Recent analysis at the LEGOS/CLS Analysis Center

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2003 Activities

Participation to the IDS:

•Monthly coordinates and daily E.O.P. solutions provided (SINEX files) (2002 campaign)

Series lca02md02: 01/93 to 12/02 (spot-2,-3,-4,topex)
Series lca02md03: 01/02 to 12/02 (spot-2,-4,-5,topex,jason,envisat)

•Weekly coordinates and daily E.O.P. solutions provided (SINEX files) (2003 Campaign « Gravity field comparison »)

EGM96, GRIM5, GGM01C and GGM01S, and EIGEN-GRACE01S (GFZ01S)
Series lca02wd01, lca02wd02, lca02wd03, lca02wd04, lca02wd05: 29/09/02 to 29/12/02 (6 satellites)

Participation to the GRGS Combination Research Center for the IERS:

•LCA is involved for the DORIS technic.

Weekly matrices over 2002 were provided (spot-2,-4,-5,topex, envisat) : coordinates, velocities, EOP, precession, nutation

Studies:

New tropospheric correction model based on zenithal delay grids.
Impact of arc length on the positioning performances
Definition of a new computation strategy

IDS Analysis Campaign 2003

Processing

DORIS data from all six satellites over the three months Oct-Nov-Dec 2002
Gravity fields used: EGM96, GRIM5, GGM01C and GGM01S, and EIGEN-GRACE01S (GFZ01S)

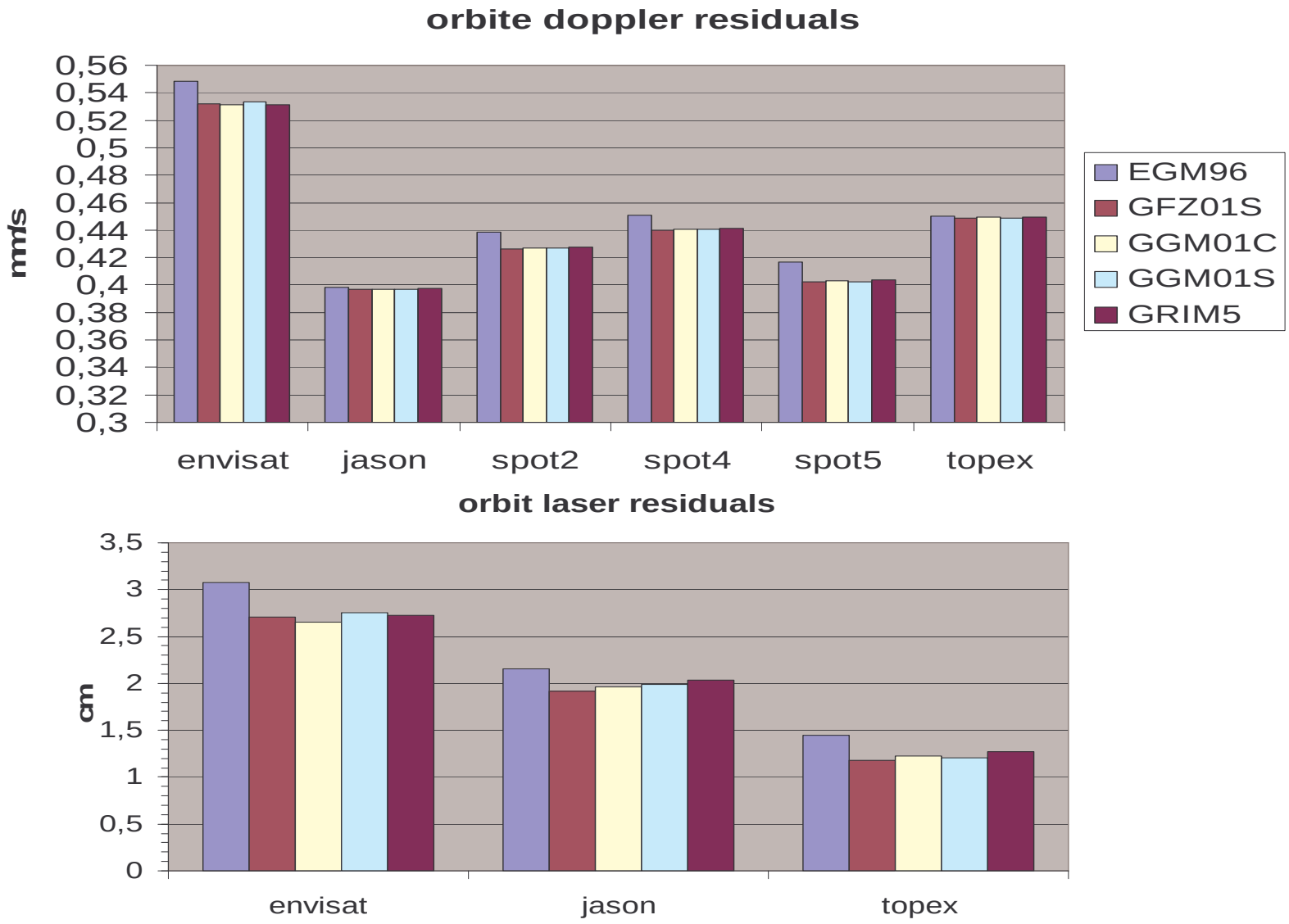
Analysis

•very close results from the 3 Grace models

•Compared to EGM96, an important gain is obtained (up to 4% on the doppler residuals, 2 to 4 mm on the laser residuals, up to 1 mm in weekly positioning repeatability.

