Early results on the validation of the horizontal velocities from the cumulative solution based IDS 09

Guilhem Moreaux

Context and Objectives

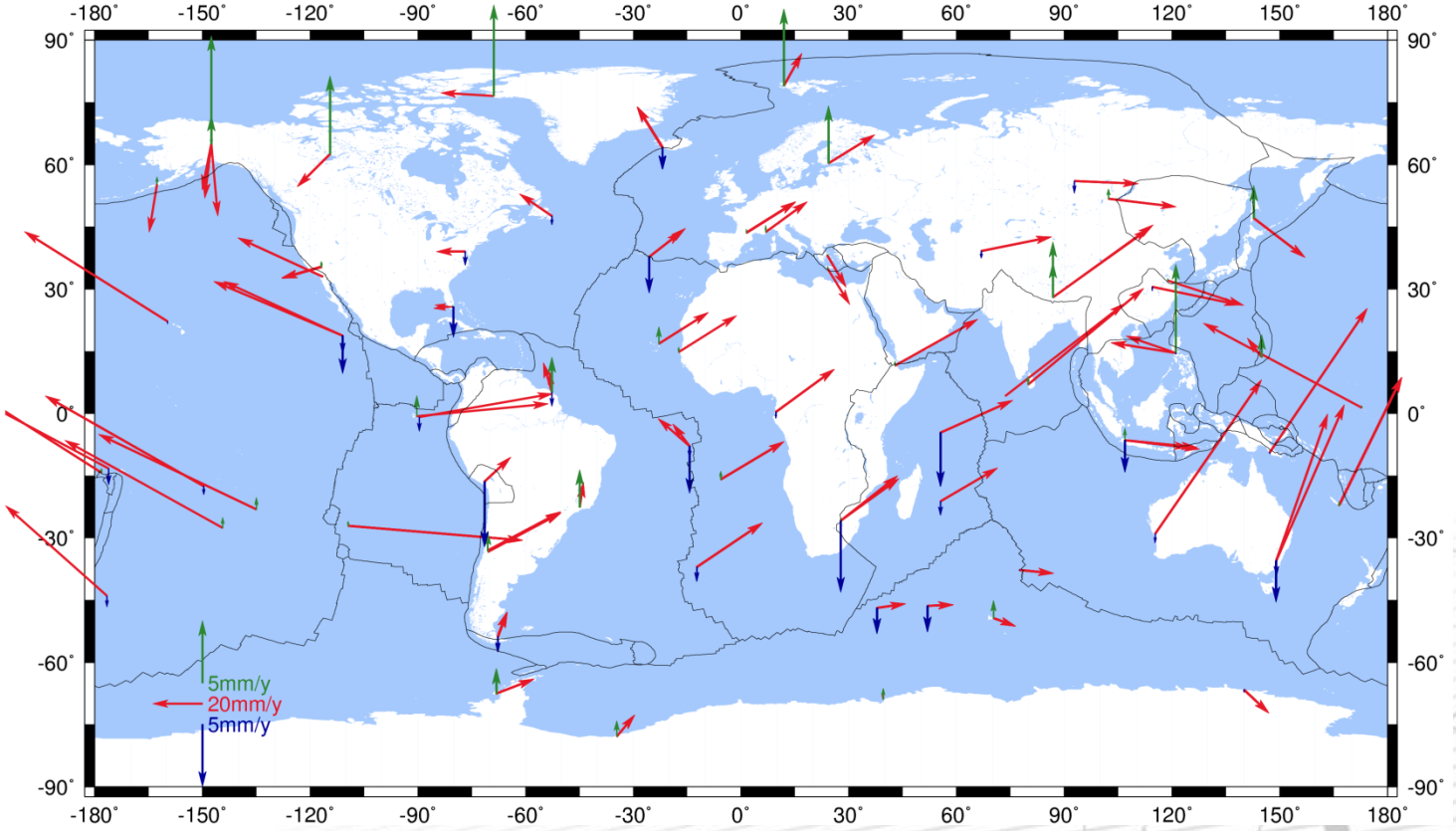
- **Construction of a cumulative position and velocity solution is part of the internal validation process of the IDS contribution to ITRF2014.**

