

# Plate motion and glacial isostatic adjustment from DORIS

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# SUMMARY

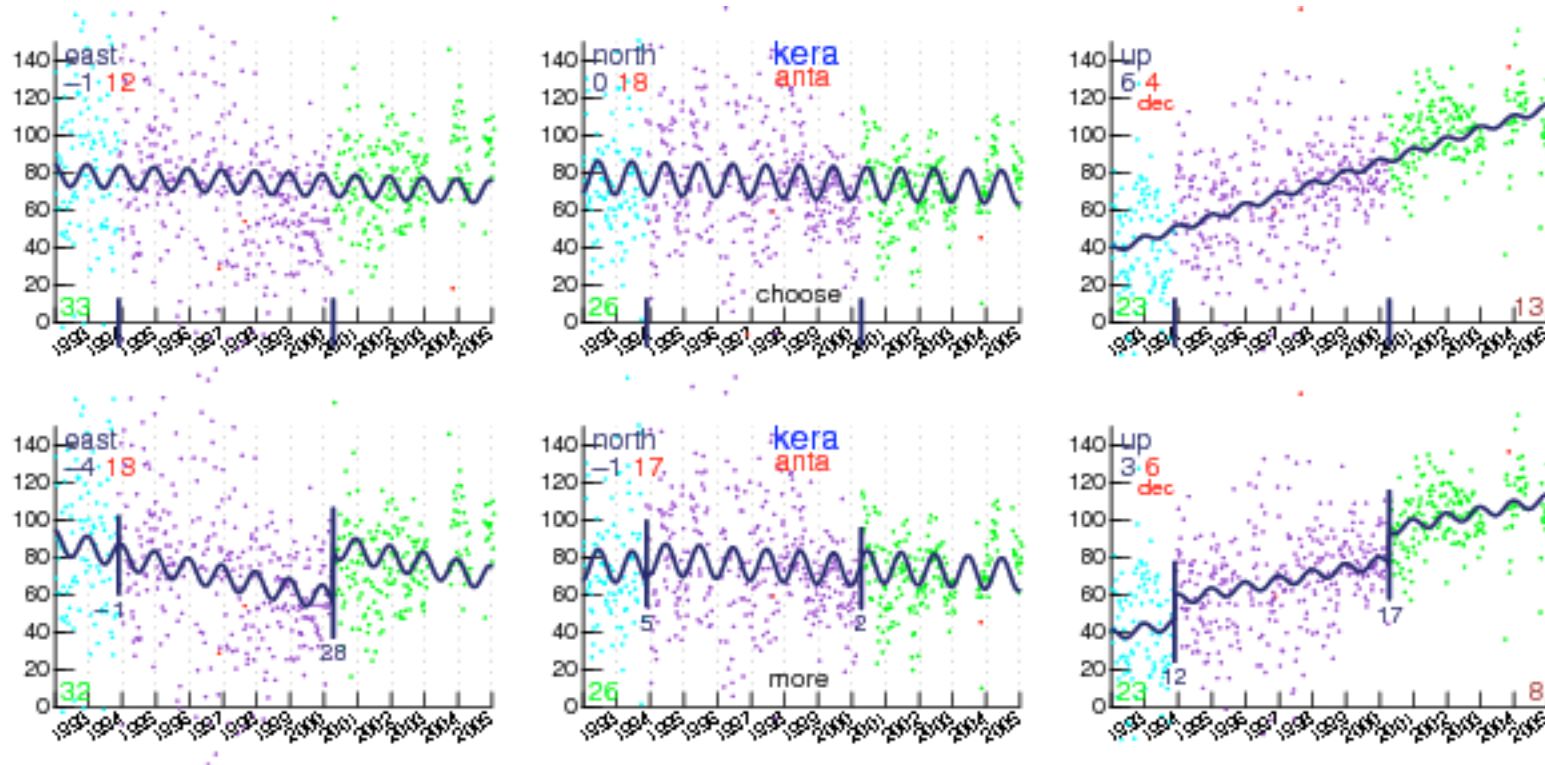
- Scientific goals
  - Validate DORIS precision (station velocity)
  - Is DORIS useful in a GPS-VLBI-SLR solutions?
- Method (using STCD files)
- Results

