IGS Workshop 2017

BOOKLET

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IGN INSTITUT NATIONAL DE L'INFORMATION GÉOGRAPHIQUE ET FORESTIÈRE

cnes CENTRE NATIONAL D'ÉTUDES SPATIALES

PARIS DIDEROT

IGS INTERNATIONAL GNSS SERVICE

IAG

1. Welcome

Dear attendee of the IGS Workshop 2017,

It is my great pleasure to welcome you to the IGS Workshop 2017, held at the University Paris-Diderot. The workshop is supported and hosted by IGN, CNES and Campus Spatial of the University Paris-Diderot. We are expecting more than 200 participants from around the world, testifying the large number of institutions contributing to the IGS activities, and demonstrating the importance of IGS products for science and society.

IGN and CNES involvement and commitment in the IGS activities include a certain number of GNSS permanent stations around the world, a Data Center maintained by IGN, an Analysis Center operated by CNES and a Combination Center hosted by IGN that insures the generation of the IGS Reference Frame, its consistency and alignment to the International Terrestrial Reference Frame (ITRF) that has also been maintained by IGN for more than three decades.

The 2017 IGS Workshop registration and pickup of the workshop material start at 13:30 on Sunday, July 2nd 2017, at the workshop venue, 15 rue Hélène Brion, and every day at 8:00.

Plenary sessions start at 8:30 and will take place in the Buffon amphitheater. As we are exceeding the maximum capacity of the main Workshop venue, an annex meeting room, where a live streaming of the presentations will be operated, is located at the 3rd floor of Lamarck B building. We are very thankful to the "live streaming" participants for their understanding. Coffee breaks will be served at 10:00 and 15:00 each day in the main hall of the Buffon amphitheater and 3rd floor of Lamarck B building. Buffet lunches will be served for all participants between 12:00 and 13:30 at 1st floor of the students' restaurant called "Halle aux farines", facing the Seine River.

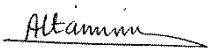
Splinter meetings for IGS working groups and projects are arranged at some class rooms located at Lamarck B building, as well as poster sessions.

The Local Organizing Committee welcomes the entire participants to the Icebreaker Reception on Monday evening, at 18:30, at the 1st floor of the student restaurant called "Halle aux Farines", where lunches are taking place.

The gala dinner on Wednesday evening will take place at the famous Château de Vincennes at the east border of Paris, starting at 19:00.

You will find all other useful information in this booklet.

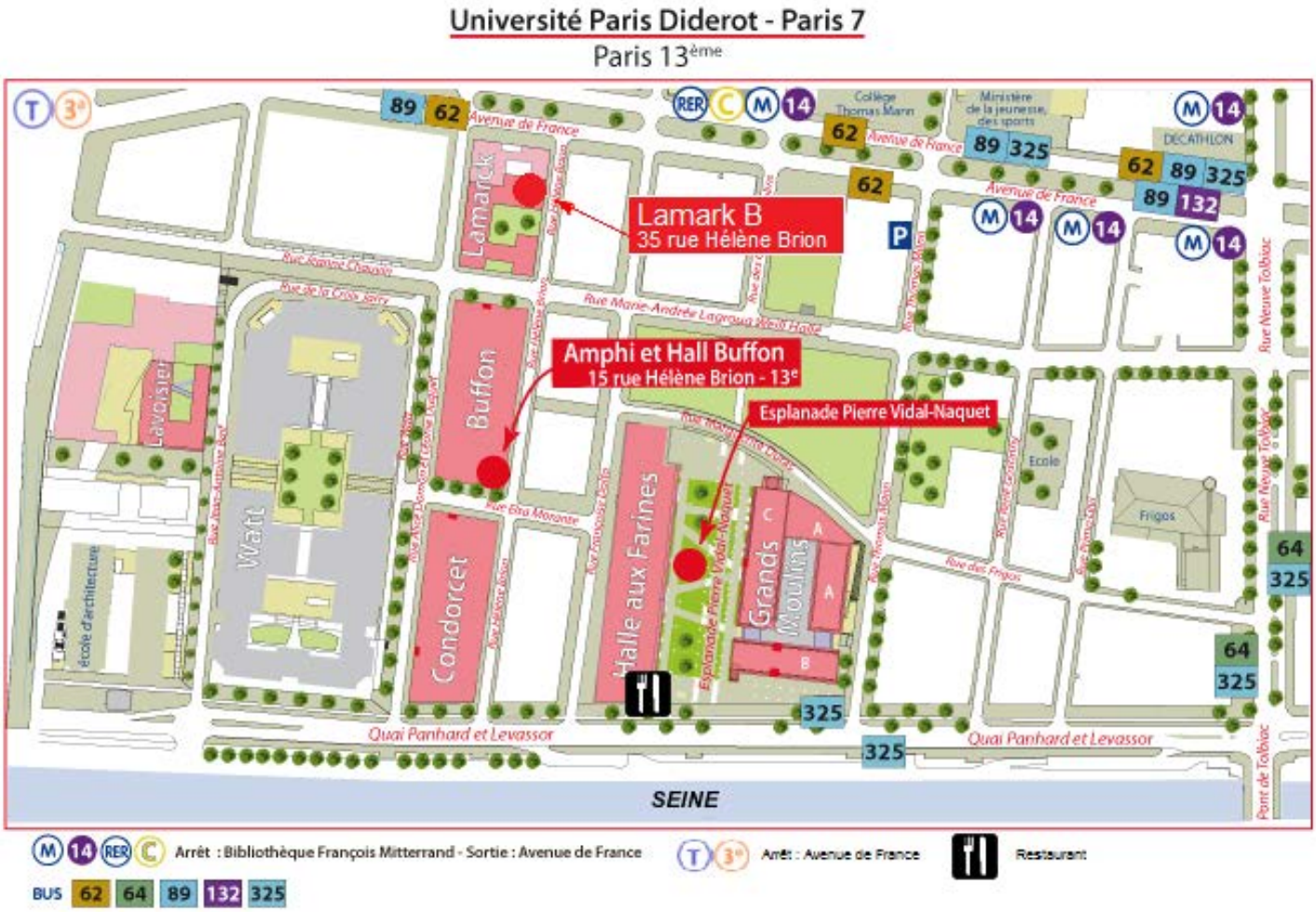
We wish you all a very fruitful workshop in Paris.