- **In addition and in response to P. Willis during last AWG in Toulouse, the IDS agreed to take over from Pascal the DPOD activities.**

➔ **IDS CC has and will have to compute cumulative solutions**

➔ **As it is a new task for the IDS CC, the very first solution must be validated by comparison to external models.**

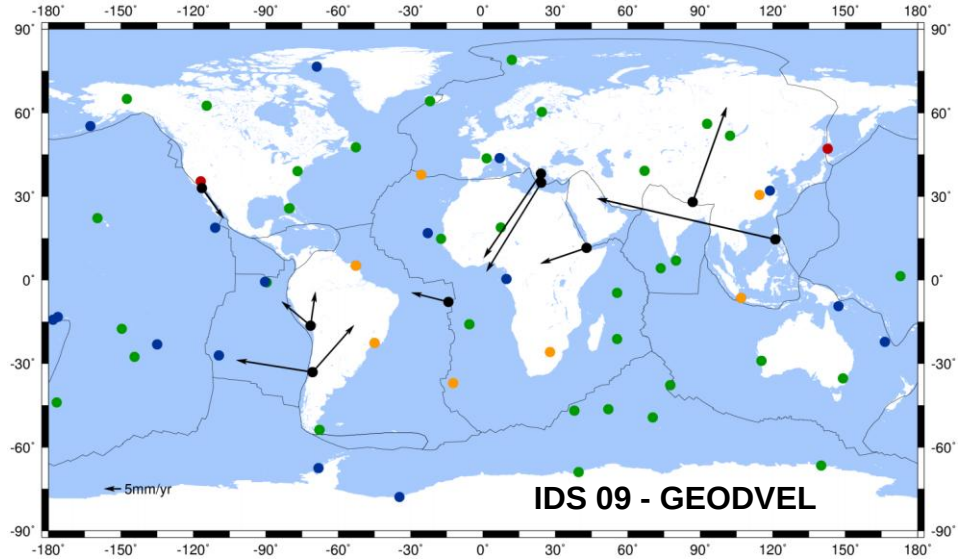
Horizontal Velocities from IDS-TRF2014

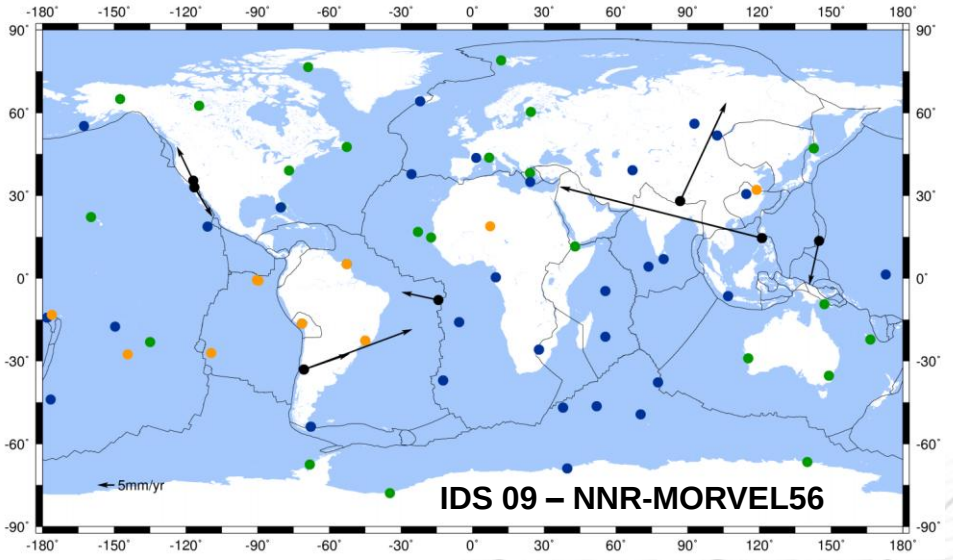


- ❑ **IDS 09 (resp. IDS 03) includes 57 (resp. 53) discontinuities in position**
  - ✓ **Concern 30 (resp. 28) over 71 DORIS sites.**
  - ✓ **25 (resp. 14) with seismic origin.**
