# GGOS Bureau of Networks and Observations

GGOS Coordinating Board Meeting
May 16, 2022

Mike Pearlman

IUGG

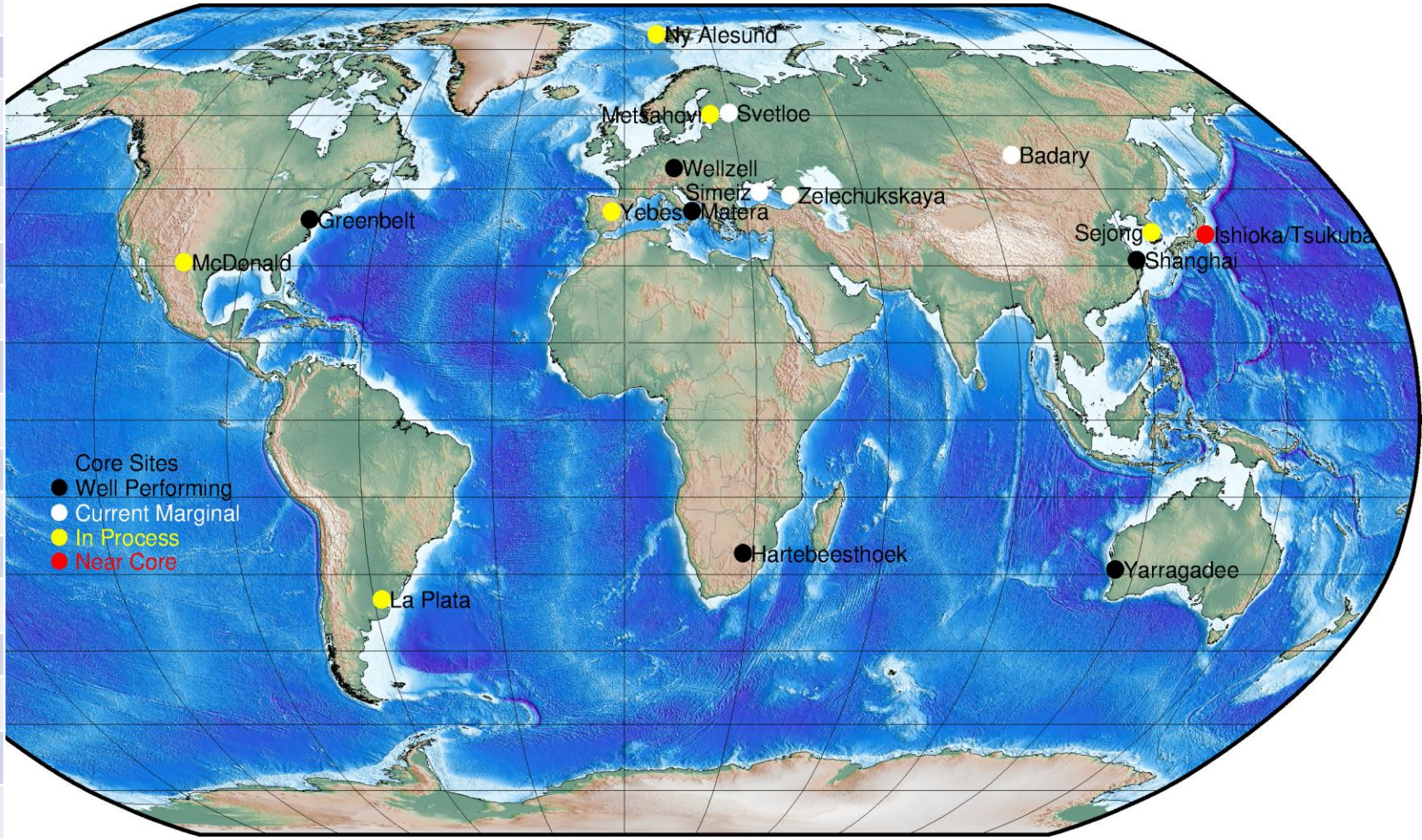
IAG GGOS Global Geodetic Observing System

# Role of the Bureau

- Advocate and encourage expansion and upgrade of the space geodesy network; Integrate non-geometric services into the network;
- Provide the opportunity for representatives from the Services and the Standing Committees to meet and share progress and plans; discuss issues of common interest; meetings at EGU, AGU, GGOS Days, etc.;
- Scope the required network and project network status in the future;
- *Develop a plan to fulfill the IAG network (with the UN GGIM)*

