

DORIS Contributions to Integrated Earth Monitoring

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6. Collecte Localisation Satellites
7. Jet Propulsion Laboratory

- Earth and space colocations
- Current performance
- Near future expectations

The DORIS-equipped fleet

Orbital colocations

- (Image taken from the IDS web site)
- **Doris - SLR - GPS:**
Topex/Poseidon
- **Doris - SLR - GPS:**
Jason 1
- **Doris - SLR:**
Envisat

Precise orbitography

Jason orbit overlapping (6h/30h)

(preliminary POD results)

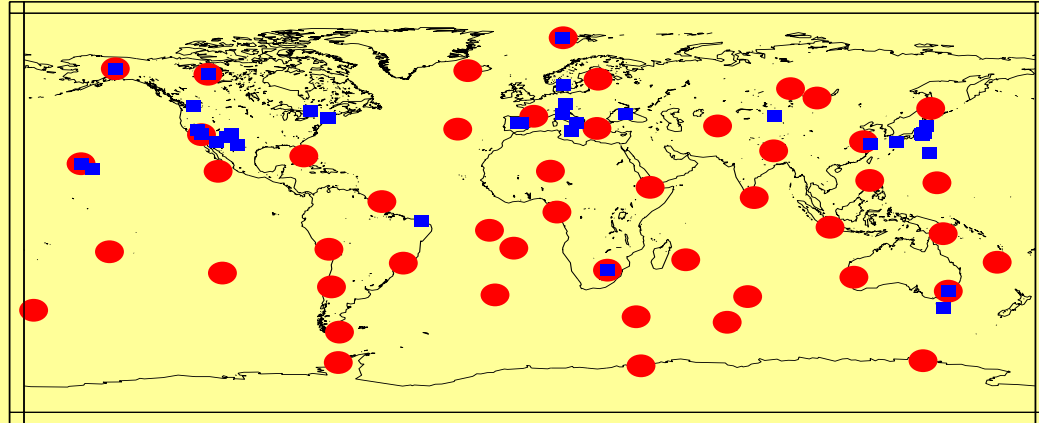
Radial rms agreement (mm)

Doy 2002	GPS	GPS+DORIS	DORIS
	(May 3rd)		(May 22nd)
84	16	11	11
85	8	9	8
86	13	10	8
87	11	6	6
88	7	5	25
89	17	12	37
90	12	8	14
91	15	8	8
92	14	13	19
93	12	9	9

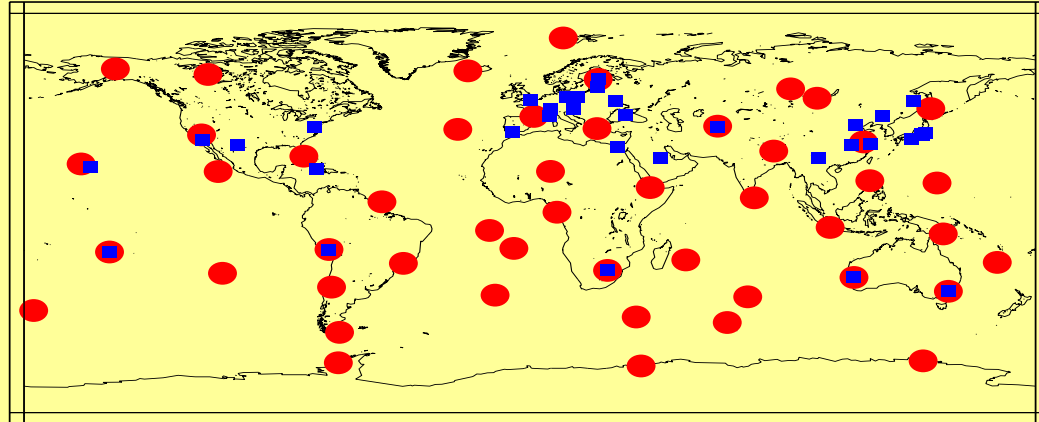
Source: P. Willis, JPL-IGN

The DORIS terrestrial network and the ITRF

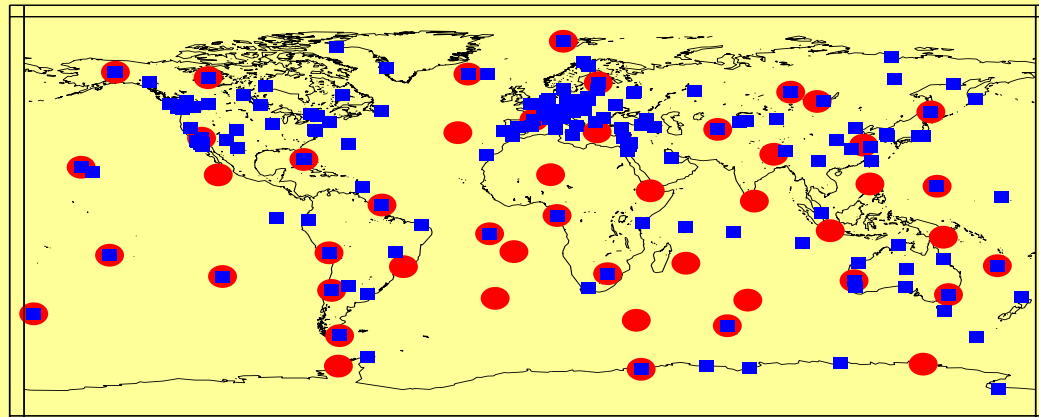
DORIS-VLBI Collocations



DORIS-SLR Collocations



DORIS-GPS Collocations



source:

Zuheir Altamimi, IGN

Geometry of ITRF colocations

Helmert transformation: correlation coefficients of Translations (Tx,Ty,Tz) with Scale and Rotations (Rx,Ry,Rz)

VLBI & other 3 tech. (41 sites)

	Scale	Rx	Ry	Rz
Tx	.03	-.07	-.52	-.32
Ty	.30	.56	.04	.08
Tz	-.45	.39	-.01	.03

SLR & other 3 tech. (37 sites)

	Scale	Rx	Ry	Rz
Tx	-.24	-.13	-.52	-.28
Ty	.18	.44	.05	-.24
Tz	-.39	.28	.37	.08

GPS & other 3 tech. (63 sites)