  - ✓ **8 (resp. 06) with beacon or antenna origin (ex: USO change).**
  - ✓ **24 (resp. 33) with unknown origin.**

http://ids-doris.org

Comparison of Horizontal Velocities
IDS 09 vs GEODVEL & NNR-MORVEL56





Green: 0.0-2.5mm/yr – Blue : 2.5-5.0mm/yr – Orange: 5.0-7.5mm/yr – Red: 7.5-10mm/yr – Black > 10mm/yr

GEODVEL (GEODesy VELocity – Argus et al. 2010)

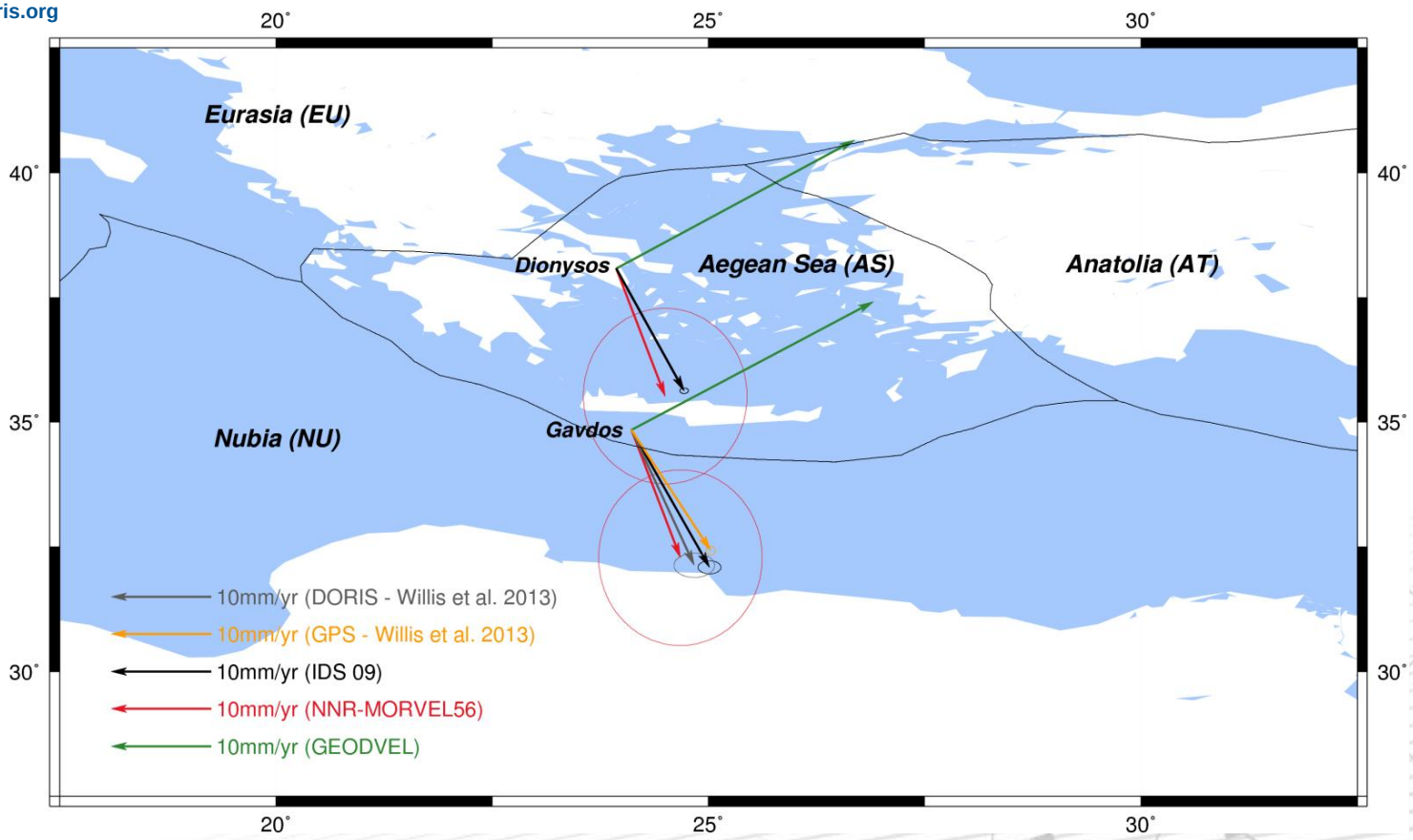
- **11 plates.**
- **Data: DORIS, GNSS, SLR, VLBI.**
- **Data Time Span: 1976 -2007.**
- **DORIS contribution from IGN AC.**
- **RMS of differences:**
  - **North: 6.2 mm/yr**
  - **East: 10.3 mm/yr**