# DORIS network and major plate tectonics

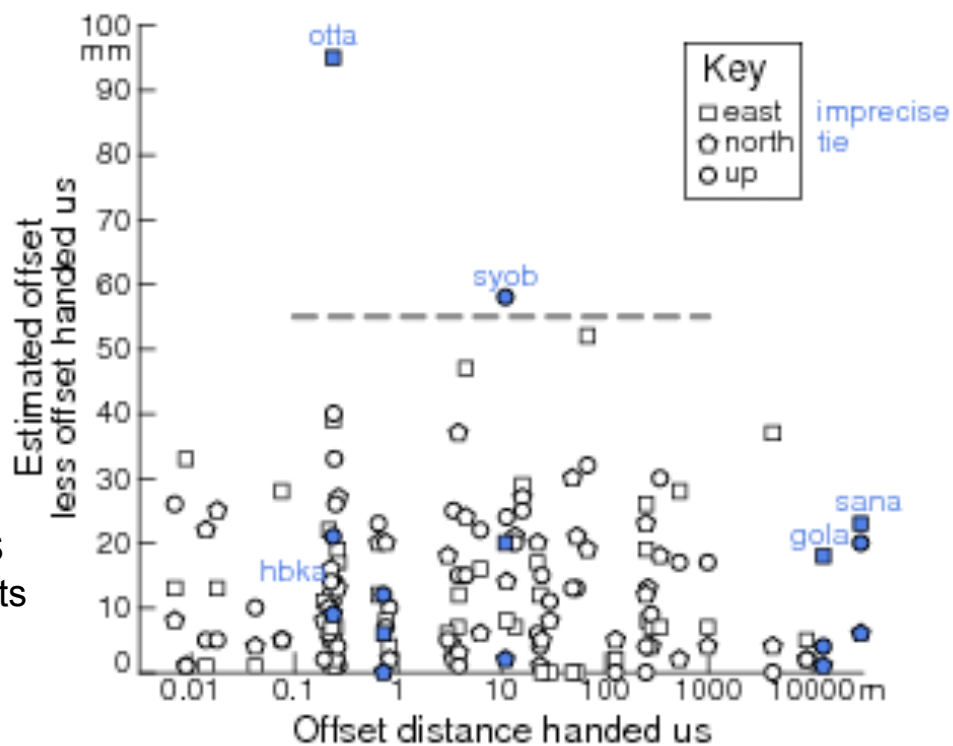
34 used on plates  
 20 at plate boundary  
 5 omitted (GIA)