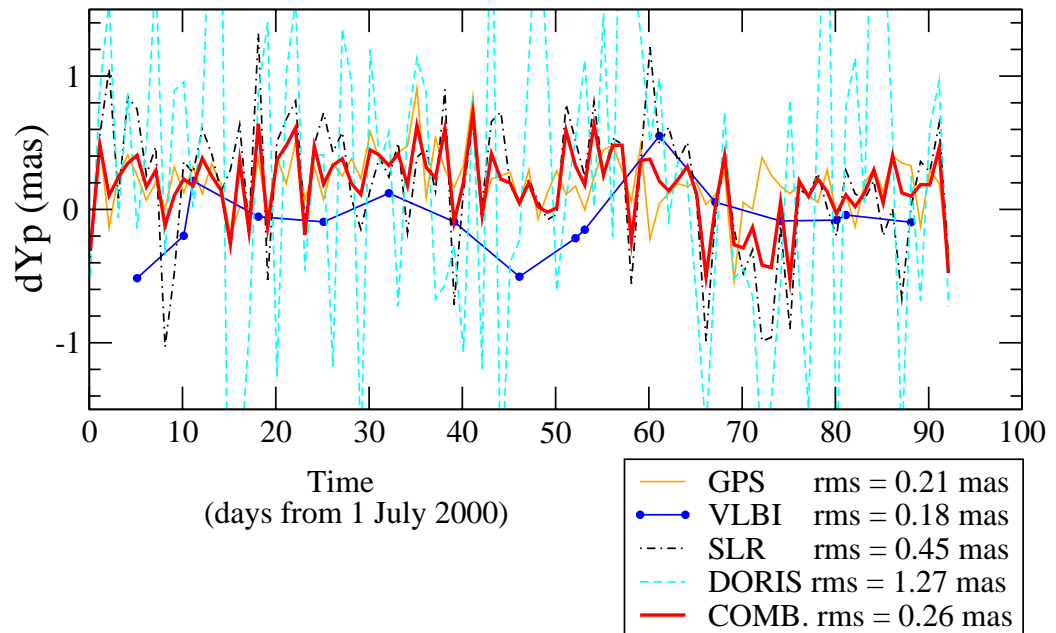
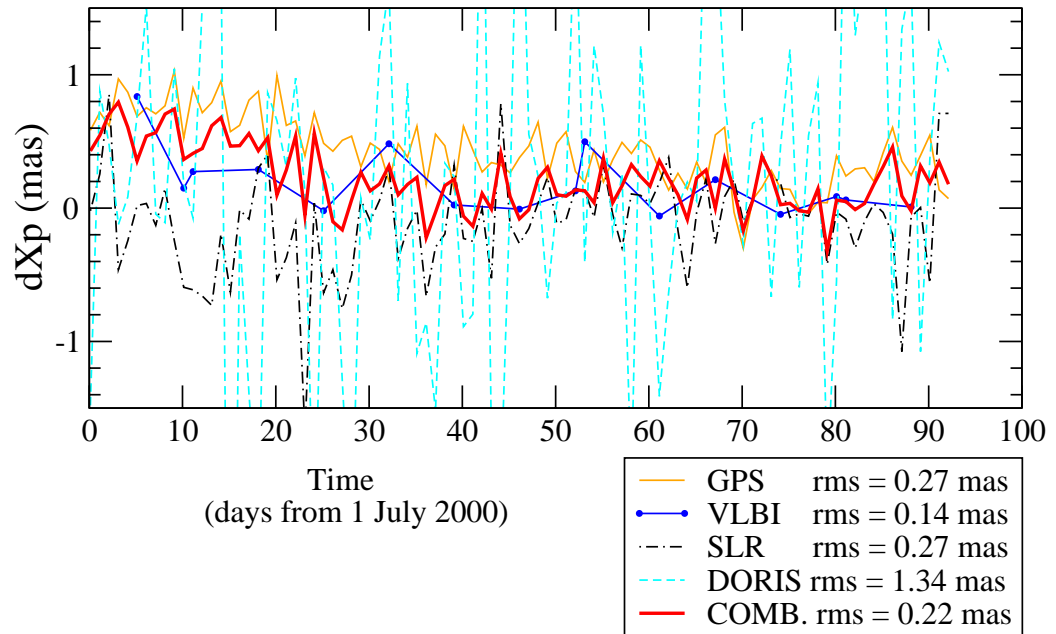
	Scale	Rx	Ry	Rz
Tx	-.10	-.04	-.31	-.11
Ty	.10	.32	.03	-.09
Tz	-.27	.14	.13	.01

DORIS & other 3 tech. (24 sites)