•GRIM5-C1 released in 2000 is at the same level of performance as the GRACE models. The contribution of the GRACE measurements is indeed slight at the altitude of the DORIS satellites (830 and 1300 kms).

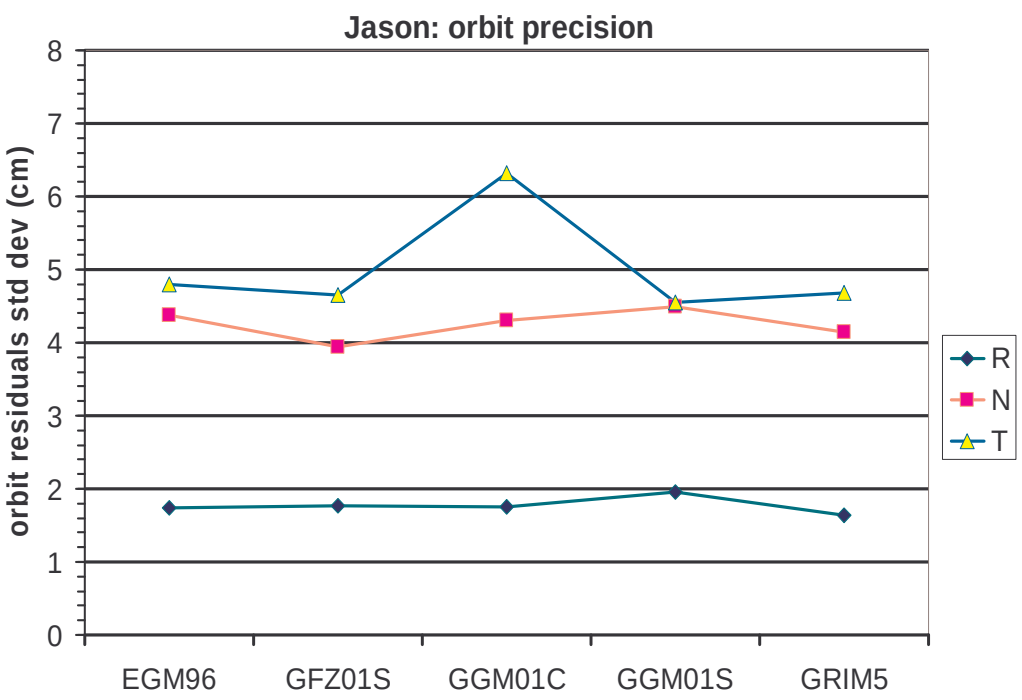
IDS Analysis Campaign 2003 (cont'd)

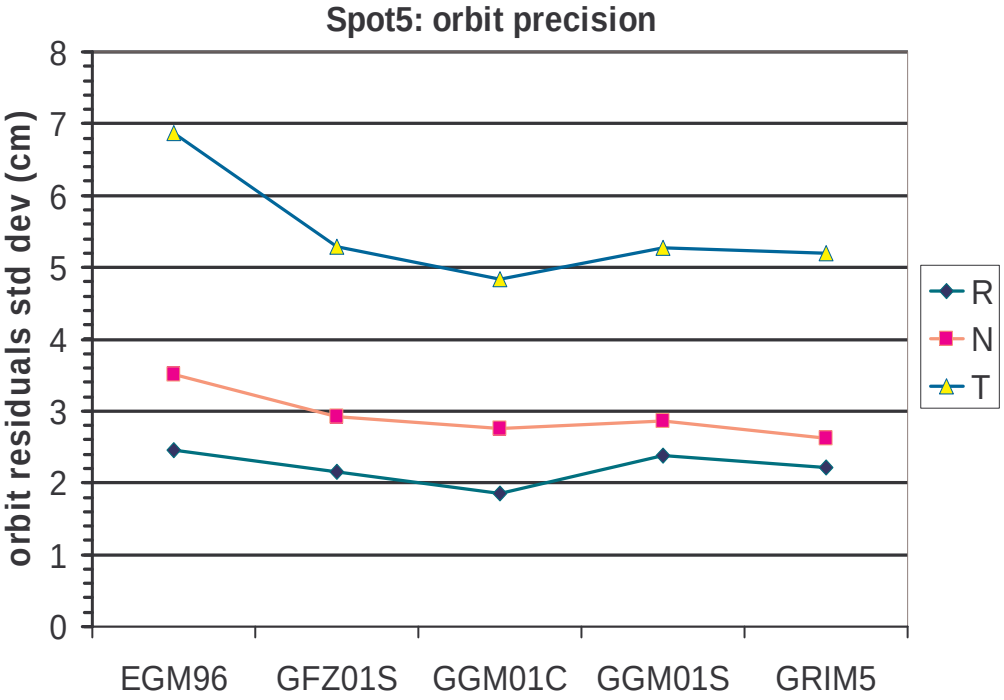


IDS Analysis Campaign 2003 (cont'd)

Orbit precision:
ten 1-day arc orbits compared to one 10-day arc orbit for Jason and Spot5.