ZuheirAltamimi

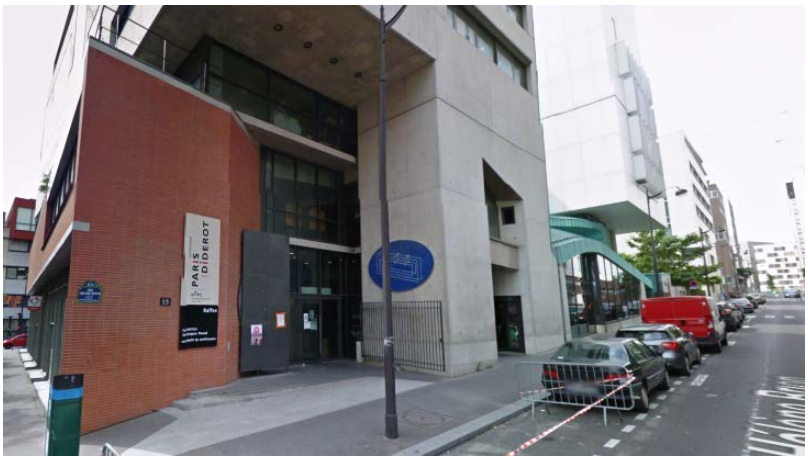
Coordinator of the 2017 IGS Workshop, and on behalf of the Local Organizing Committee: Anne Duret, Kevin Eyermann, Félix Perosanz, Paul Rebischung, Xavier della Chiesa, Bruno Garayt, Thierry Person

2. Registration and venue



The university is reachable by train RER C, and metro Line 14, station “Bibliothèque François Mitterrand”, by bus 325 and 62, stop “Porte de France”, and by tram T3a, station “Avenue de France”.

You can also find all other information you need on public transports in Paris, including fees and lines, on http://www.ratp.fr .

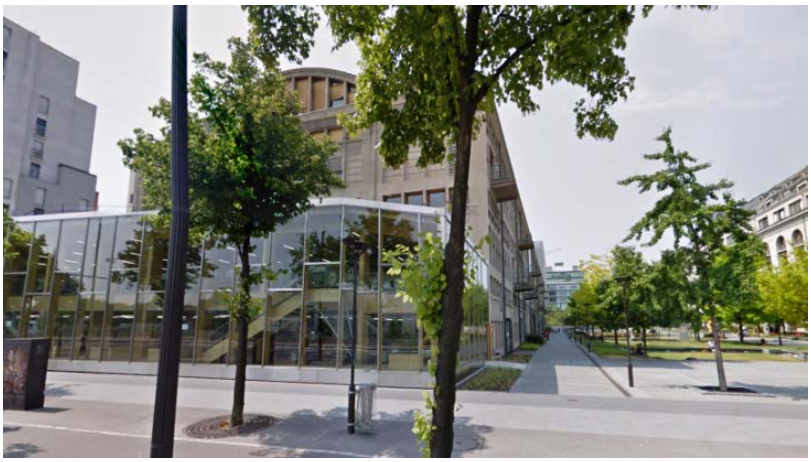


Amphitheater Buffon, 15 rue Hélène Brion

- Registration and pick up of the workshop material, on Sunday July 2nd from 13:30 to 18:30, on the other days from 8:00
- Plenary sessions and coffee breaks