# Analyzing STCD files: Estimating velocity + annual signal with/without breaks



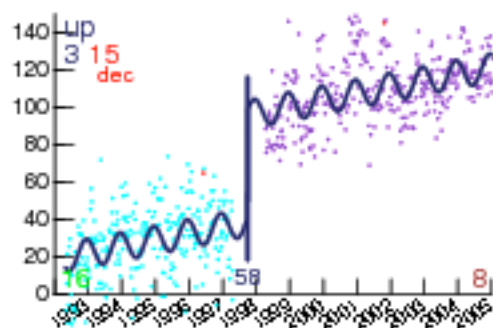
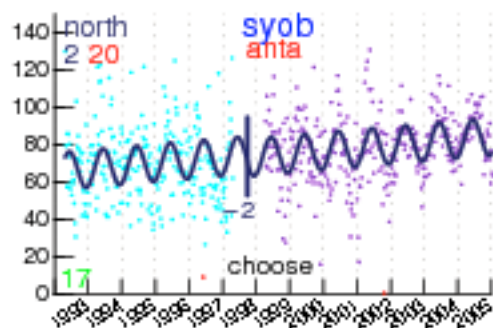
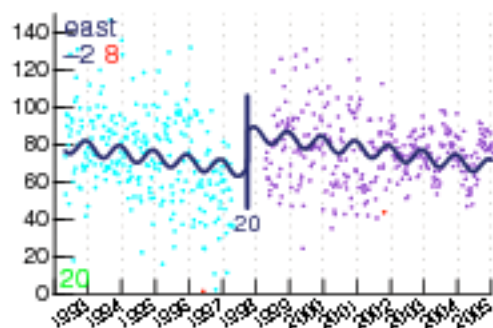
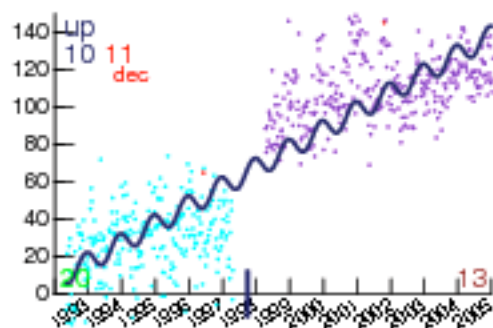
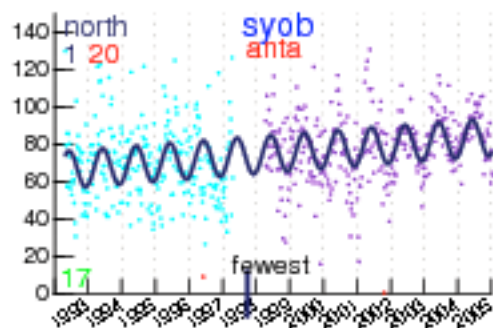
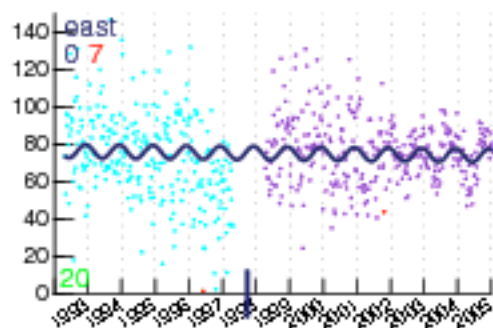
# Concatenating/correcting STCD files Verifying DORIS-DORIS local ties (SIMB)



Noise is in the DORIS  
IGN/JPL weekly results

Not in local ties

We enforced all geodetic local ties provided by IGN/SIMB  
 (45 with formal error  $\leq 5$  mm, only 5 not used)



(NB: SYOB tie is provided with 50 mm formal error by SIMB)

## Discontinuities detected for DORIS stations on plates

Station	Epoch	E (mm)	N (mm)	V (mm)	Comment
syob	01-OCT-1998	20	-2	58	Imprecise tie
adea	25-MAR-1998	17	15	-8	Belleny Earthquake M 8.1
cola	16-NOV-1994	53	-54	6	Unknown cause
otta	01-JAN-1998	95	-9	-21	Imprecise tie
tria	29-JUL-2004	-18	-65	-40	Volcanic activity Mb 4.2
soda	06-OCT-2002	60	-40	1	Unknown cause

## Discontinuities detected for DORIS stations at plate boundary

Station	Epoch	E (mm)	N (mm)	V (mm)	Comment
sana	01-JAN-1997	23	6	20	Imprecise tie
saka	25-SEP-2003	-7	-13	-11	Hokkaido Earthquake M 8.3
hbla	01-JUN-1997	-6	0	-12	Imprecise tie
gola	11-AUG-1994	-18	-1	4	Imprecise tie
gola	16-OCT-1999	-16	-4	-1	Hector Mine Earthquake M 7.1