•For Jason, the potentiel models are more or less at the same level
•For Spot5 (lower orbit), EGM96 is the less performant, GRIM5 is as good as EIGEN-GRACE01S and GGM01S, GGM01C is the better.

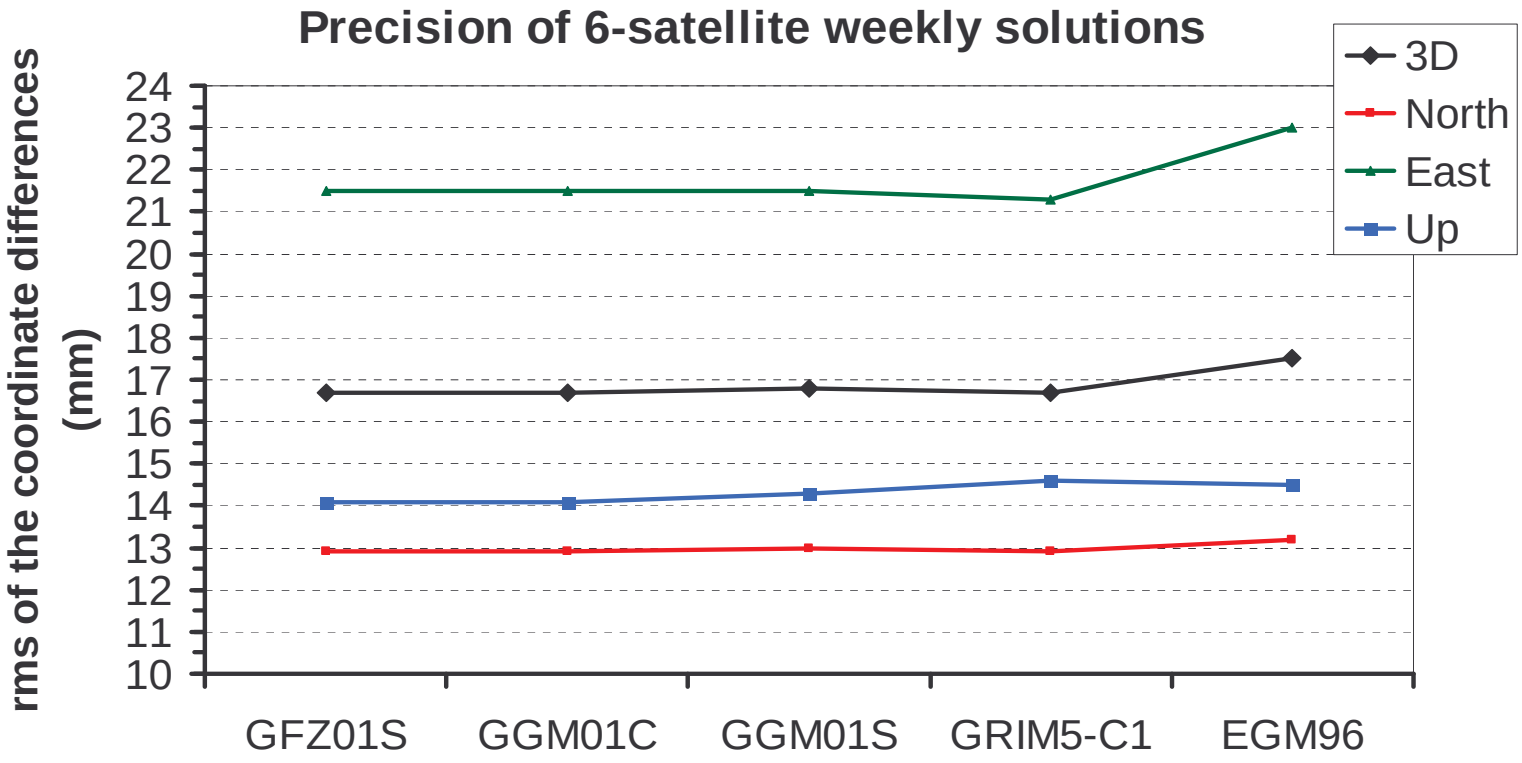




IDS Analysis Campaign 2003 (cont'd)

Station positioning precision of the 6-satellite weekly solutions
comparison of 13 weekly solutions to a 3-month solution (40 stations).

•Except EGM96, all the models are very close.