Lamarck B building, 35 rue Hélène Brion

- Splinter meetings: 3rd floor
- 1st poster session: main hall
- 2nd poster session: 3rd floor, rooms 334 and 338
- Live stream: 3rd floor, room 317
- Coffee breaks for live stream: 3rd floor

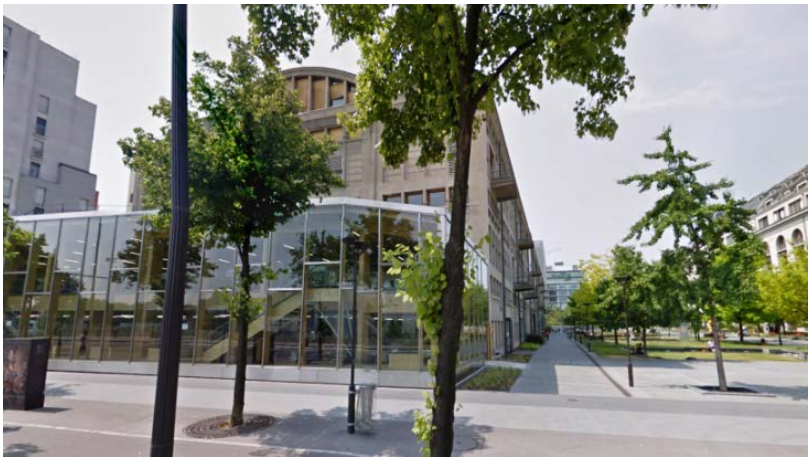


Students' restaurant, "la Halle aux Farines", 3 esplanade Pierre Vidal-Naquet

- Lunches from monday to thursday, from 12:00 to 13:30

3. Social events

Icebreaker party



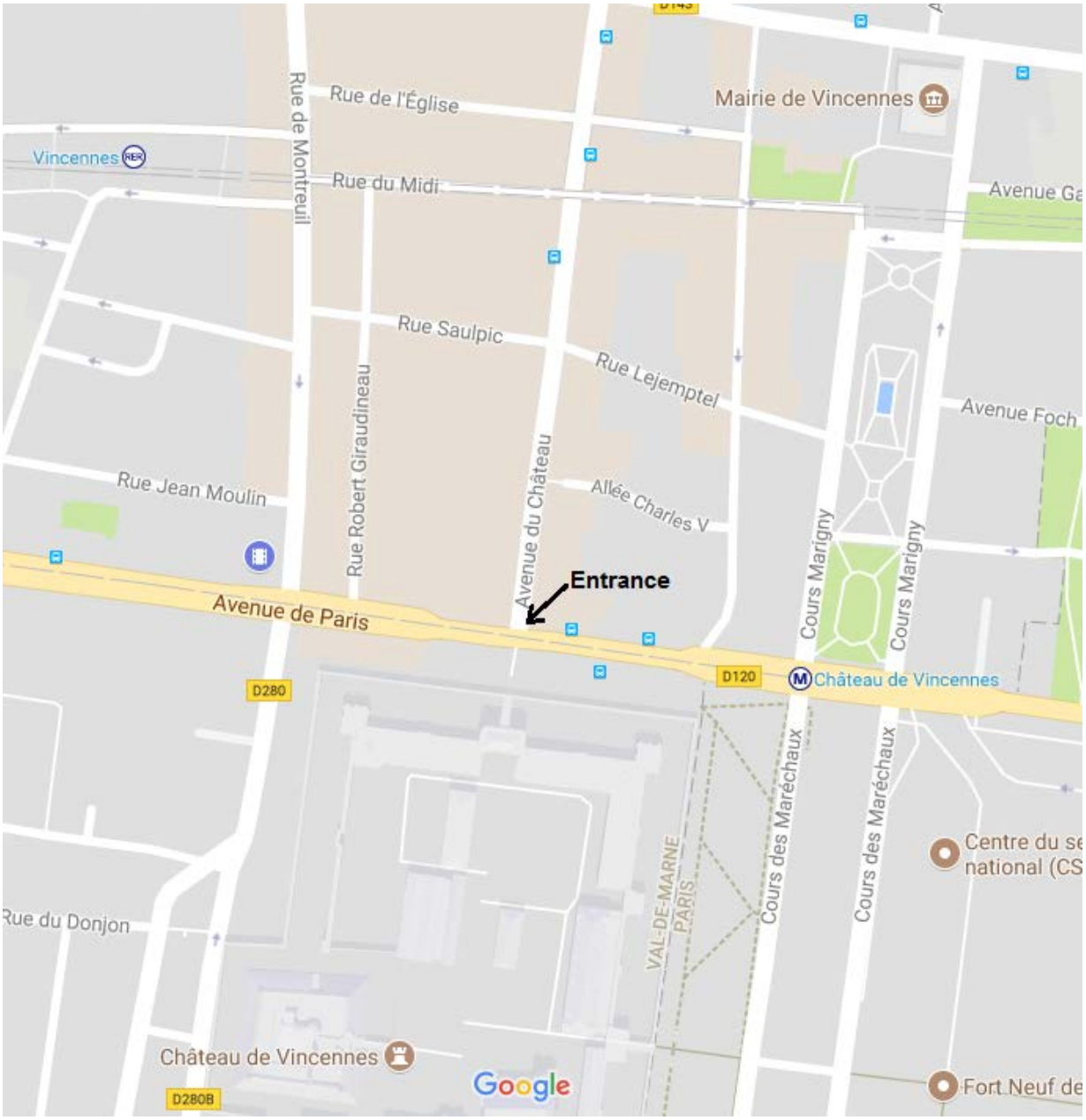
Students' restaurant, "la Halle aux Farines", 3 esplanade Pierre Vidal-Naquet
Icebreaker reception: on Monday night from 18:30, 1st floor
This event is included in your registration. Please bring some identification paper, and the invitation you receive when you register.