	Scale	Rx	Ry	Rz
Tx	-.06	-.01	.04	-.09
Ty	.07	-.05	.00	-.08
Tz	.03	.08	.08	.01

Polar motion

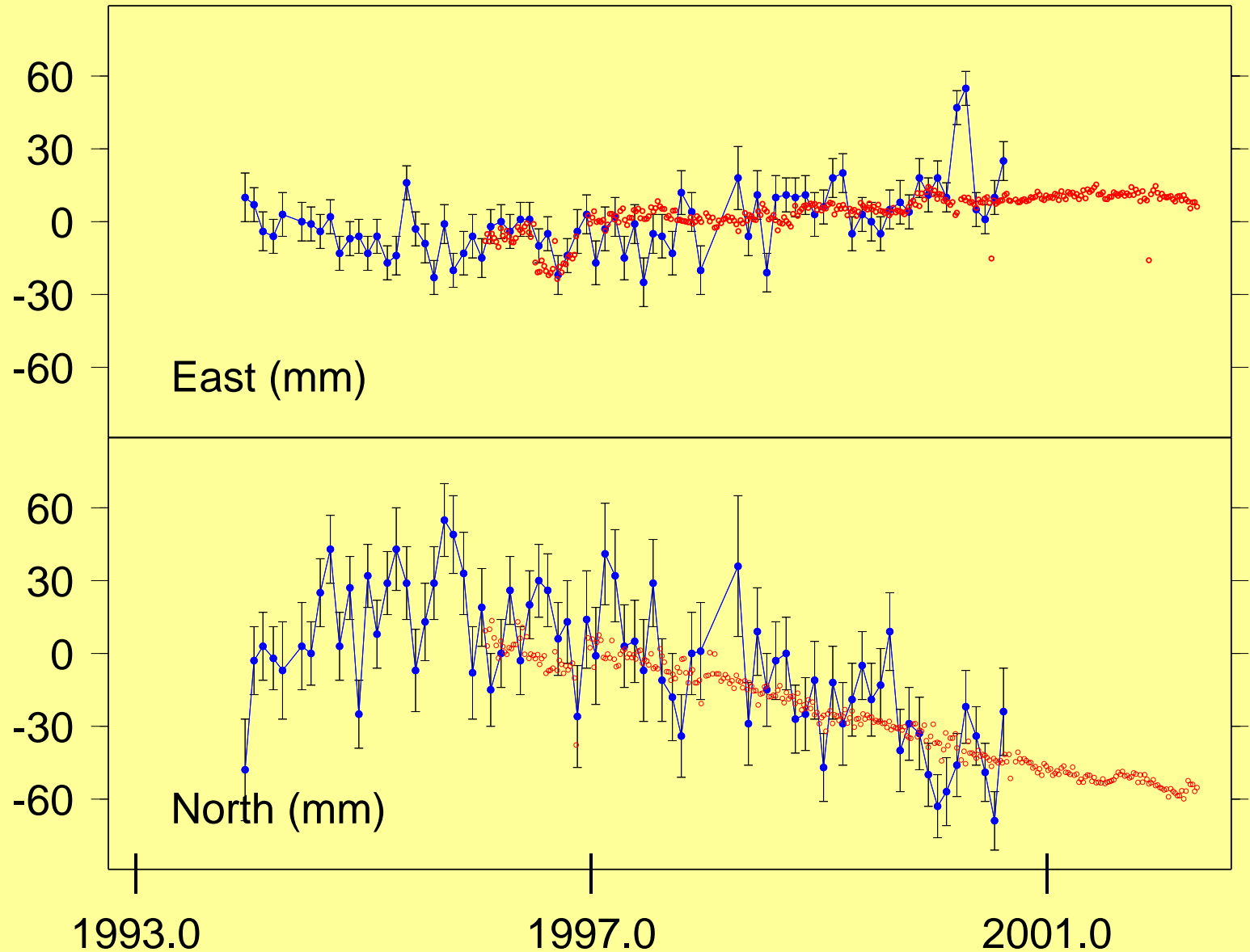
RESULT OF THE COMBINATION (24h concatenation from 6h resolution)



- source: Philippe Yaya, Obs. Paris - GRGS

Horizontal motion: GUAM

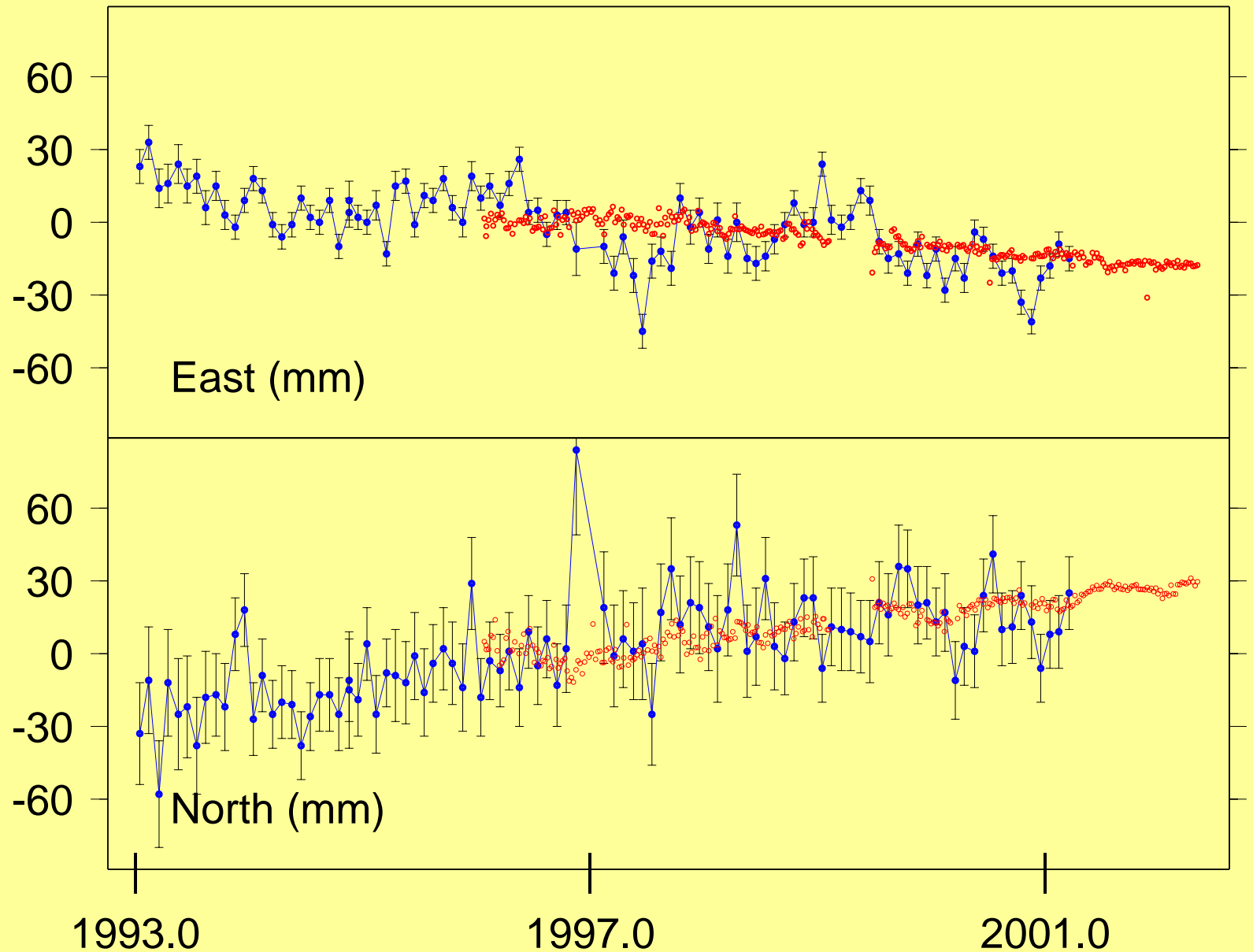
GUAM: DORIS (blue with error bars) and GPS (red) coordinates



