are willing to participate to provide their time series of DORIS measurement residuals since 2011.0 for each satellite available	Volunteer ACs and associated		open
AWG_05	DORIS data SAA corrective model for Jason-2	GRG AC is volunteer to test the model of AB for Jason-2 to analyze its impact on the position estimation of SAA stations	GRG AC and Volunteer ACs		open
AWG_06	Strategy to minimize the SAA impact on the positioning for Jason-2 and Jason-3	Use a strategy to minimize the SAA impact and provide solutions to IDS CC for evaluation	GRG AC and Volunteer ACs		open
AWG_07	HY-2A high scale	Do not use the HY2A scale in the multisatellite solution	All ACs		open
AWG_08	Scale factor increase in 2012	IDS CC has to confirm by analyzing all the AC contributions that only AC not using the flagged data in the doris2.2 file (from CNES pre-processing) are impacted	IDS CC		open
AWG_09	Scale factor increase in 2012	ACs could provide a Jason-2 single satellite solution obtained from processing using homogeneous editing criteria since 2011 (i.e. not relying on the CNES editing flags in the doris2.2 file). Then, if the problem is solved for Jason-2, it has been decided to reprocess all data using these homogeneous editing criteria for the whole period of each satellite having data in 2012	ACs		open
AWG_10	Inclusion of Jason-3 and Sentinel-3A in the multi-satellite solution	Provide to IDS CC single satellite solutions for evaluation	GRG AC and Volunteer ACs		open
AWG_11	Orbit comparison	On voluntary basis and for test purpose (maybe not on regular basis), ACs and associated may deliver their sp3 orbit to the CDDIS/IGN data centers in the appropriate directory: ftp://cddis.gsfc.nasa.gov/pub/doris/products/orbits/	Volunteer ACs and associated		open

5. Next Meeting

5.1. Next IDS Workshop

IDS WS is planned in September 2018 in Ponta Delgada (Azores, Portugal).

5.2. Next AWG

A Telecon is planned at the end of September 2017 to discuss about the DORIS data processing.

The next IDS AWG will take place before June 2018.