IDS

Meeting minutes

IDS AWG - Toulouse

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Participants (*):

Z. Altamimi (IGN), A. Auriol (CNES), J-M. Lemoine (CNES), H. Capdeville (CLS), J-P. Chauveau (CNES/AKKA), A. Couhert (CNES), G. Moreaux (CLS), P. Ferrage (CNES), L. Soudarin (CLS), C. Tourain (CNES), P. Willis (IGN), T. Guinle (CNES), Geir Arne Hjelle (NMA), E. Jalabert (CNES), C. Jayles (CNES), S. Kuzin (INASAN), F. Lemoine (NASA), P. Stepanek (GOP), S. Loyer (CLS), F. Mercier (CNES), E. Obligis (CLS), S. Rudenko (GFZ), J. Saunier (IGN), E. Schrama (TU Delft)

Distribution (*):

Liste AWG IDS

	Written by:	*Approved by:*
Names:	H. CAPDEVILLE, J-M. LEMOINE	
Signature: (Visa or ref.)		[Approver]

Agenda (optional):

1. Context

Hereafter the minutes of the IDS AWG meeting held at CLS Toulouse on May 28-29.

The main objectives of this meeting were:

- ACs and CCs feedback on the ITRF2014 realization. To discuss about open issues and recommendations following ITRF2014. To propose a schedule of the ITRF evaluation.
- ACs status and schedule on the DORIS RINEX data processing.
- to define the next Models/Standards to be used.

All the slides displayed during this meeting will be available at http://ids-doris.org/report/meeting-presentations/ids-awg-05-2015.html

2. Day 1 – May 28th

2.1. IDS Combined Solution for contribution to ITRF2014 (By Guilhem MOREAUX)

The combination results are improved thanks to

- beacon frequency variations included.
- time variable gravity field: reduces periodic signal on translations.
- Jason-1 SAA corrected data.
- new DGXX satellites (3D positioning is at 7-8 mm from 2010 onward).

Following the ITRF realization some open questions still remain:

- Origin of scale increase mid 2012.
- Origin of piecewise linear behavior of SPOT5 scale.
- Origin of IDS 09 WRMS degradations wrt IDS 03 before 2002.4.

IDS CC Feedbacks from ITRF2014:

- ITRF2014 needs represents nearly one full year.
- Part of the activity was devoted to development of new tools (ex: residual analysis, cumulative solution).
- Still points to better overcome such as computation and validation of cumulative solution, AC individual weighting…
- Single-satellite solutions are very instructive.
- « One model update, one new series » is strongly recommended to better analyze its impact at the AC and CC levels.

2.2. Status of ITRF2014 analysis (By Zuheir Altamimi)

The ITRF2014 Products provided by Z. Altamimi are the usual products:

- Station positions, velocities and residuals;

  -EOPs

And some additional/new products:

-Geocenter motion model (amplitude & phase per component: X, Y, Z), probably from SLR only

-Post-seismic parametric models (amplitude and relaxation time). Necessary to propagate coordinates at any epoch

Z. Altamimi proposes to remove periodic signals (amplitudes and phases), annual + semi-annual, per station and per technique.

2.3. ACs Feedback from ITRF2014 reprocessing

GOP (By Petr Stepanek)

Feedback from ITRF reprocessing

- Good news: GOP solution was improved (WRMS, Geocenter, Pole)
- New goal: enable to calculate own CoM corrections instead of those from data files
- New goal: analyze a short periodic signal (14-days) in GOP Xp, Yp series (tides?)