Sources:
LEGOS-CLS (DORIS)
IGS/R. Ferland (GPS)

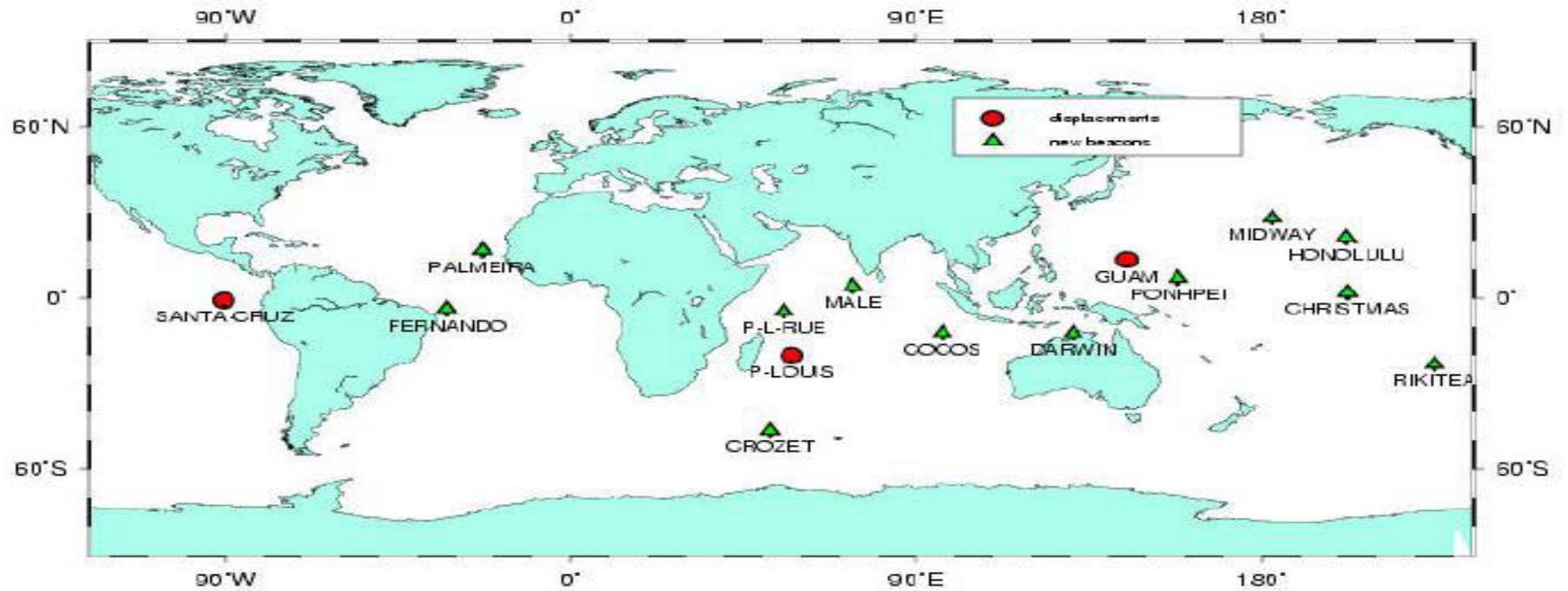
Horizontal motion: KERGUELEN

KERG: DORIS (blue with error bars) and GPS (red) coordinates



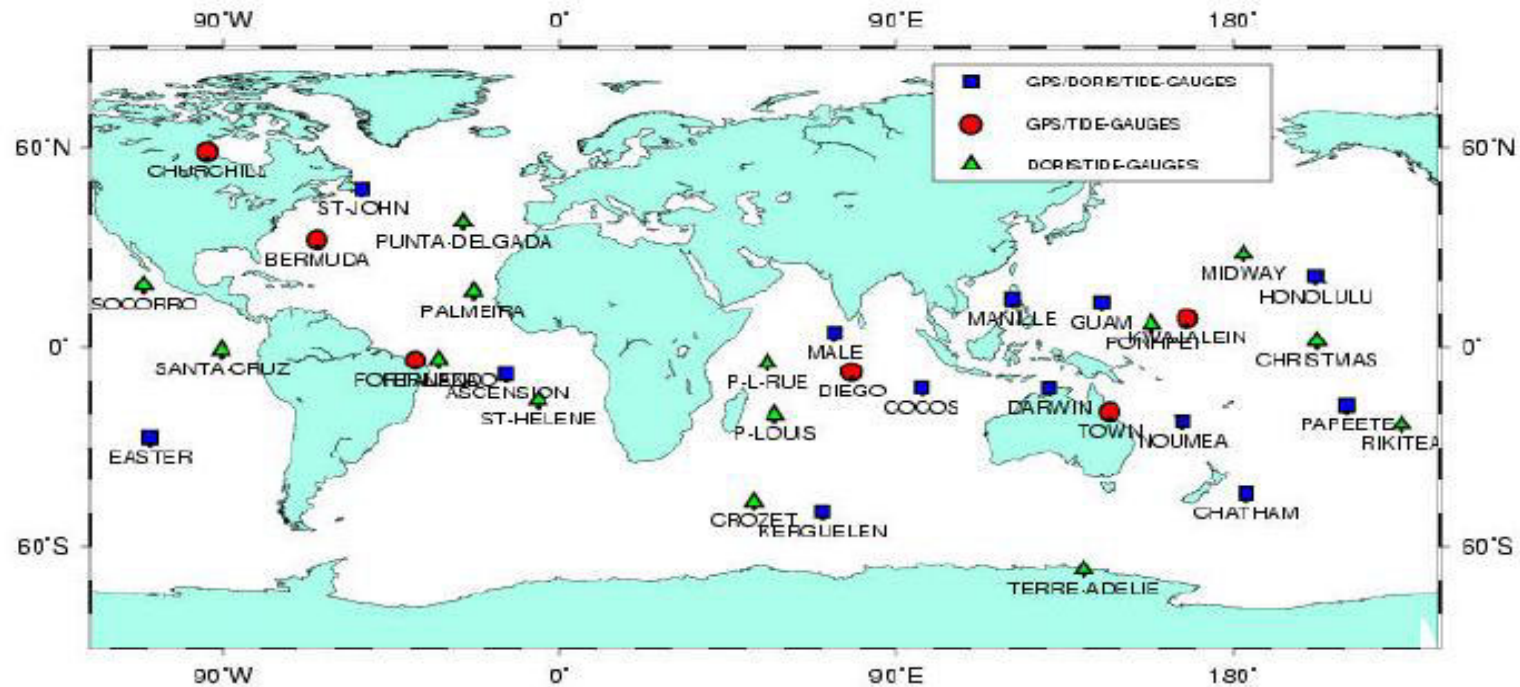
Sources:
LEGOS-CLS (DORIS)
IGS/R. Ferland (GPS)