NNR-MORVEL56 (Argus et al. 2011)

- **56 plates.**
  Extension of the MORVEL model (25 plates).
- **Geologic data.**
- **Data Time Span: -3 200 0000 / -780 000 yr.**
- **RMS of differences:**
  - **North: 5.4 mm/yr**
  - **East: 11/.1 mm/yr**

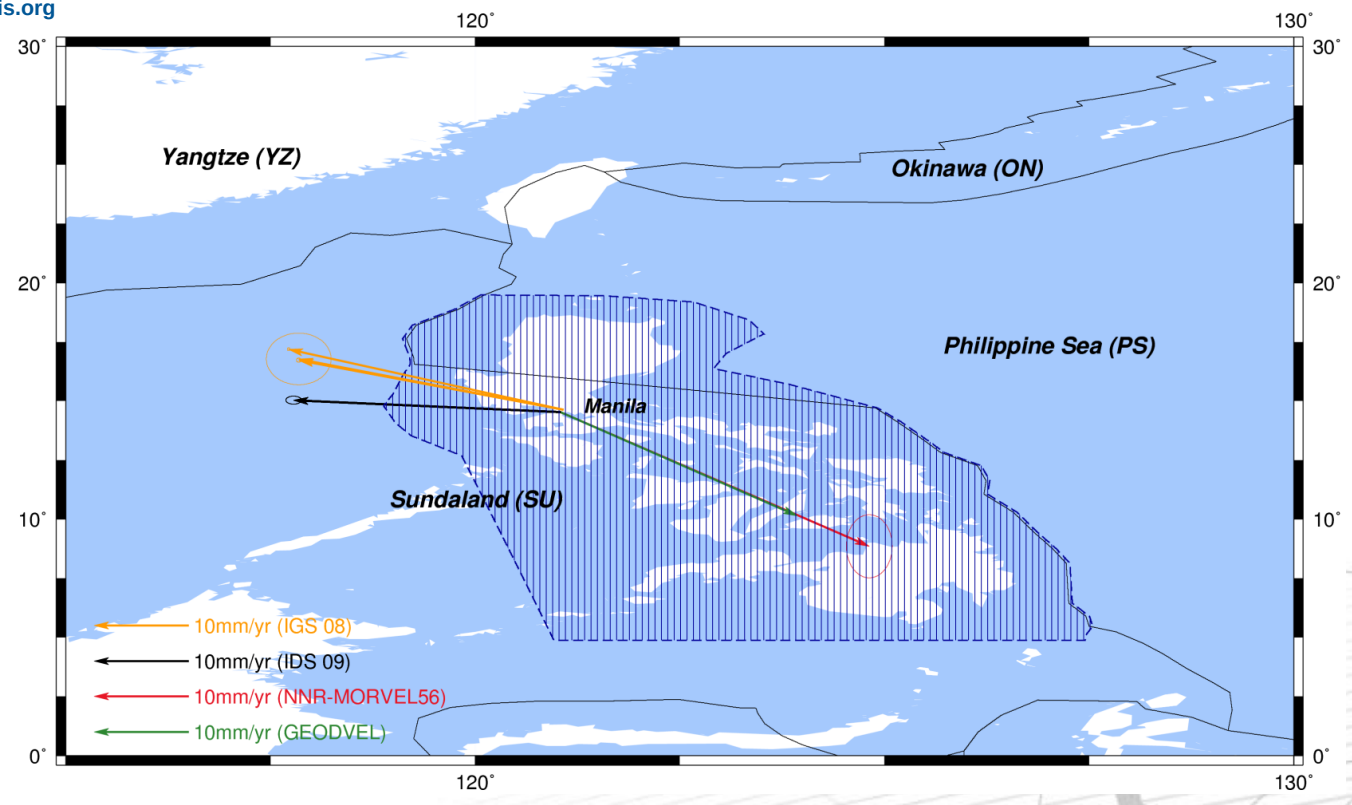
Highest differences occur in plate boundaries or in seismic active zones. Nevertheless…