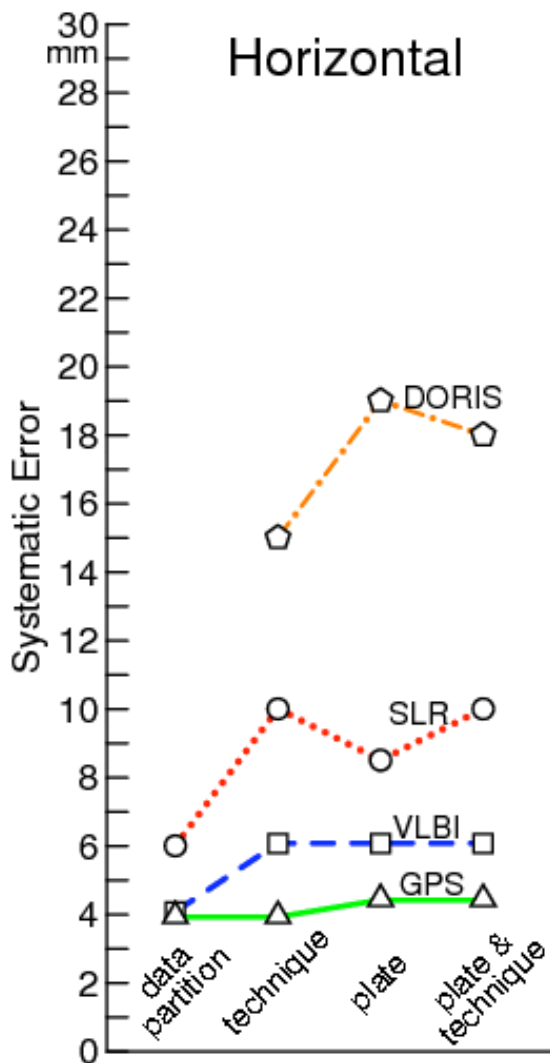
# ERROR BUDGET

$$\left(\text{true error}\right)^2 = \left(\text{random error}\right)^2 + \left(\text{system error}\right)^2$$

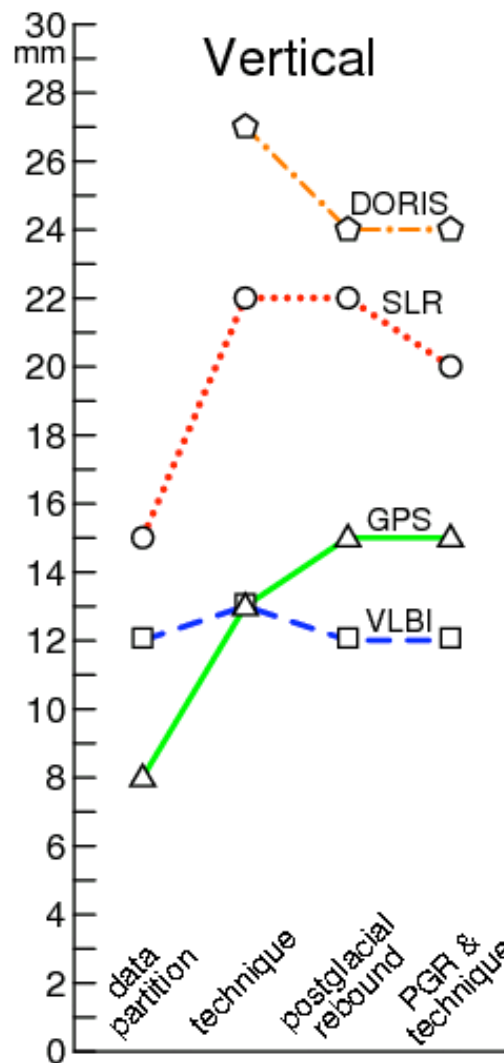
random error = dispersion of position estimates  
about constant velocity