Choice of an optimal arc length

Comparison of daily values series of the Earth rotation pole coordinates

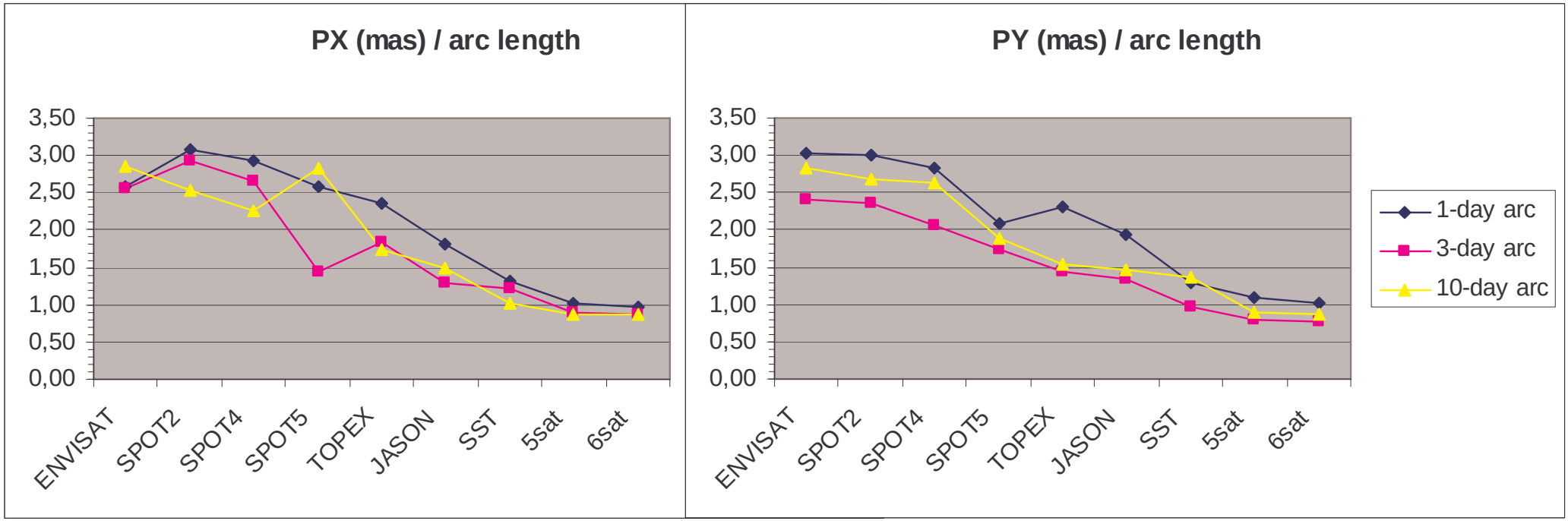
•Better results with 3-day arcs.
Compared to 1-day arc results, the station position determination are not degraded, that is not the the case with 10-day arcs (dynamic model error most important in the orbit computation) .

•Important gain with 3-day arcs 6 sat. (0.8 mas.) compared to SST 1-day arcs (1.2-1.5 mas) (our last submission to IERS)

Choice of an optimal arc length

Comparison of daily values series of the Earth rotation pole coordinates

Estimation over Dec. 2002 compared to the IERS 97C04 series for each satellite and for 3 combinations (Spot2,Spot4,Topex (SST); the all 6 satellites (6sat); all but Envisat (5sat))



weighted rms (mean removed)

Activities for 2004

Data processing

- •Use of the last GINS version (4.00) (new IAG standards, use of the 6-hour EOP series, new convention for the parameter names, new models of on-board oscillators, troposphere bug correction…)
- • Use of a new computation strategy (3.5-day arcs)

- • Processing of data of year 2003 (and 2004)
- • Re-processing of all the data over the period 1993-2002

Participation to IDS

- • Delivery of a new 11-year series of weekly solutions

Participation to the GRGS CRC for the IERS

Participation to IERS pilot campaign

Tropospheric correction model study will be continued

New processing strategy

•Use of the last GINS version (4.00): new IAG standards, use of the 6-hour EOP series, new convention for the parameter names, new models of on-board oscillators (medium and long terms), troposphere bug correction…)

• Data processing per monthly set over 3.5-day arcs (start on Sunday 0:00 or Wednesday 12:30)
(compromise to keep the possibility of computing weekly solutions and to obtain good EOP results)

•Weekly and « monthly » solutions (all satellites excluding Jason) for coordinates and EOP

•Use of the minimal constraints (new DYNAMO facility) (To be tested)

•Possibility for sub-daily determinations of the polar motion

•Possibilities for geocenter solutions

•New tool of SINEX conversion developed in the framework of the CRC (To be tested)

•Automated data acquisition (monthly basis; could be reduced)