Workshop dinner

The workshop dinner will take place at the Château de Vincennes, from 19:00 to 23:00. This event is by invitation only and included in your registration fees, if you chose to attend when you registered. This is a military area. Therefore, security is very strict and arrivals will be accepted from 19:00 to 20:00 only. **Please, bring some identity papers along with your dinner invitation**.

A presentation of the history of the castle will be done at 19:15, and dinner will begin at 20:00. If you have any food allergy, or intolerance, please mention it to the local organizing committee at the beginning of the workshop.

The castle is reachable by bus 325, 115, 118, 124, 318, 325 station “Avenue du château”, metro line 1 station “Château de Vincennes”, and RER line A station “Vincennes”.



4. Sponsor acknowledgement

Special thanks to our partners

Gold

- when it has to be **right**

Leica Geosystems

Silver

septentrio

Bronze

Trimble

5. Schedule

	Sunday, July 2	Monday, July 3	Tuesday, July 4	Wednesday, July 5	Thursday, July 6	Friday, July 7
08:30 - 09:00		Registration	Plenary #03: Antennas & Biases	Plenary #05: Real-time	Plenary #08: Orbit modeling	Plenary #10: Timing
09:00 - 09:30		Welcome				
09:30 - 10:00						
10:00 - 10:30		coffee break	coffee break	coffee break	coffee break	coffee break
10:30 - 11:00		Plenary #01: Multi-GNSS & Constellation Monitoring	Plenary #04: Part 1 Troposphere & Ionosphere IC/DC/Format summary	Plenary #06: Analysis Centers	Plenary #09: Reference Frame	Closing session Recommendations
11:00 - 11:30						
11:30 - 12:00						
12:00 - 13:30		lunch	lunch	lunch	lunch	
13:30 - 14:00	Registration / Governing Board Meeting	Plenary #07: Part 1 Scientific Applications of IGS products	Posters #01 to #05 / Splinter meetings: • IC+DCWG+RINEX • Ionosphere	Plenary #04: Part 2 Plenary #07: Part 2	Posters #06 to #10 / Splinter meetings: • ACs + RF	Governing Board Meeting
14:00 - 14:30						
14:30 - 15:00						
15:00 - 15:30		coffee break	coffee break	coffee break	coffee break	
15:30 - 16:00		Keynote lecture: Galileo	Splinter meetings: • MGEX • TIGA	Posters #06 to #10 / Splinter meetings: • Antennas • Real-time • Troposphere	Splinter meetings: • Biases & clock products • Orbit modelling	
16:00 - 16:30						
16:30 - 17:00		Posters #01 to #05				
17:00 - 17:30			Splinter meetings: • IGMA		Splinter meetings: • Communications	
17:30 - 18:00						
18:00 - 18:30						
18:30 - 19:00		Icebreaker cocktail				
19:00 - 23:00				Workshop dinner		

6. Program

Monday, July 3

09:00 – 10:00 Opening Session

09:00-09:10 Welcome by IGN, *D. Bursaux, IGN General Director*

09:10-09:20 Welcome by CNES, *J. Lambin, on behalf of CNES President*

09:20-09:30 Welcome by University Paris-Diderot, *S. Rousset, Vice President of Research, University Paris-Diderot*

09:30-09:40 Welcome by IAG & Local Organizing Committee, *Z. Altamimi, IGN, IAG Vice-President*

09:40-09:50 Welcome by IGS, G. Johnston, *Chair of IGS Governing Board*

09:50-10:00 Welcome by IGS Central Bureau, *R. Neilan, Director of IGS Central Bureau*