Horizontal Velocities – Dionysos and Gavdos



- **DORIS estimations are coherent with NNR-MORVEL56 and Willis et al. (2013) ones.**
- **DORIS also shows a SW motion of the Aegean Sea relatively to Eurasia at a spped of 30mm/yr.**
- **GEODVEL default is due to no Aegean Sea plate in the model so for that model the motions of Dionsysos and Gavdos are modelized by the Eurasia parameters.**

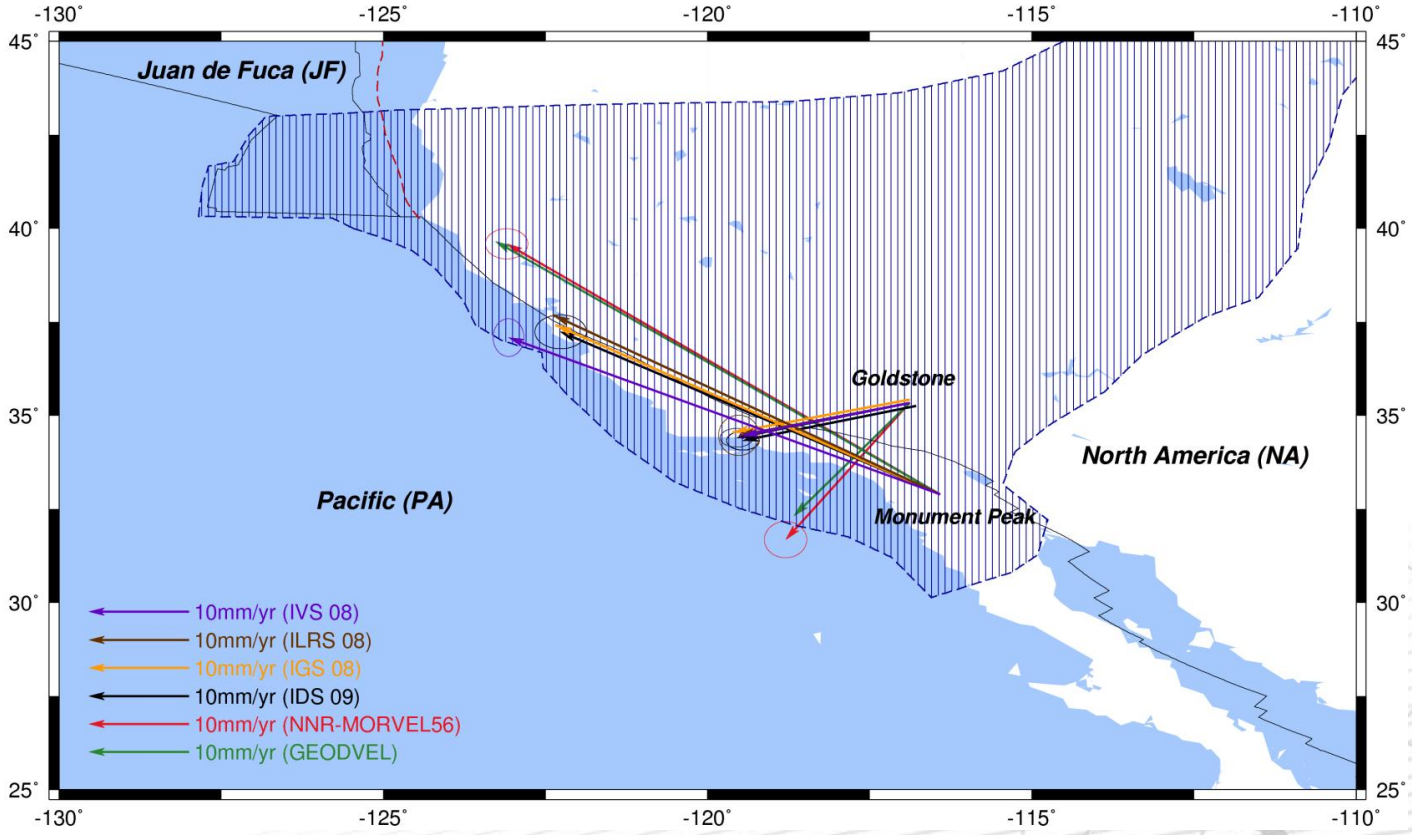
Horizontal Velocities - Manila



- ❑ **DORIS velocity differ very much (in direction mainly) from both GEODVEL and NNR-MORVEL56 estimations.**
- ❑ **DORIS estimate is similar to the GPS PIMO site (10km NE from MANA-MANB) as extracted from IGS 08.**
- ❑ **Bird (2003) ➔ Manila belongs to the Philippines orogen zone.**
  - **➔ Orogen must explain MORVEL and NNR-MORVEL56 defaults.**
- ❑ **DORIS velocity is also compatible with GPS LAOA estimations from Rangin et al. (1999)**

➔ counter-clock rotation of Luzon block / Sundaland.

Horizontal Velocities – Goldstone & Monument Peak



- **Goldstone and Monument Peak are located to the east and to the west of the Pacic-N. America plate boundary (the San Andreas Fault).**
- **DORIS velocities are similar to GNSS, Laser and VLBI estimations as extracted from ITRF2008.**
- **DORIS estimations differ from the plate models in direction for Goldstone and amplitude for Monument Peak.**
- **Next: comparison to dense GPS network estimations.**

Preliminary Conclusions

- **IDS 09 horizontal velocities show good agrement (differences smaller than 5mm/yr) with the two models for most of the beacons.**

- **Larger differences occur at plate boundaries or in active seismic areas.**

- **Some differences can be explained and external comparison show that IDS 09 estimations are realistic.**

What's next ?

- **Rotation parameters of some plates will be estimated when possible.**

- **IDS 09 vertical velocities will be compared to GIA models and to GNSS ULR6 (La Rochelle University) estimations at coastal sites. Sites like Thule will be of special concern.**

- **That study is planned to be published as a paper with Frank, Laurent, Pascal, Donald Argus, Alvaro Santamaría-Gómez and Médéric Gravelle as co-authors.**
- **The results will also be presented during next AGU as poster #64285 on December 15th in section G23B.**

- **IDS 09 velcoities will be compared to ITRF2014 solutions from DGFI, IGN and JPL.**

- **IDS 09 cumulative solution will serve as reference for the future DPOD solutions.**