# CORE Sites

| Core Sites: Present and Planned | | | | |
|---|---|---|---|---|
| **Site** | SLR | | VLBI | |
| | SLR | Class | S/X | VGOS |
| **Badary (Russia)** | Operational | 2 | Operational | In process |
| **Greenbelt (Maryland)** | Operational | 1 | Operational | Operational |
| **Hartebeesthoek (South Africa)** | Operational | 1 | Operational | In process |
| **La Plata (Argentina)** | In process (2002) | | Operational | |
| **Matera (Italy)** | Operational | 1 | Operational | |
| **MacDonald (Texas)** | In process (2005) | | | Operational |
| **Metsahovi (Finland)** | In process (2002) | | Operational | In Process |
| **Ny Alesund Norway)** | In process (2004) | | Operational | In process |
| **Shanghai (China)** | Operational | 1 | Operational | Operational |
| **Simeiz (Crimea)** | Operational | 2 | Operational | |
| **Svetloe (Russia)** | Operational | 2 | Operational | In process |
| **Tsukuba/Ishioka (Japan)*** | In process (2023) | | Operational | Operational |
| **Wettzell (Germany)** | Operational | 1 | Operational | Operational |
| **Yarragadee (Australia)** | Operational | 1 | Operational | In process |
| **Yebes (Spain)** | In process (2023) | | Operational | Operational |
| **Zelenchukskaya (Russia)** | Operational | 2 | Operational | In process |
| ***Separated by ~ 20 Km** | | | | |
| **Class – Present level of performance** | | | | |



# International Laser Ranging Service

*Erricos Pavlis, Claudia Carabajal*

- Evaluation of ITRF 2020P complete, documentation in preparation
- Most significant SLR improvement in ITRF2020 is the scale agreement with VLBI, at **0.28 ppb or 1.8 mm** level (**ITRF2014 was at 1.4 ppb or 8.8 mm**);
- New Data Handling file in preparation, consistent with the yet to be released SLR version of ITRF2020 (SLRF2020);
- 8 - 10 new SLR stations anticipated over the next several years; significant delays due to the pandemic, importation delays, and funding issues;
- Significant void in Southern Hemisphere;
- Virtual station tours replaced Workshops in 2020 and 2021. In **2022 ???**