DORIS and tide gauges



DORIS network densification

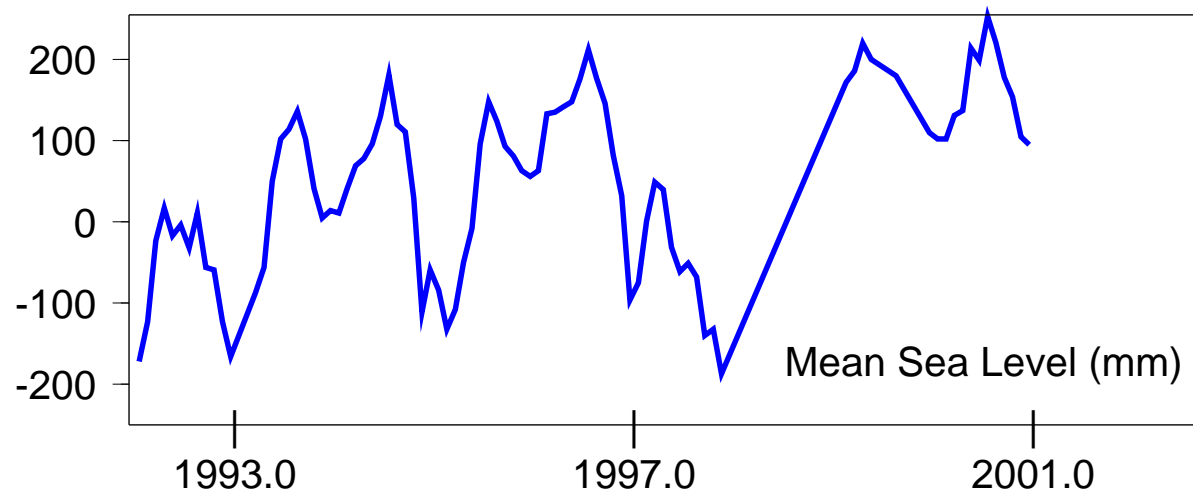
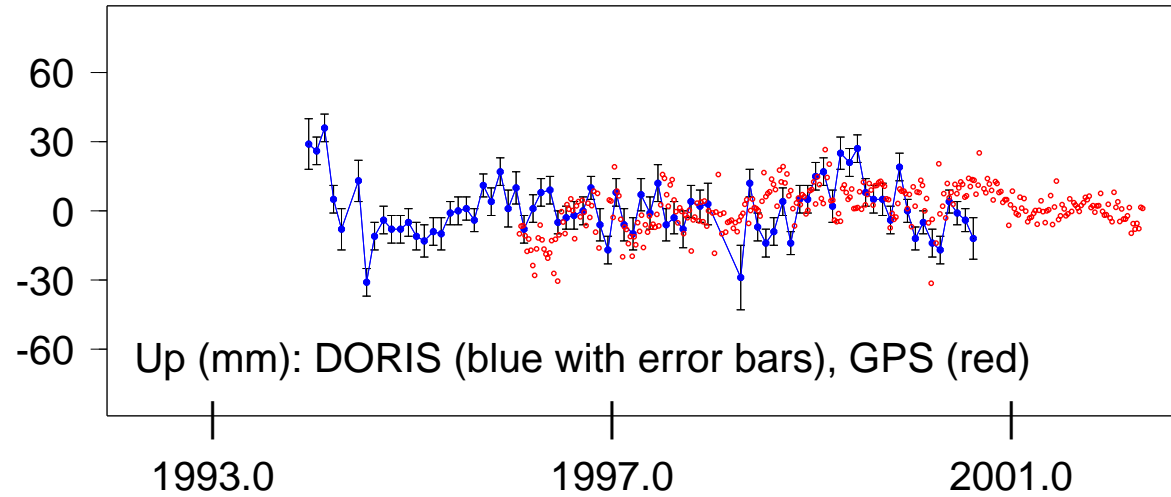
DORIS, GPS, and tide gauges



IGS (&/or) DORIS permanent sites - tide gauges collocations (<10 km)