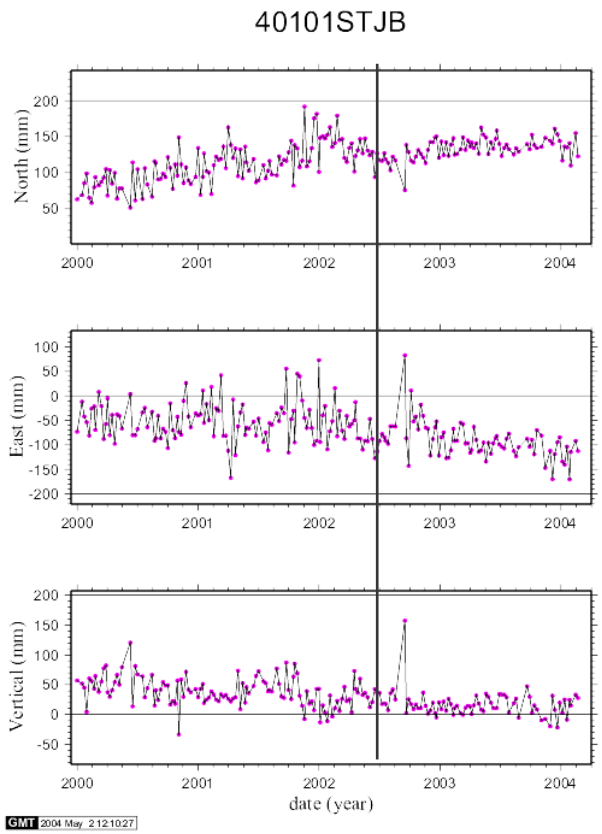
New processing configuration

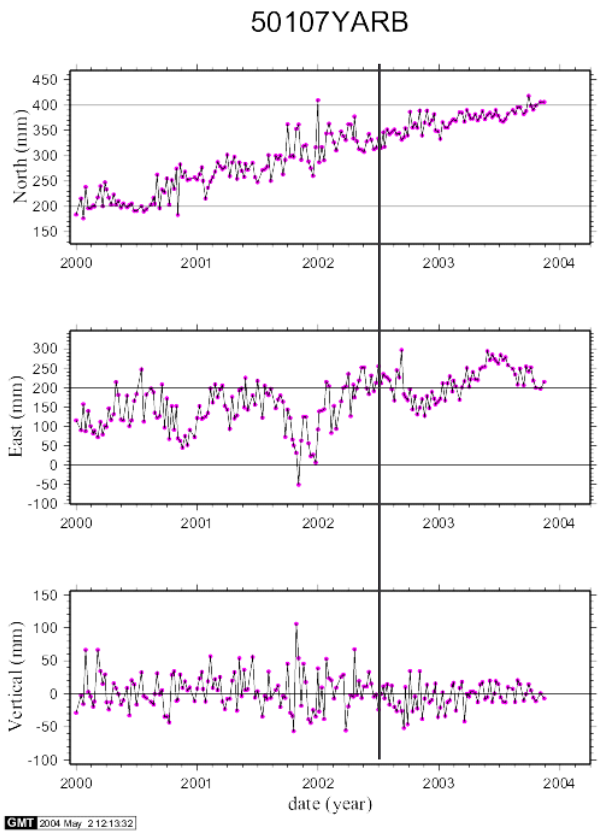
- Gravity model: GRIM5-C1
- Atmospheric density model: DTM94
- Oceanic tides FES2002 and associated loading effects
- Station coordinates and velocities: ITRF2000
- Numerical model for the albedo and ECMWF grids
- Atmospheric loading effects taken into account
- …

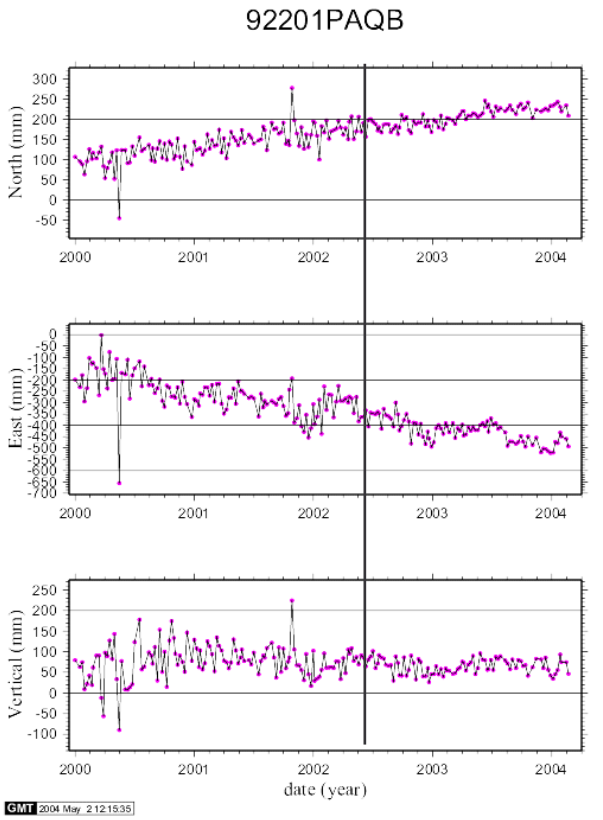
➢ Today, we have analysed Spot2, Spot4, Spot5, Topex and Envisat data from Jan. 2000 to Feb. 2004