**Current and Planned ILRS Network**


**Expected in 2022**

- La Plata
- San Juan
- Metsahovi
- 2nd SLR at Mendeleevo
- 2nd SLR at Irkutsk

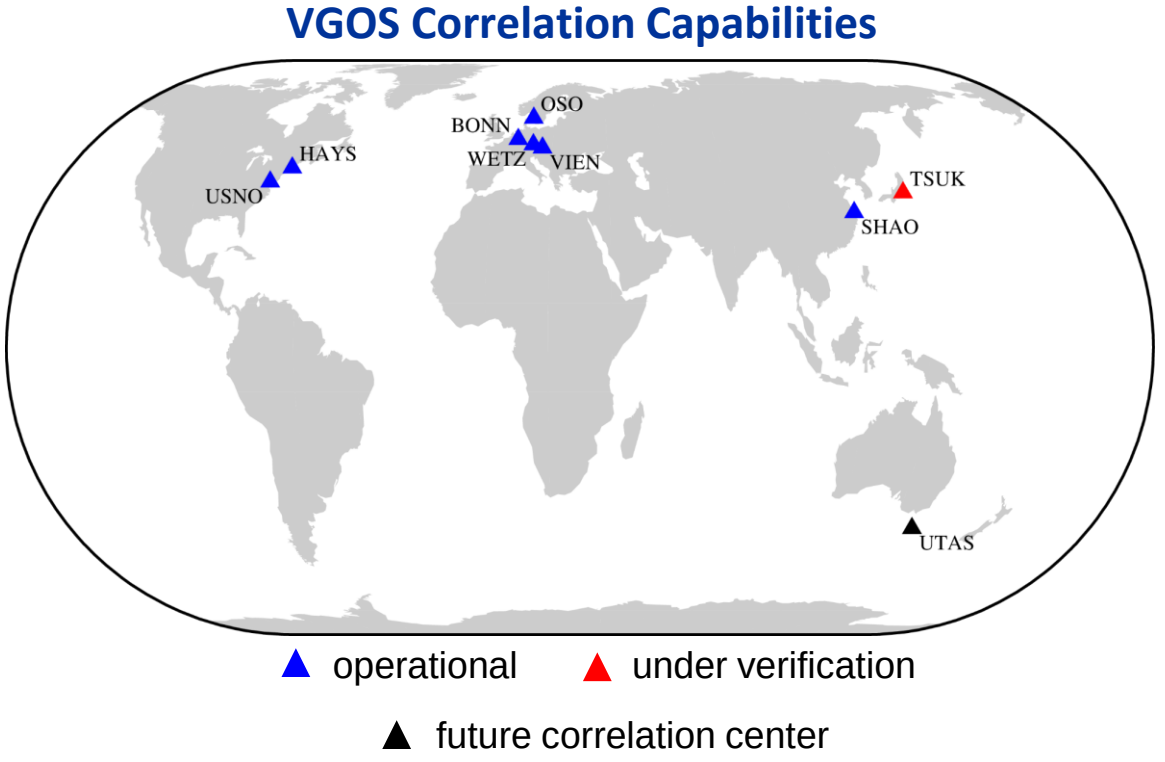
**Sites in process**

- NASA Sites
- Russian Sites
- Indian Sites
- Yebes
- Tsukuba

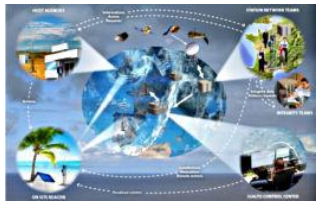
# International VLBI Service for Geodesy and Astrometry (IVS)

*Dirk Behrend*

- VGOS infrastructure buildout is progressing: station network will grow to up to 16 stations by the end of 2022; correlators capable of processing VGOS data increased to currently 7 from just one a couple of years ago;
- First southern hemisphere stations to become part of VGOS observing network;
- 4th VLBI Training School: successfully held in Finnish Cyberspace with ~120 participants;
- 12th General Meeting: successfully held in Finnish Cyberspace with ~175 participants.



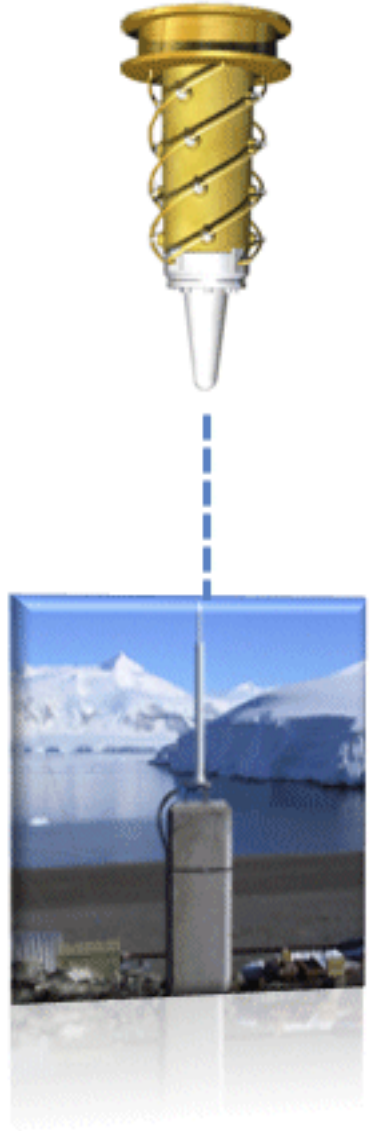

- Next General Meeting: Tsukuba, Japan in March 2024; 25th IVS Anniversary



# International DORIS Service (IDS)

*Jerome Saunier*

- Network:
  - in 2020-2021 efforts focused on maintaining the required level of service (more than 80% of the stations in operation)
  - 2022 should see 3 new DORIS sites in Gavdos (Greece), Katherine (Australia) and Hanga Roa (Chile)
  - A Call for interest in hosting a DORIS station issued 27 April
  - 4th generation beacon deployment: 22 stations equipped (over 59)
- Constellation: 8 DORIS-equipped satellites; next to be launched: SWOT (Nov. 2022)
- Contribution to ITRF2020: significant improvement over ITRF2014 IDS contribution
  - see Bogusz, J., Klos, A., and Moreaux, G.: Assessment of IDS contribution to ITRF2020, EGU General Assembly 2022, Vienna, Austria, 23–27 May 2022, EGU22-3417
- IDS events:
  - DORIS Days 2021 (Nov. 16-18): real success for this first event aiming at introducing DORIS to beginners
  - IDS Workshop will take place from Oct 31 to Nov 2, 2022 in Venice, Italy