10:30 – 12:00 Multi-GNSS & Constellation Monitoring

10:30-10:45 The IGS/IGMA Monitoring Pilot Project, *U. Hugentobler, T. Springer, S. Kogure*

10:45-11:00 Multi-GNSS SISRE Monitoring - Methodology and Results, *P. Steigenberger, O. Montenbruck*

11:00-11:15 Hourly Updated GNSS Orbit and Clock Correction, *Q. Chen, S. Song, W. Zhou, H. Chaoi*

11:15-11:30 Multi-GNSS real-time precise positioning service and Initial assessment of BDS-3, *X. Li, M. Ge, X. Li, X. Zhang, M. Wu, J. Wickert, H. Schuh*

11:30-11:45 Latest model improvements in CODEs IGS MGEX solution, *L. Prange, R. Dach, G. Beutler, D. Sidorov, A. Villiger, S. Schaer, A. Jäggi*

11:45-12:00 Solar Radiation Pressure modeling for BeiDou GEO satellite, *J. Guo, Ch. Wang, Q. Zhao*

13:30 – 15:00 Scientific Applications of IGS Products – Part 1

13:30-14:00 Earthscope's Plate Boundary Observatory (PBO) use of IGS products, *T. Herring, T. Melbourne, M. Murray, M. Floyd, W. Szeliga, R. King, D. Phillips, C. Puskas*

14:00-14:30 On the Scientific Applications of IGS Products: An Assessment of the Reprocessed TIGA Solutions and Combined Products, *N. Teferle, A. Hunegnaw, K.E. Abraha, A. Santamaría-Gómez, M. Gravelle, G. Wöppelman, T. Schöne, Z. Deng, R. Bingley, D. Hansen, L. Sanchez, M. Moore*

14:30-15:00 GNSS Augmentation to Tsunami Early Warning Systems, *J. Lauterjung, J. L. LaBrecque, G. Occhipinti, M. Crespi*

15:30 – 16:30 Keynote lecture: Galileo

M. Falcone, System Manager of ESA's Galileo Project Office

16:30 – 17:00 Workshop Sponsors

16:30-16:45 Improving the resilience to interference of a GNSS reference station, *Y. Tawk, Product Application Specialist, Leica Geosystems*

16:45-17:00 Data quality : From tracking to archiving with no gaps, *F. Clemente, Product Manager, Septentrio*

16:30 – 18:00 Poster Sessions (Lamarck B, main hall)

PS #01 Multi-GNSS & Constellation Monitoring

PS #02 Infrastructure, Data Centers & Formats

PS #03 Antennas & Biases

PS #04 Troposphere & Ionosphere

PS #05 Real-time

Tuesday, July 4

08:30 – 10:00 Antennas & Biases

08:30-08:45 New GNSS Bias Products from CODE, *S. Schaer, A. Villiger, R. Dach, L. Prange, A. Jäggi*

08:45-09:00 Revisiting the origin of GLONASS inter-frequency phase biases and its implication to IGS Bias-SINEX products, *J. Geng*

09:00-09:15 Analysis of GNSS Receiver Biases and Noise using Zero Baseline Techniques, *K. MacLeod, S. Banville, P. Collins, R. Ghoddousi-Fard*

09:15-09:30 Consistency antenna products in the MGEX environment, *A. Villiger, L. Prange, R. Dach, S. Schaer, A. Jäggi*

09:30-09:45 Phase Centre Calibration of the Galileo Satellite Navigation Antenna, *F. Gonzalez*

09:45-10:00 Type mean antenna PCV models are no longer sufficient to support geodetic analysis, *M. Moore, G. Hu*

10:30 – 11:45 Troposphere & Ionosphere – Part 1

10:30-10:45 ROTI Maps: a new IGS's ionospheric product characterizing the ionospheric irregularities occurrence, *I. Cherniak, A. Krankowski, I. Zakharenkova*

10:45-11:00 The Recent Activities of CAS Ionosphere Analysis Center on GNSS-based Ionospheric Modeling within IGS, *Y. Yuan, Z. Li, N. Wang, M. Li*

11:00-11:15 High rate GPS and GLONASS observations of RT-IGS network to monitor ionospheric irregularities and TEC mapping, *R. Ghoddousi-Fard*

11:15-11:30 Parallel computing techniques for global ionospheric modeling, *C. Wang, C. Shi, H. Zhang*

11:30-11:45 Dual-layer tropospheric correction model using optimally data from GNSS and numerical weather model, *J. Douša, M. Eliaš, P. Václavovic*

11:45 – 12:00 Infrastructure, Data Centers & Formats Summary

I. Romero, Chair of IGS Infrastructure Committee

13:30 – 18:00 Poster Sessions (Lamarck B, main hall)