Weekly series over 2000/01 -2004/02

Spot2/Spot4/Spot5/Topex

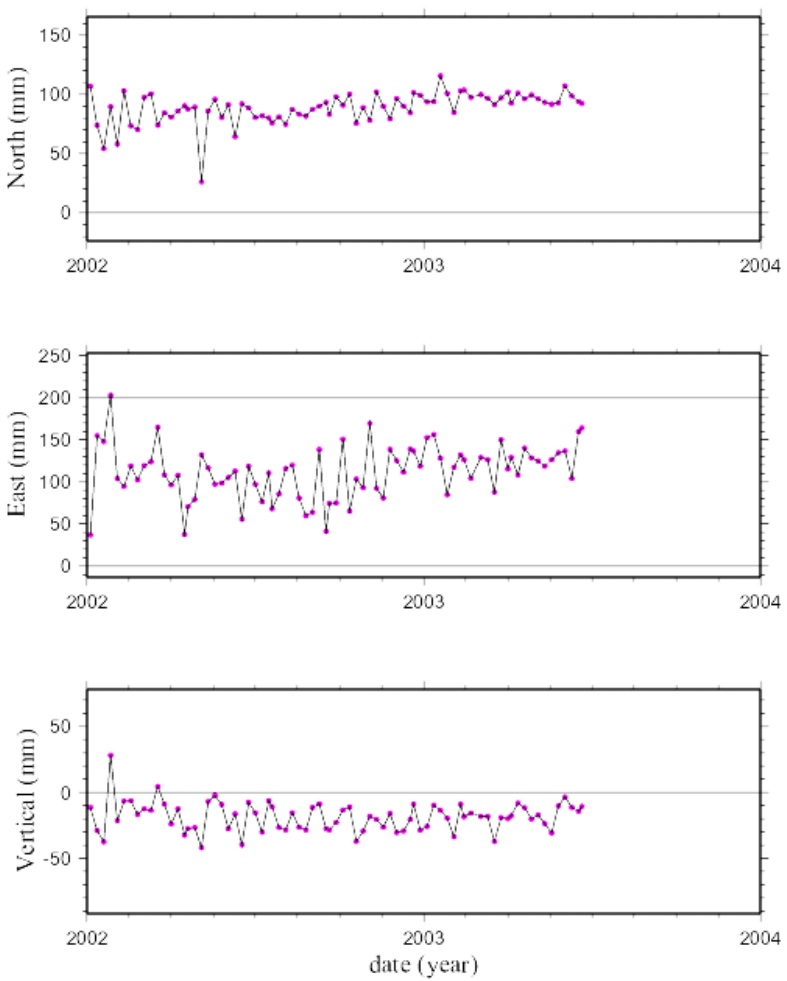




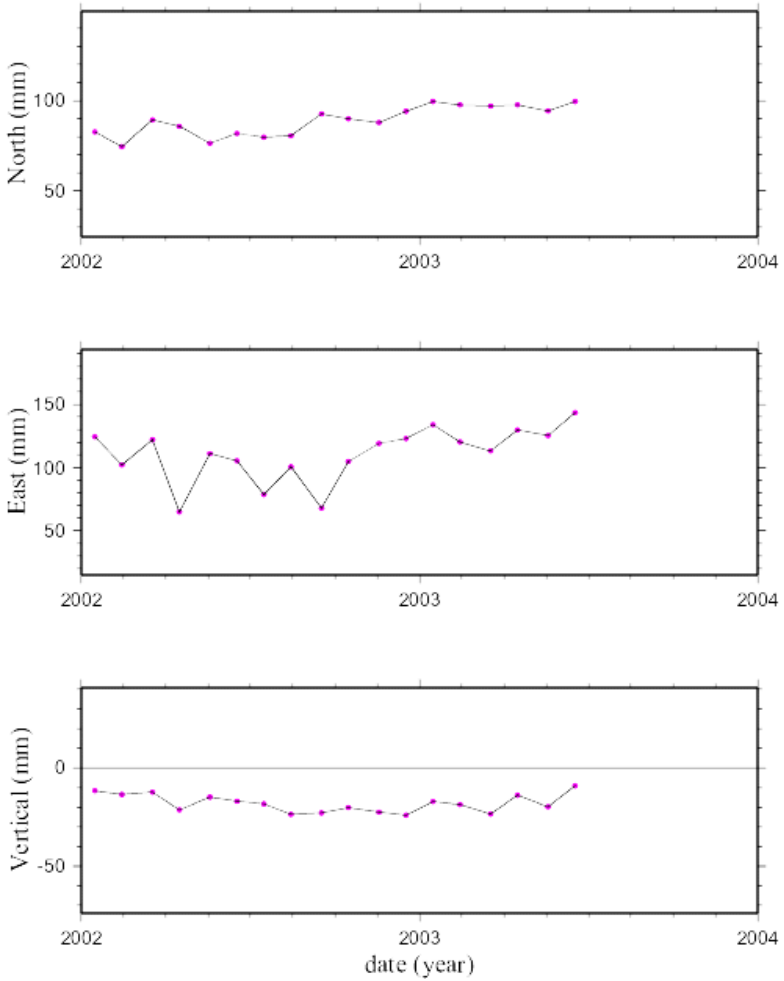


Better results with Spot5 (after June 2002)