# International GNSS Service

*Allison Craddock*

- First three “Tour de l’IGS” virtual technical mini-workshops were a success; all presentations are available for viewing on the IGS YouTube Channel.
- IGS contribution to ITRF2020 submitted, included estimate of scale, made possible by the release of Galileo Satellite Phase Center values as well as the availability of receiver antennas that are calibrated for Galileo.
- IGS Analysis Center Coordinator continues to work on developing Multi-GNSS combinations.
- Constellations, new IGS quarterly newsletter, launched.
- The next IGS Workshop will take place virtually 27 June to 1 July 2022, virtually hosted by Boulder Colorado-based UNAVCO and UCAR. Registration and information is available on the IGS website: IGS.org

# International Gravity Field Service (IGFS)

*Riccardo Barzaghi*

- Implementation of the IHRS/IHRF: network design, theory and methods for estimating W(P) (together with GGOS Focus Area on Unified Height System and GGOS BNO)
- Co-operation in the establishment of the new International Gravity Reference Frame (together with IAG JWG 2.1.1, GGOS BNO&BPS, Commission 2, ICCT, IERS Committee on EGV)
- Geoid/Quasi-geoid modelling for the realization of the geopotential height datum (together with IAG JWG 2.2.1, Commission2, GGOS, ICCT)

# Permanent Service for Mean Sea Level

*Elizabeth Bradshaw*

- Looking for novel ways to increase global sea level data.
- Detailed update on tide gauge observations for the GGOS website, highlighting the importance of co-locating tide gauges with other geodetic sensors that measure land movement.
- The GNSS-IR (Infrared Reflectometry to GNSS ground receivers) portal created as part of the EuroSea project is now live; distributes sea level data from over 250 global GNSS receivers.
- Created an interactive planning tool allowing users to determine the best place to install a receiver at any location for water level data.
- 3,800+ volunteers finished digitizing 100 years of tide gauge data from the UK Tides Citizen Science Zooniverse project; plan to publish the data with an evaluation.
- Funded to coordinate an IAPSO Best Practice Study Group on water level tidal analysis; will host an open workshop, possibly alongside the IUGG General Assembly.

# Performance Simulations and Architectural Trade-Offs (PLATO)

*Daniela Thaller, Benjamin Maennel*

- Simulation study on possible extension of Australian SLR network (DGFI/TUM).
- Simulation study on differential LLR (IfE, Hannover).
- Simulation study on VLBI observation to Galileo satellites (TU Vienna)
- Simulation studies on future GNSS constellation (GFZ, TU Berlin) as well as GNSS+LEO processing to derive phase center offsets and terrestrial scale (GFZ).
- Contributing to the ESA mission GENESIS-1;  geodetic satellite program, with missions scheduled for each 3 - 4 years; discussion underway with member states; The first mission scheduled for launch in 2027 will be a co-location in space mission (like the proposed GRASP and E-GRASP mission).

# Standing Committee on Missions

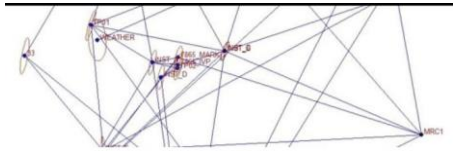
*Roland Pail, C.K. Shum*

- Advocate, coordinate, and exchange information with approved and ongoing satellite missions to support GGOS goals.
- Archiving and updating GGOS information for relevant proposed, planned and operating satellite missions.
- Support proposals for new mission concepts and advocate for needed missions.
- Advocate for and support future gravity field missions, by providing material and taking part in current and future studies that support the realization of such concepts.
- Scientific support of the the joint ESA/NASA satellite gravity constellation Mass-change And Geosciences International Constellation (MAGIC).

# Standing Committee on Data and Information Systems

*Nick Brown, Sandra Blevins*

- Global initiative to develop a meta data system for Findable, Accessible, Interoperable and Reusable (FAIR) geodetic data.
- GeodesyML as an international standard.
- Development of metadata profiles; metadata requirements for specific industries which use geodetic data.
- Demonstrate the feasibility of using different protocols, for the dissemination of real-time GNSS data and product streams.
- Work continues at CDDIS on collection-level metadata efforts.



# IERS Working Group on Ground Survey and Co-location

*Ryan Hippenstiel*

- Reinvigorating the working group through meetings (most recent on April 5, 2022); sharing thoughts and presentations, and members contributing to ITRF2020; New members and new countries;
- Members submitted tie surveys to IERS for inclusion in ITRF2020.
- Members have continued to conduct tie surveys, improve protocols, and research potential collecting additional set of data, specifically deflection of the vertical observations using exiting robotic total stations;
- Within the joint project GeoMetre, members determined the reference point of the Wettzell SOS-W SLR telescope), using applied close-range photogrammetry instead of a polar measurement system.
- Continued investigating DoV capabilities during tie surveys, especially with developments in observing DoV with existing robotic total stations.