PS #01 Multi-GNSS & Constellation Monitoring

PS #02 Infrastructure, Data Centers & Formats

PS #03 Antennas & Biases

PS #04 Troposphere & Ionosphere

PS #05 Real-time

13:30 – 15:00 Splinter meetings

Buffon amphi. Infrastructure, Data Centers & RINEX Working Groups

Room 317 Ionosphere Working Group

15:30 – 17:00 Splinter meetings

Buffon amphi. Multi-GNSS Working Group

Room 317 TIGA Working Group

17:00 – 18:30 Splinter meetings

Room 317 IGMA Working Group

Wednesday, July 5

08:30 – 10:00 Real-time

08:30-08:45 SSR Technology for scalable Real-Time GNSS Applications, *G. Wübbena, J. Wübbena, T. Wübbena, M. Schmitz*

08:45-09:00 A real-time clock combination supporting precise point positioning with ambiguity resolution, *S. Banville, D. Laurichesse*

09:00-09:15 BDS real-time precise products from WHU and its application in National BDS Augmentation Service System of China, *C. Shi, Y. Lou, M. Li*

09:15-09:30 Examples of IGS real-time Ionospheric information benefits: Space Weather monitoring, precise farming and real-time GIMs, *M. Hernández-Pajares, A. García-Rigo, D. Roma-Dollase, D. Laurichesse, M. Schmidt, E. Erdogan, Y. Yuan, Z. Li, J.M. Gómez-Cama, A. Krankowski*

09:30-09:45 Towards a flexible real-time and near real-time system for monitoring the troposphere, *J. Douša, P. Václavovic*

09:45-10:00 Real-time Precise Point Positioning supported with high-resolution troposphere models based on Numerical Weather Prediction, *T. Hadas, K. Wilgan, P. Hordyniec, J. Bosy*

10:30 – 12:00 Analysis Centers

10:30-10:45 Metadata project update, *F. Boler, G. Johnston*

10:45-11:00 CODE's Update of the Clock products, *A. Villiger, S. Lutz, A. Sušnik, L. Prange, S. Schaer, R. Dach, P. Stebler, A. Jäggi*

11:00-11:20 Hourly Updated Precise Orbit Products of Quad-constellation Satellites in IGS Analysis Center at Wuhan University, *Q. Zhao, H. Ma, X. Xu, J. Guo*

11:20-11:40 Impact of modern Earth orientation models on GPS precise orbit determination, *A. Sibois, S. Desai*

11:40-12:00 The ESA/ESOC Analysis Center Recent Activities, *T. Springer, E. Schoenemann, R. Zandbergen, W. Enderle*

13:30 – 14:15 Troposphere & Ionosphere – Part 2

13:30-13:45 SISTED & GSFLAI solar flare nowcasting products based on GNSS ionospheric monitoring, part of SSA's Ionospheric Weather ESC and ESA's MONITOR service, *A. García-Rigo, M. Hernández-Pajares, K. Kauristie, R. Orús-Pérez*

13:45-14:00 Improvement in the estimation of troposphere zenith delays using high-accuracy clocks, *K. Wang, M. Rothacher, M. Meindl, E. Schoenemann, W. Enderle*

14:00-14:15 A new zenith tropospheric delay grid product for real-time PPP applications over China, *W. Zhang, Y. Lou, J. Huang, H. Liang, F. Zheng, J. Liu*

14:15 – 15:00 Scientific Applications of IGS Products – Part 2

14:15-14:30 EPN-Repro2: a reference tropospheric dataset over Europe, *R. Pacione, A. Araszkiewicz, E. Brockmann, J. Dousa*

14:30-14:45 Constraints on Intra-Continental Strain Rates and Glacial Isostatic Adjustment from Thousands of GPS Velocities, *C. Kreemer, W.C. Hammond, G. Blewitt*

14:45-15:00 A review of recent advances in GNSS-MR, *S. Tabibi, T. van Dam, F.G. Nievinski, K.M. Larson, O. Francis, S. Williams*

15:30 – 18:00 Poster Sessions (Lamarck B, rooms 334 and 338)

PS #06 Analysis Centers

PS #07 Scientific Applications of IGS Products

PS #08 Orbit Modelling

PS #09 Reference Frame

PS #10 Timing

15:30 – 17:00 Splinter meetings

Buffon amphi. Real-time Working Group

Room 317 Antenna Working Group

Room 322 Troposphere Working Group

Thursday, July 6

08:30 – 10:00 Orbit Modelling

08:30-08:45 Next generation radiation pressure modelling for GNSS space vehicles – grid file model tests on GPS IIR, *M. Ziebart, S. Bhattarai, S. Grey, S. Allgeier, T. Springer, G. Tobías González*