Other recent research activities

- LOD estimation experiment (individual presentation)
- Long term testing of SPOT-5 data corrective model (individual presentation)
- Testing of Gravity field application including time-variations modeling (impact on the POD)
- Merging of Bernese/DORIS with Bernese 5.2: ongoing development

GSC (By Frank Lemoine)

Considerations for future work:

1. Scales issues (2012 and later).
2. Scale issue SPOT-5 (sawtooth pattern).
3. Degradation near solar maximum of Solar Cycle 23 (2001-2002); seen in WRMS (~2x), and in RMS of fit to SPOT data.
4. Improvement (degradation) in RMS of fit when tracking point offsets applied in POD software (GEODYN) instead of using data corrections supplied with DORIS data.
5. In view of previous results, consideration should be given to having quaternions available for all DORIS satellites to handle off-nominal attitude situations for the measurement model, and to model properly the non-conservative forces. ACs must verify that quaternions can be implemented in their POD software.
6. Error in Center of Mass of Saral. Discrepancy between ACs that use data-supplied corrections, and those that apply corrections in the POD software. Which value of COM to adopt? Should the DORIS offset be updated as well? Processing must be consistent for all DORIS ACs!
7. Implementation and evaluation of ITRF2014: new parameterization will be provided to handle post-seismic deformation at sites with large earthquakes. This must be implemented in the POD software. We need examples and documentation in order to begin planning implementation.
8. Continue evaluation of phase laws for DORIS & Alcatel antenna. Is the manufacturer's phase law for Alcatel adequate? Should it be tuned empirically?
9. Based on the ITRF2014 experience, decide on schedule for next ITRF. How far in advance should the processing begin?

IGN (By Pascal Willis)

Building new internal DORIS station position/velocity to generate derived products:

- Satellite orbits
- Station position time series 5STCD files)
- Tropospheric results (ZTD results)

AOD1B corrections (atmosphere, ocean gravity loading corrections) done for one specific day → Doppler residuals decreased and more data kept in filter. To be automated and included in standard GIPSY/OASIS data processing as new option for IGN and INASAN DORIS data processing

DORIS PPP solutions (eg using GPS derived orbits for Jason-2)

INA (By Sergey Kuzin)

INA AC reprocessing for ITRF2014

- The results of inawd08 series (for ITRF2014) as compare with inawd07 ones are a little bit worse for Helmert transformation parameters but better for polar motion.
- Scale single satellite campaign: curious variations of the scale parameter for CRYOSAT2; scale for HY2A up-biased for about 4.00 ppb (about 24 mm) wrt other satellites.
- DORIS TRF scale parameter is significantly dependent from ground antennas PCV correction (scale offset about 1.2 ppb).
- Scale jump in the mid 2012 stays unresolved.

GRG (By Hugues Capdeville)

GRG ITRF2014 Status
- SINEX from 1993 to 2015.0 with Satellites: SPOTs, Topex, Envisat, Jason-1 & 2, Cryosat-2, HY-2A, Saral
-
- Contribution to ITRF helps to improve the quality of AC products
- Positive Feedback IDS CC to IDS ACs
- Keep 2 AWG/year in order to maintain the constructive discussions within the community

Improvement point proposals
- Write a procedure describing the different steps
- Make a single satellite solution systematically

What next for GRG AC
- Automation of Processing chain (in progress)
- Define a new processing context (new models, parameterization, …)
- Use of quaternions for Jason-2, Cryosat-2
- Improvement of the DORIS RINEX data processing (all global parameters OK, but unexplained higher residuals with RINEX)

2.4. ITRF 2014 Discussions / Action Item Review

Open issues:

1. **Jump in DORIS scale (2012 and later)**
   All the DORIS Analysis Centers observe the jump in scale. Presently the only substantive clues are that the jump seems more prominent for the DORIS analysis centers that use the data-supplied corrections and that although Cryosat-2, Jason-2 and HY-2A seem implicated, it is HY-2A that seems to cause the largest jump in scale. The scale jump in 2012 is also seen when GRG AC uses DORIS RINEX data. They also showed that there is no scale jump for HY-2A but the scale value is high and increases clearly the multi-satellite scale jump.
   Action 1 (Pascal Willis): check Jason-2 scale with PPP solution
2. **HY-2A**
   Zoffset
   What happens with high scale (confirmed by SLR, correction of COM value?)
   Action 2 (all ACs): adjust Zoffset over one year 2014
   Since IDS AWG in Toulouse, we have to take into account the discussion about the paper of Gao et al. (2015, ASR) which proposes news values of COM, of 2Ghz DORIS Phase center and of LRA spherical center (different from ILRS recommended values).
   HY-2A Tz
   Tz is also higher (~70 mm for GRG),
   Action 3 (all ACs): HY-2A test campaign, provide one year of single satellite solution to IDS CC (2014 for example)