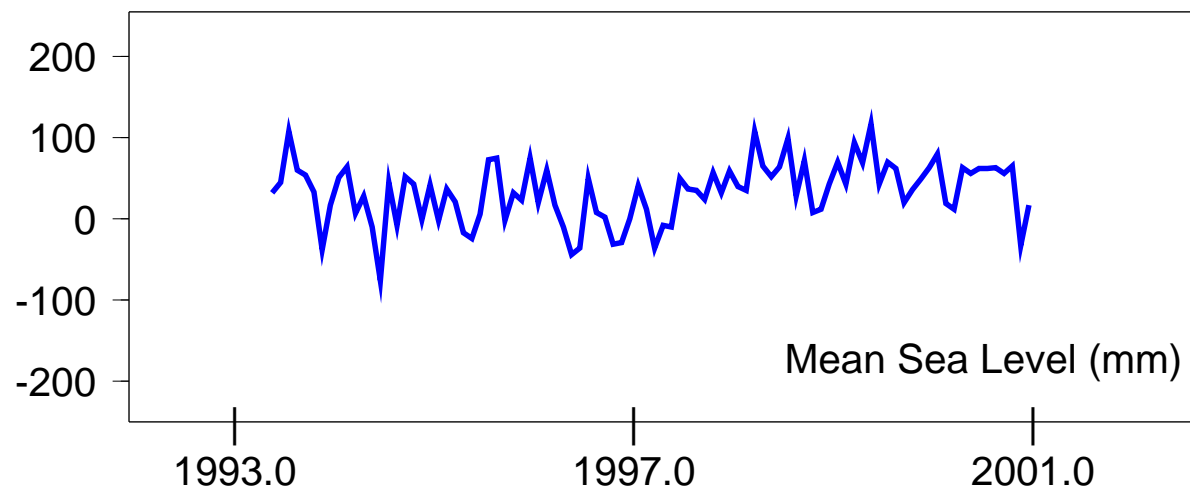
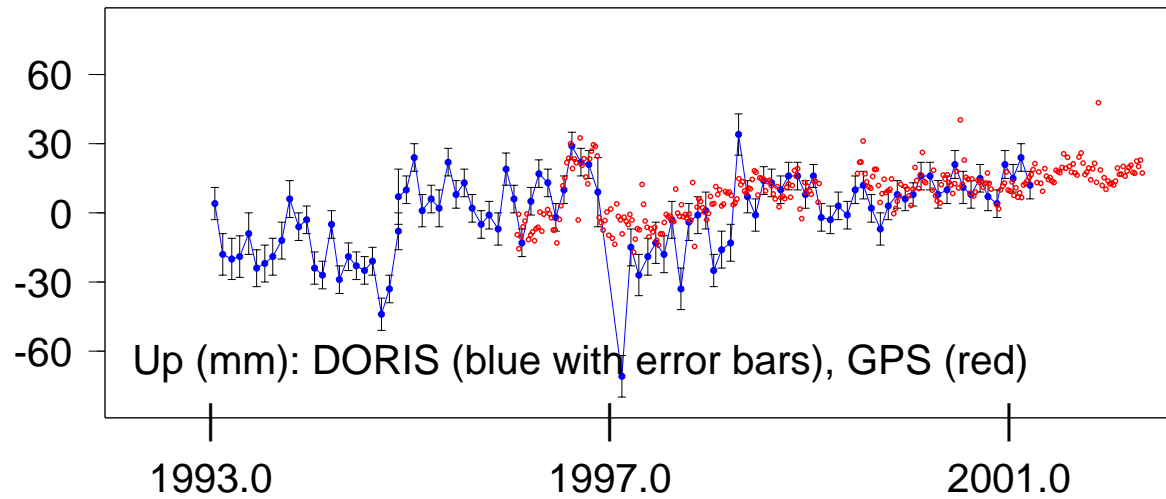
Vertical motion and mean sea level change

GUAM: Vertical land motion and Mean Sea Level (PSMSL)



Vertical motion and mean sea level change

KERG: Vertical land motion and Mean Sea Level (PSMSL)



The Grasse - Corsica multitechnique CALVAL complex

- Objectives

- Long term monitoring of space altimeter calibration: Topex/Poseidon, Jason 1, ...

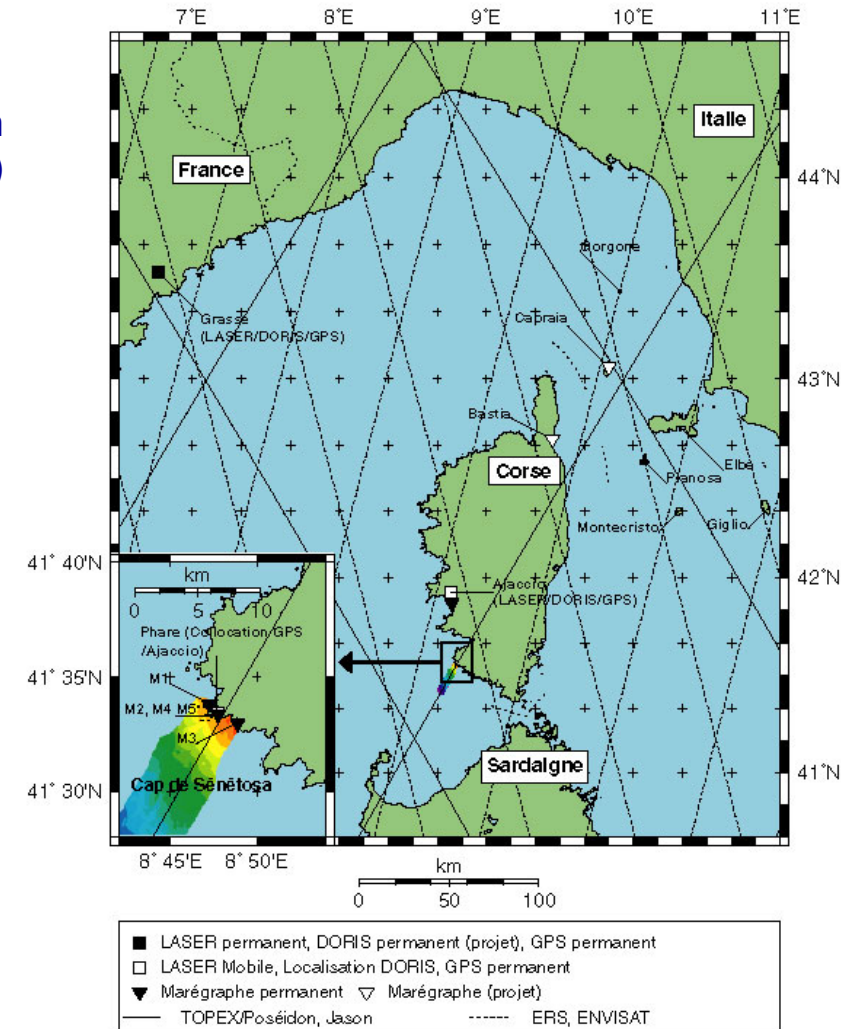
- Multi-technique DORIS-GPS-SLR orbital colocation

- source: OCA/CERGA

- Grasse ITRF collocated site
- French transportable laser station (300 kg, 5 mm ranging precision)



- DORIS beacon
- Three sea-bottom tide gauges
- GPS buoys
- GPS-positioned reference point