Weekly and monthly series of Toulouse



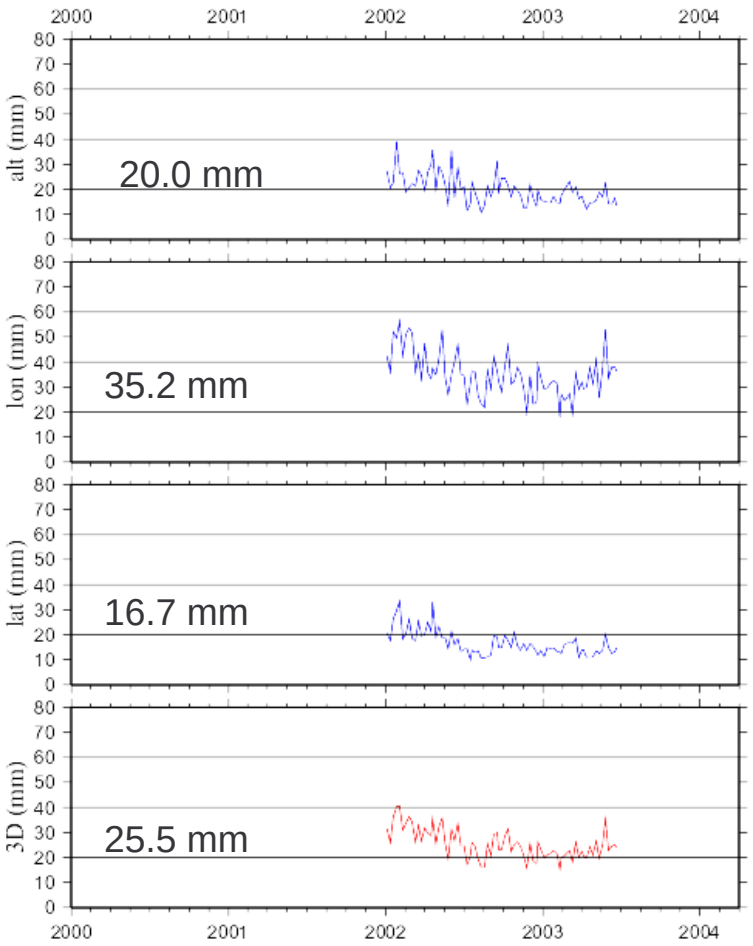
Weekly solutions



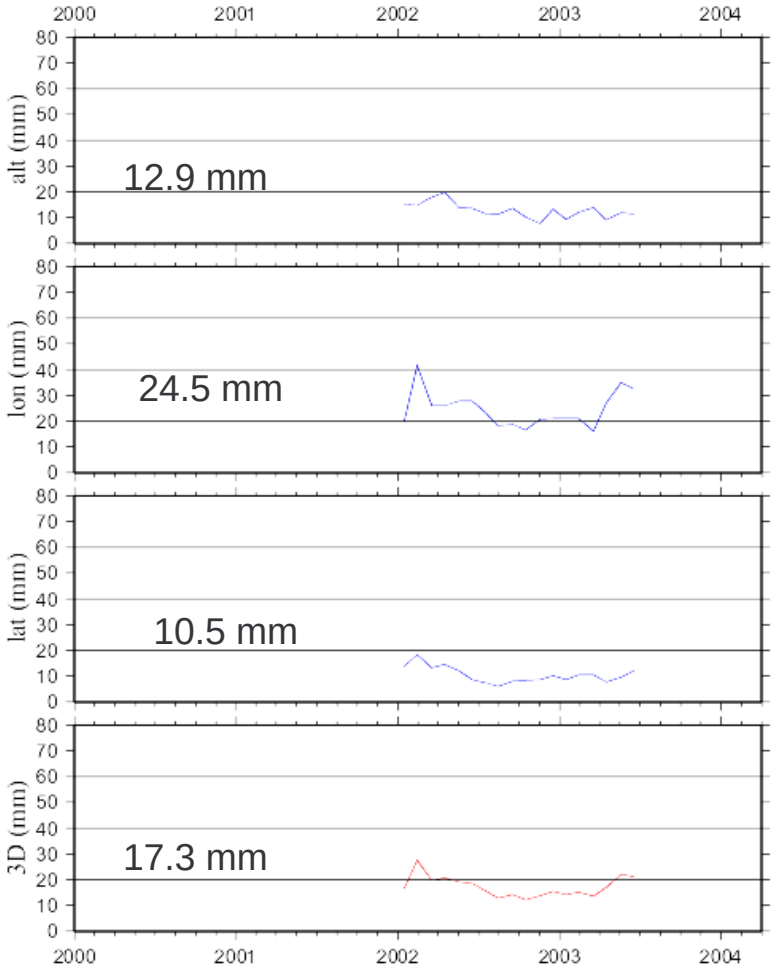
Monthly solutions

(Spot2, Spot4, Spot5, Topex + Envisat in 2002)