3. **Scale issues on SPOT-5 (sawtooth pattern) / Spot attitude**
   At the AWG meeting in Washington DC (October 2013), G. Moreaux presented an analysis of the scale of SPOT-5 single-satellite SINEX solutions submitted by three ACs (ESA, GRG, GSC). All three ACs applied the SPOT satellite attitude law in their software and the tracking point offsets and center of mass as specified in the CNES documentation.
   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. Although no obvious cause has been found, efforts to understand these

variations should continue, in particular to understand if something intrinsic to the SPOT-5 DORIS USO might be the cause.
Action 4 (F. Lemoine): provide the list of suspect attitudes (apart from 2011).
Action 5 (all ACs): plot histogram of residuals for SPOT-4/5, JASON-2 and CRYOSAT-2. See if the center moves according to the elevation.

4. Error in Center of Mass of Saral.
Both the CNES POD team and the GSC analysis center showed that there was a -4 cm error in Z (cross-track) in the Center of Mass of the satellite in the spacecraft frame. The IDS needs to agree on a corrected value for the Center of Mass, enssure that the DORIS format 2.2 data are reprocessed to this new standard, and then verify that all the ACs (especially those that apply the tracking point offsets themselves in their respective orbit determination programs) use these updated values.
Action 6 (A. Couhert & P. Ferrage): Provide in the official documentation the 2 values for the COM offset: one from Frank (used also by GRG), the other one from CNES POD team (A. Couhert), to inform IDS AWG when CNES POD has changed the COM value in the DORIS data.
5. Strange TZ CRYOSAT2 behaviour
The Tz CRYOSAT-2 value for GRG, GOP INA ACs is higher and chaotic for GOP and INA. Only GSC has an acceptable level but the value stays higher compared to the Tz from others satellites.
Action 7 (GOP AC): check strange behavior of CRYOSAT-2
Action 8 (GRG AC): test CRYOSAT-2 quaternions from Ernst Schrama (TU Delft). Before, we have to take into account the last exchanges between Ernst and Frank about quaternions of Cryosat-2. Indeed, the quaternions do not include the 6 deg pitch. It means we need to do an additional quaternion multiply or matrix multiply to correctly represent the orientation of the s/c - w.r.t. J2000.

ITRF2014 evaluation:

- Z. Altamimi will provide the sinex ITRF2014 files during summer and proposes to some POD groups to evaluate it when it will be available.

  Action 9 (Z. Altamimi): provide an example of file with the new parameterization, including post-seismic deformation at sites with large earthquakes and annual and semi-annual signals. ACs need examples and documentation in order to begin planning implementation.

- JPL will provide weekly time series but what can we do with these products after 2014?

- Candidates to ITRF2014 evaluation: IDS CC, CNES POD team, GFZ, GSC AC, and GRG AC
  Action 10 (IDS CC, CNES POD team, GFZ, GSC AC, and GRG AC): evaluate ITRF2014 when it will be provided by ZA

Others:

- DPOD: Pascal Willis wished that the DPOD activities continue. Guilhem Moreaux proposes to continue this activity.
  Action 11 (G. Moreaux): continue POD activity
- Action 12 (all ACs): provide orbits in SP3 format at Data Centers
- Envisat: is the solar array flat or not? It seems that it is not, with a 4° angle from the mean plane. Frank mentions a weird attitude correction in the 2.2 files.
  Since the AWG, Marek Ziebart gives the confirmation of the 4 degree corrugation on the Envisat solar array. This confirmation is done at page 91 of Anthony Sibthorpe's PhD thesis. Barek said that the effect is very significant because it means there would almost always be a shear force in the overall plane of the solar panel.
  Action 13 (M. Ziebart and all ACs): discuss all this in more detail at the next AWG in October.