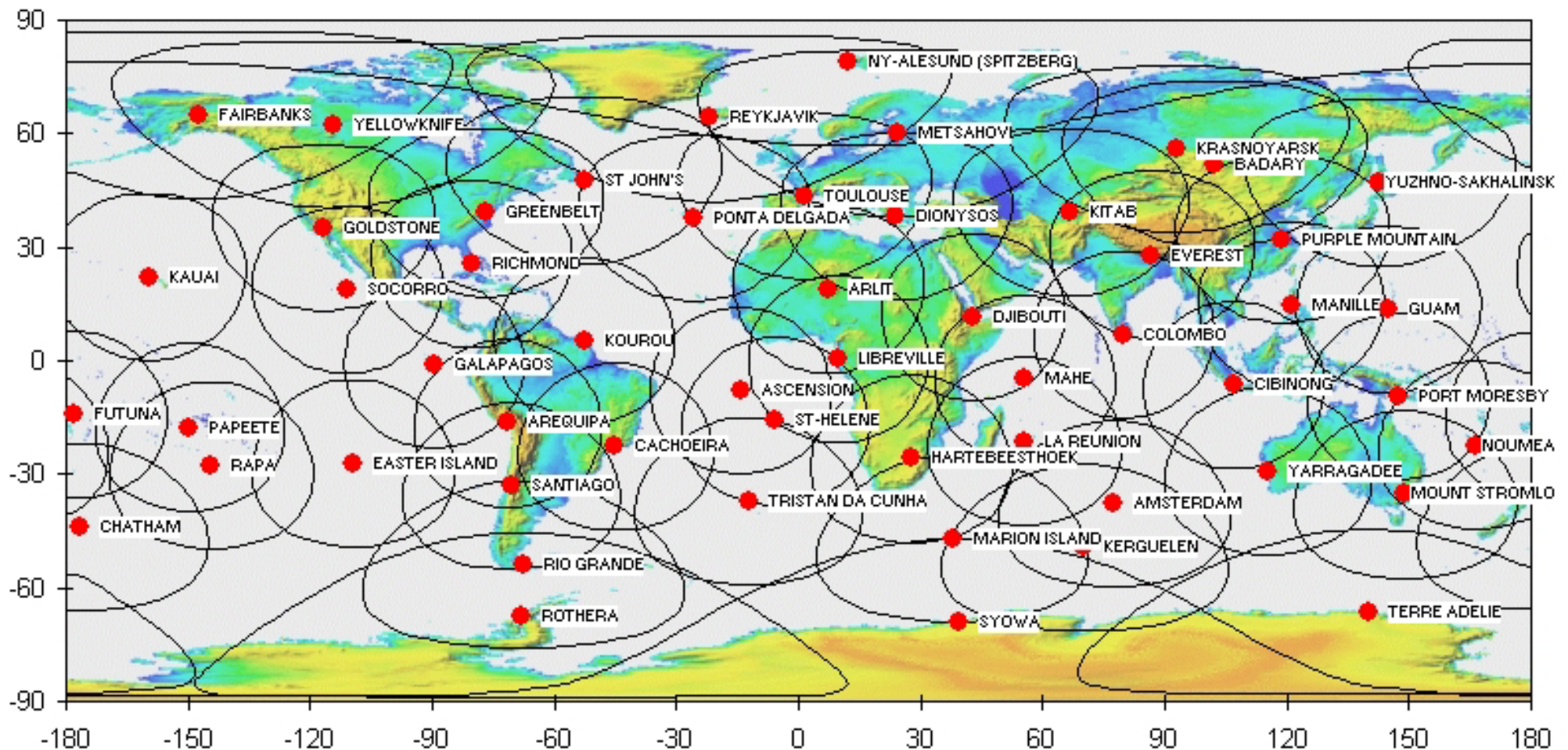
New colocation and altimeter calibration sites

- **VLBI, SLR, GPS (TIGO):
Concepcion, Chile**
- **Altimeter calibration sites:**
 - **Burnie, Tasmania**
 - **Gavdos, Greece**
 - **Grasse-Corsica, France**