08:45-09:00 Measuring GNSS Satellite Transmit Power, *P. Steigenberger, S. Thoelert, O. Montenbruck*

09:00-09:15 GLONASS Satellite Orbit Modelling, *R. Dach, A. Sušnik, A. Grahsl, A. Villiger, D. Arnold, L. Prange, S. Schaer, A. Jäggi*

09:15-09:30 Impact of improved GPS-IIF box-wing models on LEO orbit determination, *H. Peter, T. Springer*

09:30-09:45 Orbit/SRP Modelling for Long Term Prediction, *B.Polle, D. Sidorov, M.Sachot, R. Dach*

09:45-10:00 Improved modeling of GPS Block IIF satellites for the GSPM13 solar radiation pressure model, *C. Sakumura, A. Sibois, A. Sibthorpe, D. Murphy*

10:30 – 12:00 Reference Frame

10:30-10:45 Review of the IGS Contribution to the ITRF, *Z. Altamimi, P. Rebischung, L. Métivier, X. Collilieux*

10:45-11:00 The Impact of GNSS Data on JTRF2014, *R. Gross, C. Abbondanza, T.M. Chin, M. Heflin, J. Parker, B. Soja, X. Wu*

11:00-11:15 Evaluation of the IGS terrestrial frame solutions since the switch to IGS14/igs14.atx, *P. Rebischung, Z. Altamimi*

11:15-11:30 Reconciling GRACE derived loading deformation with GNSS station position time series, *K. Chanard, P. Rebischung, L. Fleitout, L. Métivier, X. Collilieux, Z. Altamimi*

11:30-11:45 Modeling environmental loading effects at the observation level in GPS processing, *J-P. Boy, A. Mémin*

11:45-12:00 Direct access to the ITRF, anywhere on Earth, *H. Boomkamp*

13:30 – 18:00 Poster Sessions (Lamarck B, rooms 334 and 338)

PS #06 Analysis Centers

PS #07 Scientific Applications of IGS Products

PS #08 Orbit Modelling

PS #09 Reference Frame

PS #10 Timing

13:30 – 15:00 Splinter meetings

Buffon amphi. Analysis Centers

15:30 – 17:00 Splinter meetings

Buffon amphi. Orbit Modelling Working Group

Room 317 Bias and Calibration & Clock Products Working Groups

17:00 – 18:30 Splinter meetings

Room 317 Communication

Friday, July 7

08:30 – 10:00 Timing

08:30-08:45 The Study of GNSS System Time Difference Monitoring, *J. Zhang, H. Yuan, W. Guang, W. Li, Z. Gao*

08:45-09:00 Calibration of DCBs in timing GNSS stations, *P. Defraigne, W. Huang*

09:00-09:15 Sub 10-16 frequency transfer with IPPP, *G. Petit, S. Loyer, F. Perosanz*

09:15-09:30 BeiDou and Galileo Carrier-Phase Time Transfer toward TAI Computation, *B. Sun, Y. Ge, M. Ouyang, L. Zhang, X. Yang, W. Qin, M. Wu, H. Yang*

09:30-09:45 GNSS space clocks assessment based on different IGS and MGEX data, *T.T. Thai, G. Signorile, I. Sesia*

09:45-10:00 Improved GNSS-Based Precise Orbit Determination by using highly accurate clocks, *A. Sušnik, R. Dach, K. Wang, M. Meindl, M. Rothacher, T. Romanyuk, I. Selmke, U. Hugentobler, Erik Schönemann, W. Enderle*

10:30 – 12:00 Closing Session – Working Group Recommendations

7. Poster presentations

PS01	**Multi-GNSS & Constellation Monitoring**
PS01-01	The positioning stability tests with the fixed inter-system biases on the Multi-GNSS kinematic PPP, *B.-K. Choi, S.J. Lee*
PS01-02	Estimation and analysis of the short-term variations of multi-GNSS receiver differential code biases using Global Ionosphere Maps, *W. Li, M. Li, Y. Yuan, N. Wang, B. Zhang, Z. Li*
PS01-03	Impact of ambiguity resolution on multi-GNSS real-time precise orbit determination, *Y. Liu, J. Geng, Y. Lou, C. Shi*
PS01-04	Disseminating GNSS attitude for improved clock correction consistency, *S. Loyer, S. Banville, F. Mercier, F. Perosanz*
PS01-05	Multi-GNSS orbit determination using 2-step PPP approach, *I. Selmke, U. Hugentobler*
PS01-06	Continuous information aided rapid orbit recovery for maneuvered BeiDou GEO satellites, *H. Su, B. Sun, Y. Wang, Z. Zhang, F. Cao, H. Yang, X. Yang*
PS01-07	Initial Results of the Precise Orbit Determination for the New-Generation BeiDou Satellites (BeiDou-3) Based on the iGMAS Network, *B. Tan, Y. Yuan*
PS01-08	BeiDou real-time satellite clocks generation based on connection of short-arc observation files, *M. Wu, B. Sun, Z. Zhang, H. Su, Z. Jia, X. Yang, H. Yang*
PS01-09	Suppression of GLONASS apparent fluctuation with a period of 8 days, *K. Sakai, S. Abe, N. Takamatsu, N. Ishikawa, K. Yamaguchi, Y. Kamakari, S. Kawamoto,, Y. Hiyama, Y. Hatanaka, H. Tsuji*