2.5. **DORIS System news (By Christian Jayles)**

First, Christian gave a short description of the Fourth generation Beacon:

- Electronic design with 2015 components.
- RF wires longer (up to 50 m) allowing better masks clearances
- Already integrated in existing system

He gave also the Schedule:

- Tender on line (on May 13th)
- Final choice by the end of 2015
- Prototype and pre-production units by mid-2017
- First production units by the end of 2017

He presented the determination of the Poles coordinates from real time DIODE navigator. The results are promising:

- RMS of mixed solution: ~0.5 mas
- Need parameters optimization (kalman filtering)
- Information can be reduced to one point every 2h
- May be useful for IDS Analysts ?

Smoothed frequencies

- RMS on-board as on-ground: < 2.0 10e-12
- Further investigation for short/mid-term frequency estimation
- Useful for Integrity Survey
- May be useful for IDS Analysts ?

2.6. **DORIS-related activities at GFZ (By** Sergei Rudenko)

New orbits of TOPEX/Poseidon (1992-2005), Envisat (2002-2012), Jason-1 (2002-2013) and Jason-2 (2008-2015) were computed at GFZ in the same ITRF realization (ITRF2008) using DORIS and SLR observations and consistent, improved models for precise orbit determination for all four missions. The analysis of these orbits performed at GFZ shows improved orbit quality of the new (VER08) orbits computed within the phase 2 of the ESA Sea Level project of the Climate Change Initiative, as compared to the previous (VER06) orbits derived within the phase 1 of this project. Thus, the mean values of the RMS fits of observations and orbital arc overlaps reduced by 0.6% for VER08 orbits, as compared to VER06 orbits, for TOPEX/Poseidon. The improvement for Envisat is even more significant: 3.1% improvement of SLR and 2.4% improvement of DORIS RMS fits and 0.6, 7.6 and 15.2% improvement of the radial, cross-track and along-track overlaps, accordingly. Further improvement of these orbits is expected, especially, for Jason-2. A reason of the degradation of Jason-1 orbit quality in 2012-2013 must be found.

2.7. **The Solar Radiation Pressure model evaluation for Cryosat-2 (By Ernst Schrama)**

Ernst has tested 4 solar radiation pressure (SRP) macro model:

- Canonball model (the simplest approach)
- ESA V0 model: six panels and offsets according to an early ESA reference
- ESA V1 model: like V0 but with updated SRP parameters
- CNES model: house model, 7 panels and updated offsets

First, Ersnt has estimated an average scale for Cr for each macro model.

For SRP setups compared:

- Empirical accelerations improve for the 7 panel roof model
- Significant improvement visible in the cross-track accelerations
- Overall acceleration level goes from 6.65 down to 3.95 nm/s2 (cannonball vs 7 panel)
- 10s Doppler fits are not really affected
- SLR fits are clearly improved
- External comparison: no significant effect by SRP model choice

2.8. **LOD estimation from DORIS data (By Petr Stepanek)**

Hypothesis: LOD could be estimated from the DORIS data with much better accuracy when not adjusting the cross track harmonic acceleration amplitudes.

GOP DORIS LOD estimation w.r.t IERS C04: Mean 0.050 ms, RMS 0.116 ms

▫ Combined IDS solution could be more accurate than this initial GOP solution.

▫Accuracy of LOD estimation by SLR (GNSS)?