DORIS and

- gravimeters
- superconducting gravimeters

Visibility JASON/DORIS
Altitude 1343 km Elevation 15°

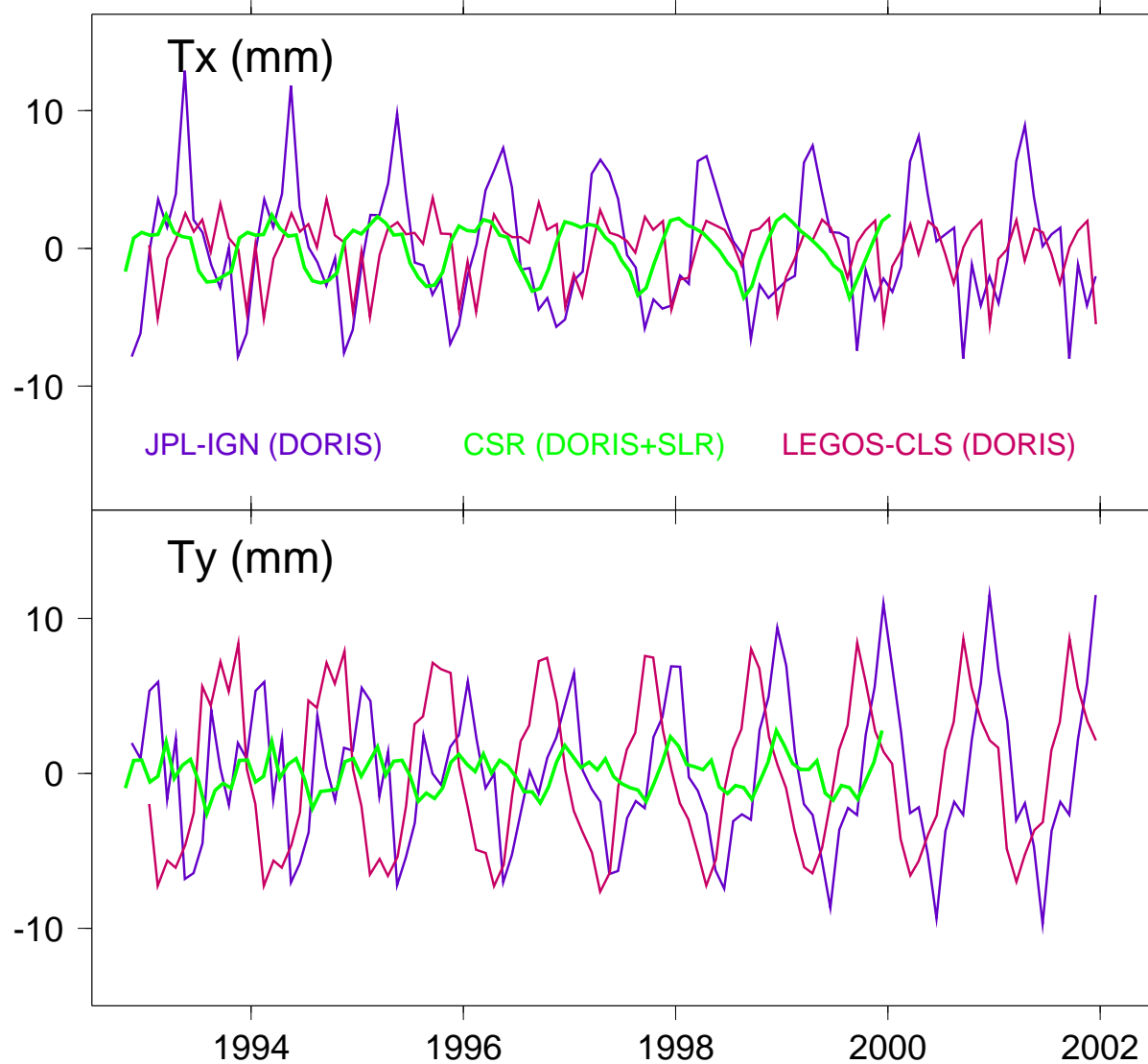


The role of DORIS in gravity field determination

- (missing transparency)

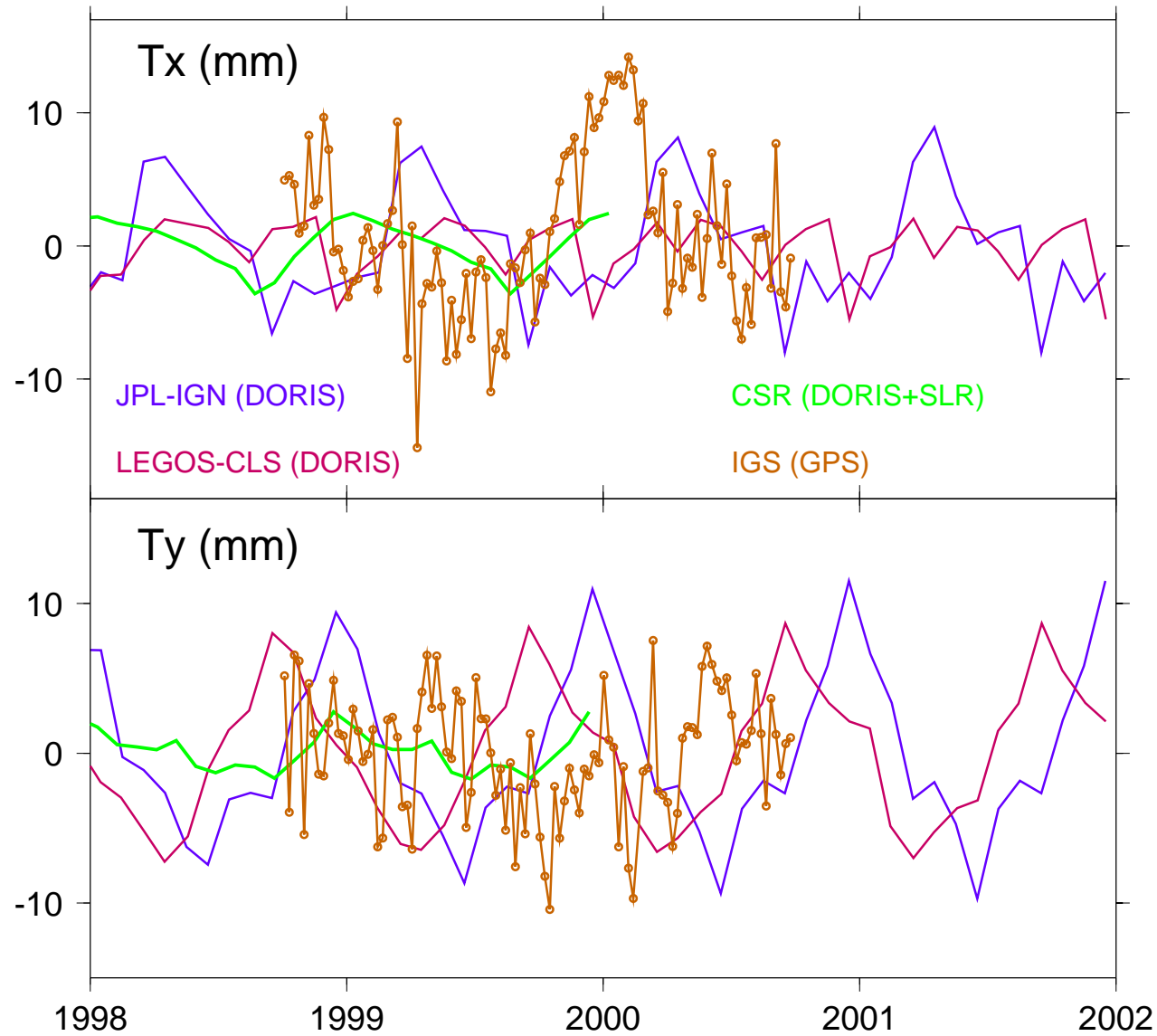
Geocenter: DORIS, SLR

Annual oscillation of equatorial components



Geocenter: DORIS, SLR, GPS

Annual oscillation of equatorial components



Expected improvements of DORIS contributions to global monitoring of the Earth

- **More equipped satellites: Jason 1, Envisat, Spot 5**
- **Better onboard receivers**
- **More and upgraded beacons**

- **More scientific experiments**
- **More analysis centers**
- **Enhanced international coordination**
Analysis Coordination: <http://lareg.ensg.ign.fr/IDS>