system error =  $\frac{\text{distance}}{\text{time}}$

18mm/12yr  
= 1.5 mm/yr

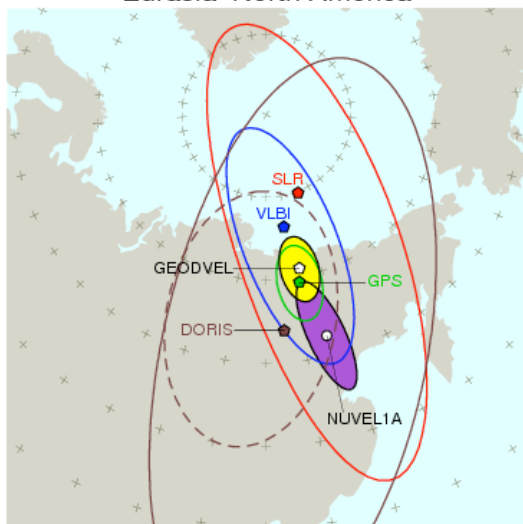


24mm/12yr  
= 2.0 mm/yr

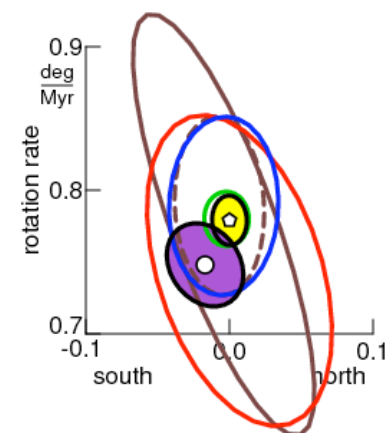
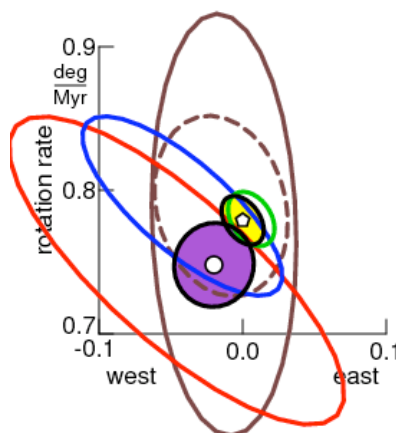
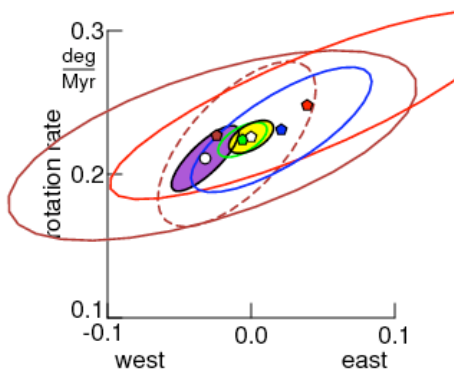
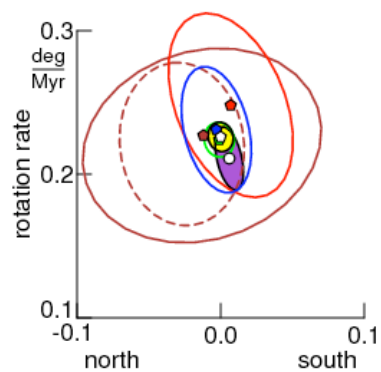
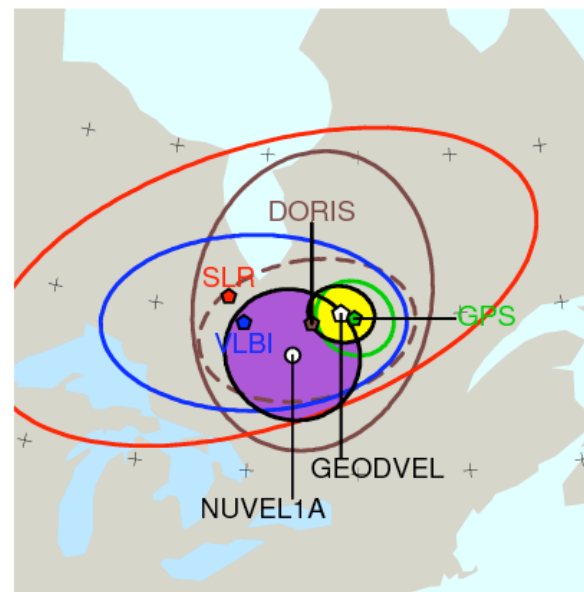


