

# IAG Sub-commission 1.2 Global Reference Frames 2015-2018

Chair: X. Collilieux

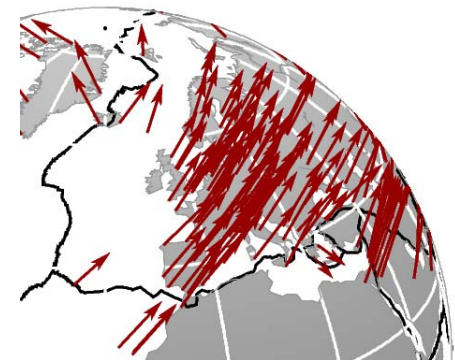


# SUB-COMMISSION 1.2

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## ■ Context

- Non constant/stationnary site motion in CM/NNR frame (modeling vs time series approach)
  - Forward modeling (loading, seismic) and parametric model
  - Space ties and time series approach, accurate tie needed for validation and monitoring
- Relativistic reference frames (from new GNSS design) and difference of potential measurements by atomic clocks
- Terrestrial reference system (TRS) and its link to world height system (WHS)



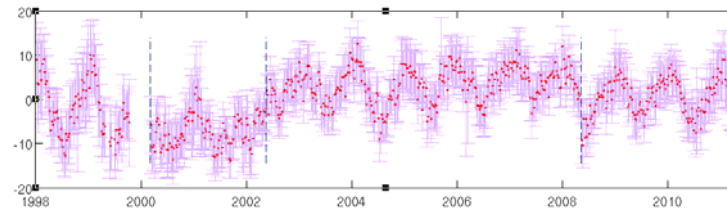
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- **THE MAIN OBJECTIVES OF SUB-COMMISSION 1.2 ARE THE FOLLOWING:**
  - Standardization activities: ISO, IERS conventions
  - Definition of the global terrestrial reference frame (origin, scale and orientation, time evolution, standards, conventions, models);
  - Linking Global height system with the terrestrial reference frame
  - Methods to determine local tie vectors
  - Evaluation of systematic errors by focusing on errors at co-location sites and offset detection methods
  - Enhanced Forward modeling of the Earth's deformation
  - Impact of multi-technique satellites (space ties)
  - Modeling of the reference frame in general relativity

## SUB-COMMISSION 1.2

- **WG1 Offset Detection in Geodetic Coordinate Time Series.**  
Simon Williams (England)



- Objectives: to encourage cooperation between different groups in the geodetic community to contribute, investigate and disseminate different offset detection methods
  - Identify and provide offset detection methods for the use of the community, including code
  - provide a realistic benchmark dataset(s) on which to test their efficacy (successor to the DOGEx)
  - Evaluate the validity of alternative velocity estimation methods that may be less biased by undetected offsets particularly in the context of a DOGEx follow on.
  - Provide guidelines and advice on offset detection in geodetic coordinate time series.
  - Foster and establish interactions with other areas of science for which offset detection is also an issue to identify different approaches to the problem.

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### **WG related to the sub-commission topic**

- **JWG 1.1 Working Group on Site Survey and Co-location.** Sten Bergstrand (Sweden)
- **JWG 1.2 Modelling environmental loading effects for Reference Frame realizations.** T. van Dam (Luxembourg), A. Mémin (France)
- **JWG 1.3 Definition of next generation terrestrial reference frames.** C. Kotsakis (Greece)
- **JWG 1.4 Working group on performance simulations and architectural trade-offs (Plato).** D. Thaller (Germany), R. Gross (USA)
- **JWG 1.5 Strategy for the Realization of the International Height Reference System (IHRIS).** L. Sanchez

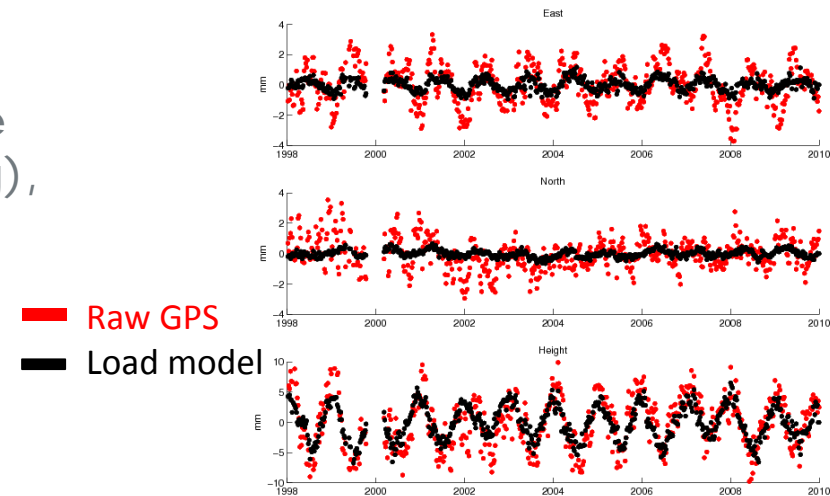
# SUB-COMMISSION 1.2

- JWG 1.2 **Modelling environmental loading effects for Reference Frame realizations.** T. van Dam (Luxembourg), A. Mémin (France)

- Link with SC1.2
  - Input data / Forward modeling

- Summary of the objectives

- Compare and assess differences between existing load models for a given effect
- Develop forward model of ice loading at high latitudes
- Monitor geocenter motion variations to identify possible accelerations
- Maintain a bibliography on the available models and their evaluation.
- Assessment of the propagation of loading model errors into the site coordinates and the ITRF.
- Define whether models should be applied at the observation level or in the post-processing.
- Tie results/findings to IERS conventions.