Precision of weekly and monthly series



Weekly solutions



Monthly solutions

2002.0-2003.5: Spot2, Spot4, Spot5, Topex + Envisat in 2002)

Files generated

Files generated per satellite and per month

Satellite information

FD: time, drag parameter, sigma
FS: time, solar pressure coefficient, sigma
Hill: time, normal cosinus, sigma, normal sinus, sigma, tangential cosinus, sigma, tangential sinus, sigma

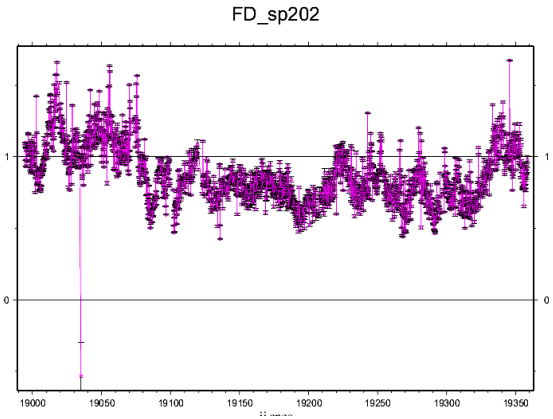
Per arc:
Info_arc: time, orbit residual of the arc, # of processed data, # of eliminated data, # of pass
Per pass:
Info_pass: time, frequency offset, sigma, tropospheric bias, sigma

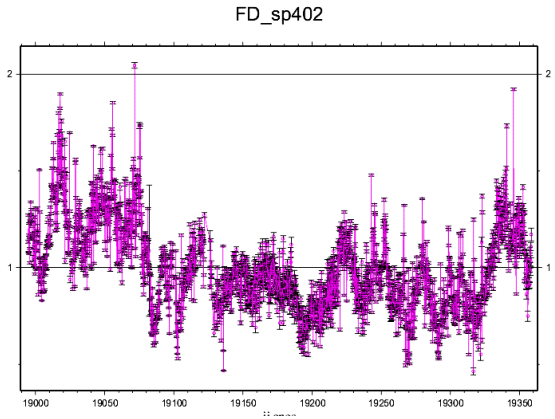
Station information

Per arc:
Info_arc_doris: station, time, satellite, orbit residual, # of processed data, # of eliminated data,…
Per pass:
Info_pass_doris: station, time, satellite, P, T,H,…
Per measurement:
Info_mes_doris: station, time, satellite, elevation, latitude, longitude, residual, loading effects (atmospheric, ocean tides, solide tides), time measurement residuals…

Drag coefficients

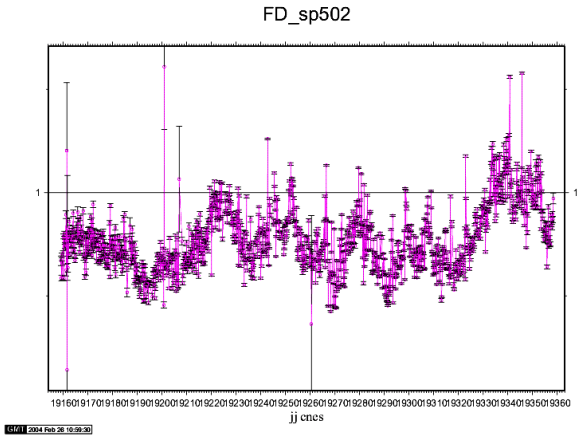
Spot2

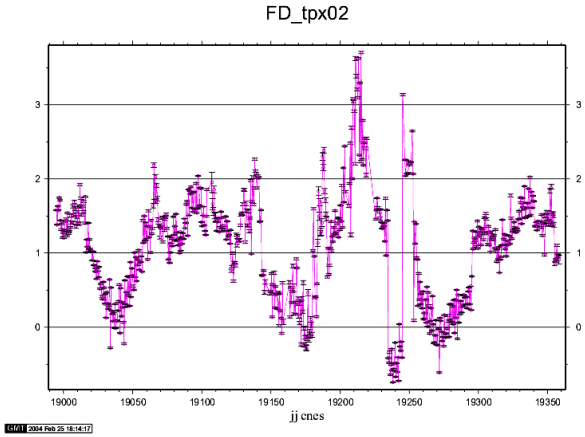




Spot4

Spot5





Topex

Conclusions

Processing of new data: 8-week delays (today)

Re-processing of all the data over the period 1993-2002 in progress (should be finished in July)

Envisat: needs some investigations

Vector “center of mass – center of phase”: centimetric discrepancies observed. To be investigated.

Solar pressure coefficients