2.9. **Testing of SPOT-5 SAA data corrective model using long time data series (By Petr Stepanek and Hugues Capdeville)**

Main conclusions of Testing of SPOT-5 SAA data corrective model using long time data series:

▫ Application of SPOT-5 data corrective model reduce RMS of the fit

▫ Improves station positioning in North and Up component but does not significantly improve positioning in East component

▫ Testing results obtained by GOP and GRG look not being completely consistent

▫ Are we satisfied with recent data corrective model?

not affecting recent operative solutions

Affecting long-term campaigns and next ITRF reprocessing

IDS testing campaign, more ACs, consistent analyses (combination center)?

possible model improvement

2.10. **Improvements in the DORIS phase modeling (By Flavien Mercier)**

Solutions with Rinex files (IDS)
- user documents for IDS
- different possible strategies (synchronization, use of pseudo-range …)
- how to estimate the receiver frequency ?
- use of phase variations (Doppler solution)
- improvement of beacon frequency model

Receiver clock periodic relativistic terms are not negligible
- classic GPS formula not valid
- true trajectory with central term and J2 is sufficient
- millimeters orbit radial perturbations
- several centimeters station vertical displacements
- important systematic geographic effects for Jason 2

this order of magnitude is very important, to be confirmed by further studies

2.11. **DORIS RINEX data processing at CNES/CLS AC (By Jean-Michel Lemoine and Hugues Capdeville)**

Main remarks about the Method and implementation in the GINS software

In the RINEX files, the Doppler count is the difference between two phase measurements done at different time tags in the proper time of the receiver. When using these measurements, the 2 GHz phase centers can no longer be used as the end points of the measurement, the iono-free phase centers have to be used. The iono-free phase centers are located a few mm away from the 2 GHz phase centers, in the direction opposite to the 400 MHz phase centers.

Conclusions of DORIS RINEX data processing results

•The larger scale with DORIS/RINEX (~2.5 cm) vanished thanks to the use of iono-free phase centers instead of the 2 GHz phase centers

• There is a good agreement between the RINEX DORIS data and DORIS2.2 The quality of processing is at the same level when using DORIS RINEX data But The DORIS RMS of fit is slightly higher in the case of DORIS RINEX data in particular for Jason-2 There is an Along track Bias between the two orbits (stronger for Crysosat-2 (~1.7 cm))
• The scale jump in 2012 is also seen when we use DORIS RINEX data and clearly increased by HY-2A
Perspectives
• Tests with the upcoming version of the DORIS RINEX including an improved time tagging from SSALTO 's component PANDOR
• Investigating the small differences of the results

2.12. **DORIS RINEX data processing Discussions/Schedule/Action Item Review**

Mail send to the ACs at the end of March
The aim of this mail is to help the IDS ACs to process the DORIS data in the RINEX format.
First, some recommendations:
Compared to the doris2.2 format, in the RINEX format the following corrections (given by measurements) are no longer mentioned:

- the center of mass correction including both effects: satellites and beacons
- the tropospheric refraction correction
- the ionospheric refraction correction
- the measurement doesn't take into account the best estimate of the actual satellite frequency (long term on-board frequency drift not taken into account)

So, to use the RINEX file data it is necessary:

- - to implement the ground antenna geometries in order to be able to position the 400 MHz, 2 GHz and iono-free phase centers with respect to the reference point of the antenna (the middle of the antenna base in the case of the ALCATEL antenna, the 400 MHz phase center in the case of the STAREC antenna)
- to implement the attitude law for each satellite in your software in order to be able to compute the phase-center-to-center-of-mass vector for each measurement
- to use a tropospheric model
- to apply the ionospheric correction by the use of the iono-free combination (BEWARE: the phase center to use is not the 2 GHz phase center any more, but the iono-free phase center)
- to estimate a long term on-board frequency drift

Secondly, you will find in attached file a note written by Flavien Mercier (DORIS_models&solutions_v1.0.pdf, draft version) which gives the equations to process the DORIS data from RINEX data file. Finally, you will find also a note written by Jean-Michel Lemoine (DORIS_RINEX_implementation_in_GINS.v2.pdf) which presents how we process RINEX data file in the GINS software. (http://ids-doris.org/about-doris-rinex-format.html)

RINEX processing implementation in ACs software

- GOP

After the software merging (Bernese/DORIS with Bernese 5.2), the implementations are planned for second half of 2015, in cooperation with TUM Munich.