# SUB-COMMISSION 1.2

- **JWG 1.3 Definition of next generation terrestrial reference frames.**

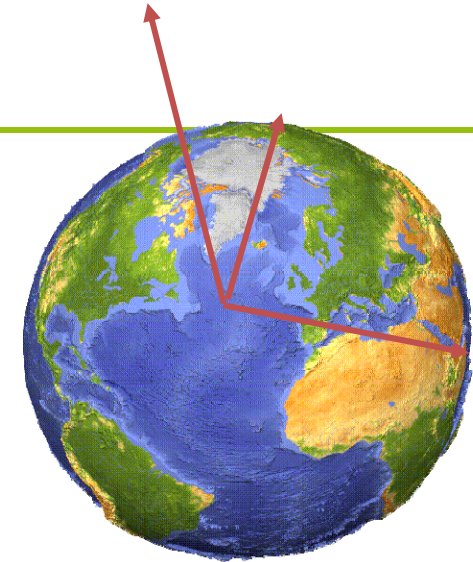
C. Kotsakis (Greece)

- Link with SC1.2

- obvious

- Summary of the objectives

- To review and compare from the theoretical point of view the current approaches for the definition and realization of global TRFs
- To investigate the modeling choices for the datum definition in global TRFs with particular emphasis on the frame orientation and the different types of no-net-rotation (NNR) conditions.
- To evaluate the distortion caused by hidden datum information within the unconstrained normal equations (NEQs) to combination solutions by the “minimum constraints” approach, and to develop efficient tools enforcing the appropriate rank deficiency in input NEQs when computing TRF solutions.
- To study the role of the 7/14-parameter Helmert transformation model in handling non-linear (non-secular) global frames
- To study theoretical and numerical aspects of the stacking problem, both at the NEQ level and at the coordinate time-series level, with unknown non-linear seasonal terms when estimating a global frame from space geodetic data.
- To compare the aforementioned methodology with other alternative approaches in non-linear frame modeling, such as the computation of high-rate time series of global TRFs.



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- JWG 1.5 **Strategy for the Realization of the International Height Reference System (IHRF).**

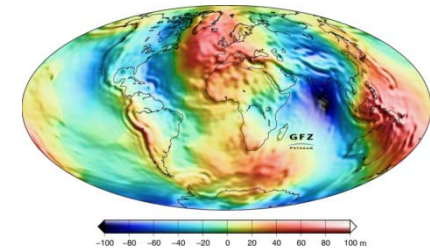
L. Sanchez

- Link with SC1.2

- Co-location issues with current ITRF sites could be discussed
- Time-variation of gravity and vertical motion can be related
- ITRF position for atomic clock (future of global height system realizations?)
- In a general relativity framework, gravity and geometry are related

- Summary of the objectives

- To define the standards and conventions required to establish an IHRF
- To model the time-dependent changes of the vertical coordinate
- To formulate minimum requirements for the IHRF reference stations.
- To develop a strategy for collocation of IHRF reference stations
- To identify the geodetic products associated to the IHRF
- To review the processing strategies for the determination of the potential values WP
- To review different approaches for the vertical datum unification and to provide guidance for the integration of the existing local height systems into the IHRF.
- To make a proposal about the organizational and operational infrastructure required to maintain the IHRF and to ensure its sustainability.





## SUB-COMMISSION 1.2

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### **Sub-commission representatives in other WGs**

- **JWG 2.3 Relativistic Geodesy: First steps towards a new geodetic technique.** SC1.2 representative: P. Delva (France)
- **GGOS WG ?? Working group on ITRS standards.** SC1.2 representative: C. Boucher (France)
- ~~A representative of UN-GGIM GGRF (to be defined) will report the working group activity to SC1.2~~



## SUB-COMMISSION 1.2

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- **JWG 1.1 Working Group on Site Survey and Co-location.** Sten Bergstrand (Sweden)



- Link with SC1.2
  - Input data / validation
- Summary of the objectives
  - Revise existing local tie procedures
  - Revise existing tie vector estimation processes
  - Develop and define new methods



## SUB-COMMISSION 1.2

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- **JWG 1.4 Working group on performance simulations and architectural trade-offs (Plato)**. D. Thaller (Germany), R. Gross (USA)
- Link with SC1.2
  - Space tie issue
- Summary of the objectives
  - Perform simulations to determine the best network configuration to reach 1mm and 0.1 mm/yr accuracy
  - Perform simulations to study the effect of station loss
  - Perform simulations to study the effect of adding space ties and its required accuracy