PS02	**Infrastructure, Data Centers & Formats**
PS02-01	GNSS in a Spectrum-Challenged Future: Adjacent Band Interference Impacts on High-Precision GNSS Receiver Performance, *F. Blume, H. Berglund*

PS02-02	GPS/GNSS Data and Metadata Services at the UNAVCO Data Center: Progress on RINEX3 Data Access and IGS Site Log XML Implementation, *F. Boler, D. Maggert, M. Rost*
PS02-03	Towards GNSS Services - The new Data Assessment and Monitoring Center of the GFZ, *M. Bradke, B. Männel, T. Nischan*
PS02-04	Improved Monitoring of GNSS Station Performance at the EPN Central Bureau, *C. Bruyninx, J. Legrand, A. Fabian*
PS02-05	REINFORCING THE U.S. NATIONAL GPS REFERENCE NETWORK, *K. Choi, D. Haw, F. Coloma, L. Sun*
PS02-06	Data quality control within large GNSS research infrastructures, *J. Douša, P. Václavovic, P. Bezděka*
PS02-07	DATA AVAILABILITY OF THE SENTINEL-1, -2, AND -3 SATELLITES, *J. Fernández, H. Peter, C. Fernández, P. Féménias*
PS02-08	Screening, Monitoring and Processing GNSS Data and Products at BKG, *M. Goltz, E. Wiesensarter, P. Neumaier, W. Söhne*
PS02-09	GFZRNX - RINEX GNSS Data Conversion and Manipulation Toolbox, *T. Nischan*
PS02-10	An Update on the CDDIS IGS Global Data Center, *C. Noll, P. Michael*
PS02-11	SONEL: Evolutions of the TIGA GNSS@TG Data Center, *E. Prouteau, M. Gravelle, G. Wöppelmann*
PS02-12	Real-time streaming from the Cloud: Geoscience Australia's data centre migration to Amazon Web Services, *R. Ruddick, B. Owen*
PS02-13	Availability and Completeness of IGS Tracking Data, *S. Schaer, L. Prange, A. Villiger, R. Dach, D. Arnold*
PS02-14	magicGNSS web service: 8 years of lessons learned from the GNSS Community, *G. Tobias, I. Rodríguez, J.D. Calle, P.F. Navarro*
PS02-15	The ESA/ESOC GNSS Station Network – Consolidating Performance and Expanding, *M. van Kints, J. Martin, I. Romero, W. Enderle*
PS02-16	GNSS Quality Control Improvements and Provider Performance Tracking at the Crustal Dynamics Data Information System (CDDIS), *J. Woo*

PS02-17	Current Status and Plan of KASI Global Data Center, *S.-M. Yoo, J. Cho*

PS03	**Antennas & Biases**
PS03-01	Group delay variations of GPS satellite antennas and their temporal stability, *S. Beer, L. Wanninger*
PS03-02	A new 6-axis robot for absolute antenna calibration at US National Geodetic Survey, *A. Bilich*
PS03-03	Study of satellite dependency of phase biases between receivers and between signals, *M. Håkansson*
PS03-04	Signal tracking analysis of (non) multi frequency GNSS antennas, *L. Huisman, H. van der Marel*
PS03-05	Determining GNSS Phase Biases by Common Clock Approaches, *T. Kersten, S. Schön*
PS03-06	BIAS VARIATION BETWEEN TWO CO-LOCATED GNSS RECEIVERS, *M.P. Olaniya, S. Yadav, P. Kandpal, P.P. Thorat, S. Panja, A. Agarwal, V.N. Ojha, K.S. Krishnan Marg*

PS04	**Troposphere & Ionosphere**
PS04-01	Pseudo ionospheric observable, cycle slip repair and STEC, *B. Arora, S. Melachroinos, T. Li*
PS04-02	Global trends and variability in integrated water vapor derived from IGS repro1 data, *O. Bock, A. Parracho, S. Bastin, F. Hourdin*
PS04-03	IGS Final Troposphere Product Update, *S. Byram*
PS04-04	The Adaptability of GPS / BDS Broadcast Ionospheric Model to Solar Activity, *N. Cheng, S. Song*
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