- GSC

End 2015

- IGN

The DORIS/RINEX reader and phase model and partial derivatives are done. The data filtering is in progress. Note that the data processing and time tagging are done at the same time

- INA

DORIS RINEX data processing under investigation (Depend on IGN)

- GRG

Done (see presentation)

Information:

Since January 20 2014, all time-tagging is done with PANDOR. Older files are progressively reprocessed. The reprocessing should be finished by the end of the summer 2015.

3. Day 2 – May 29th

3.1. DORIS satellites constellation update (By Pascale Ferrage)

Today 5 satellites contribute to IDS : SARAL (February 2013-2018, DGXX+LR), HY2-A (August 2011-post 2014, DGXX+LRA+GPS), CRYOSAT-2 (April 2010 → end 2017, DGXX + LRA), JASON2 (June 2008 → 2017, DGXX+LRA+GPS), SPOT5 (May 2002 → October 2015, DGM, on a lower orbit (-2.5 km) since April 2015 for the take-5 mission)
At least, 6 Future missions are planned: JASON-3 (in 2015?, 5 years), SENTINEL3A (Oct. 2015, 7.5 years + 5), Sentinel 3B (2018), HY2B (2016, 3 years), JASON-CS (end 2020, 7 years), *Jason-CS (B, 2022, 7 years),* SWOT* (post 2020, 3 years).

3.2. DORIS network status and local tie surveys (By Jérôme Saunier)

IGN-SGN CONTRIBUTION TO ITRF2014

PROVISION OF ABOUT 20 ADDITIONAL TIE VECTORS

RE-COMPUTING OF CO-LOCATION SURVEYS CARRIED OUT BY IGN IN THE PAST

- Re-processing of GPS observations using new software, absolute antenna calibrations
- But due to: missing data, shortage of manpower…
- Just a couple of sites has been provided

ITRF WEB SITE OVERHAUL

- Status: the database is operational, web development has stopped since 09/2014
- IGN has migrated to virtual machines and redefined its development priorities
- New objective: mid 2016

→ ITRF2014 solution will be published on the current website

3.3. 3D visualization tool for DORIS satellites (By Pascale Ferrage/Laurent Soudarin)

Past discussions within IDS about attitude laws, solar panel orientation and rotation, and more generally about the motion of the DORIS satellites. Need to visualize the satellites on their orbits for a better understanding.
Contact CNES team developing VTS software (Visualization Tool for Space data) to propose 3D models of the DORIS missions. VTS is used to animate satellites in 2D or 3D environnements (recently it helped choosing a good landing site for Philae). VTS is a free software from CNES.
L. Soudarin showed several movies of the motion of DORIS satellites as Envisat, Jason2, …
The visualization of Envisat seemed to show that the solar array was not flat (see discussion in 2.4 section).

3.4. Time variable gravity models (By Jean-Michel Lemoine)

Mean models: Problem of the extrapolation outside of the GRACE era

1. Periodic components: can probably be safely extrapolated
2. Drifts:

a) Extrapolation of the drifts of the first and last years → very dangerous !

b)Using for extrapolation the mean drift over the GRACE era → why not ?
c)Setting the drifts to 0 outside of the GRACE era → most conservative option

EIGEN-6S2 (extended.v2) (ITRF2014 processing) includes:
- One bias and one slope / year (continuous PWL except for "breaks")
- 3 breaks corresponding to the last 3 major earthquakes
- Two mean annual and semi-annual components (sine and cosine) over the full time span
- Zero-slope extrapolation
- ~ 108000 parameters for 12 years and degree max = 80

EIGEN-GRGS.RL03-v2.MEAN-FIELD (GDR-E standards) includes:
- One bias and one slope / year (continuous PWL except for "breaks")
- 3 breaks corresponding to the last 3 major earthquakes
- Two annual and semi-annual components (sine and cosine) / year
- Zero-slope extrapolation
- ~ 416000 parameters for 12 years and degree max = 80

3.5. First results on the GDR-E reprocessing based on CryoSat-2 (By Alexandre Couhert)

First results of the GDR-E reprocessing

- **CryoSat-2 GDR-E POEs: 1-cm radial RMS orbit accuracy achieved at ~700 km with DORIS-only data**
  It augurs well for the quality of the future Jason-CS orbits (same platform)
- **Jason-2 GDR-E MOEs already available:**

  ▫All-elevation SLR core-network RMS residuals:

  »**GDR-D** DORIS "stochastic": **2.6 cm RMS**

  »**GDR-E** DORIS reduced-dynamic: **2.2 cm RMS**

  ▫High-elevation SLR core-network RMS residuals:

  »**GDR-D** DORIS "stochastic": **1.7 cm RMS**

  »**GDR-E** DORIS reduced-dynamic: **1.3 cm RMS**

3.6. Next Models/Standards Discussions/Action Item Review

- Dealiasing products available:

  AOD GFZ 1979 to 2015, available with 2-month latency

  TUGO GRGS, available with more than 3-month latency

Action 13 (J-M. Lemoine): he is supposed to examine the different products available and report ASAP.

- Gravity field

Action 14 (J-M. Lemoine): make a model in which the extrapolation is based on the slope of the 3 last years of data (by opposition to the zero-slope used in the current model)

- Tropospheric gradients: 2 groups using them showed improvement. Recommendation: To be used, but not before 2002 (not enough satellites).

Action 15 (Analysis Coordinators): Ask Michiel whether he does multi-sat or single-satellite gradient estimation.

- Alcatel Antennas: Anechoïd chamber tests of the Alcatel antennas are going to be performed at CNES.

Action 16 (CNES team): give the results of Alcatel antenna tests when available

3.7. **IDS news (web site news) (By Laurent Soudarin)**

IDS Activity report 2014: thanks for your contributions, the report is ready to be printed (done in July).

Web, ftp:

Main recent updates:

- Dedicated page about the DORIS/RINEX data: http://ids-doris.org/about-doris-rinex-format.html

Next developments:

- DOR-O-T : new tool for EOP time series
- 3D visualization of the satellites in space
- Improved access to data/products, documents/reports/presentations

4. Actions review

Action 1 (Pascal Willis): check Jason-2 scale with PPP solution

Action 2 (all ACs): adjust Zoffset over one year 2014

Action 3 (all ACs): HY-2A test campaign, provide one year of single satellite solution to IDS CC (2014 for example)

Action 4 (F. Lemoine): provide the list of suspect attitudes (apart from 2011).

Action 5 (all ACs): plot histogram of residuals for SPOT-4/5, JASON-2 and CRYOSAT-2. See if the center moves according to the elevation.

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Action 11 (G. Moreaux): continue POD activity

Action 12 (all ACs): to provide orbits in SP3 format at Data Centers

Action 13 (M. Ziebart and all ACs): discuss all this in more detail at the next AWG in October

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Action 15 (Analysis Coordinators): Ask Michiel whether he does multi-sat or single-satellite gradient estimation.

Action 16 (CNES team): give the results of Alcatel antenna tests when available

5. Next meeting

5.1. Next Telecon

Mid-September (To be confirmed)

5.2. Next AWG

AWG in October 2015 in Washington DC, hosted by Goddard Greenbelt

5.3. Next IDS Workshop

La Rochelle in October 2016