When other techniques are present

Eurasia–North America



North America–Pacific

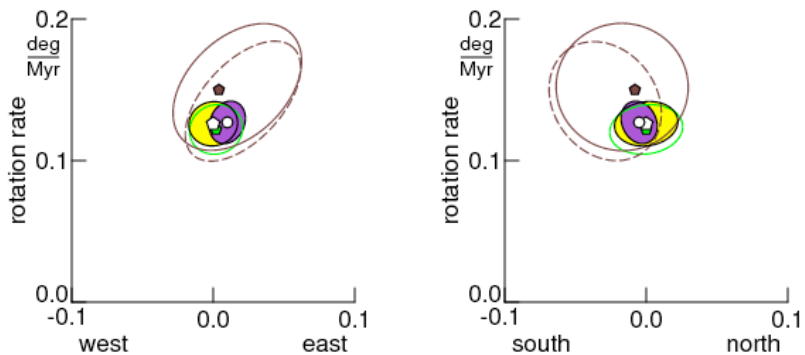
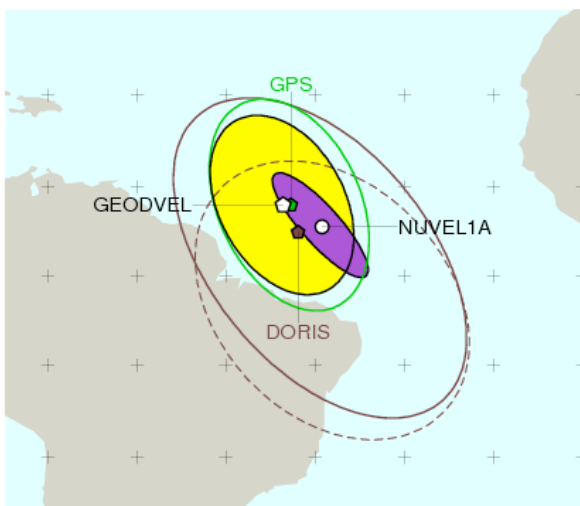


March 13-15, 2006

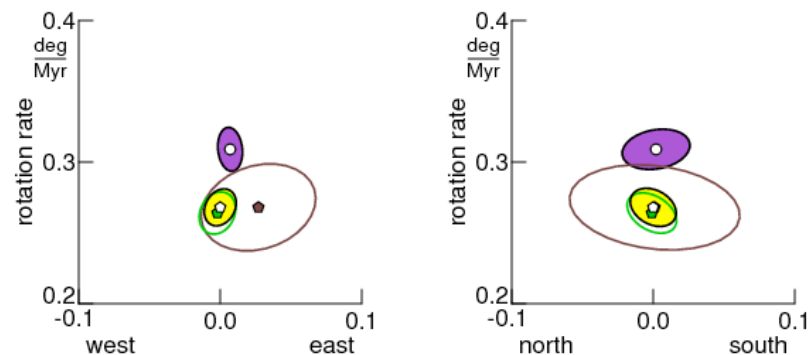
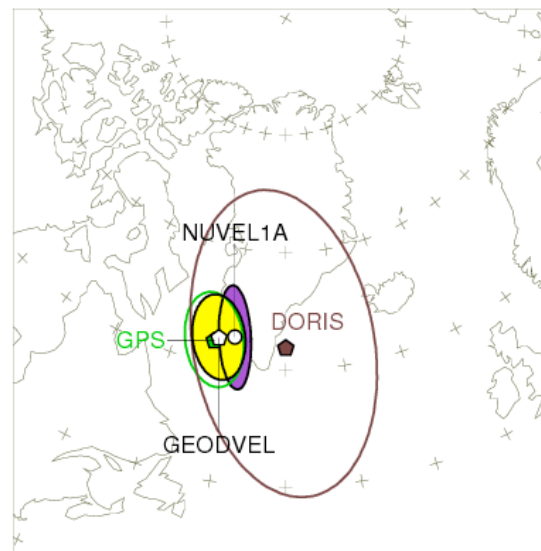
IDS Workshop, Venice, Italy

When other techniques are scarce

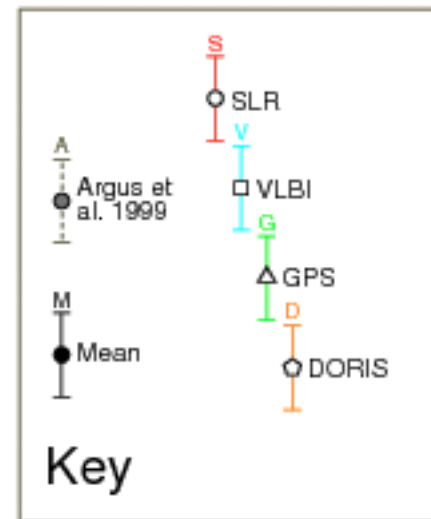
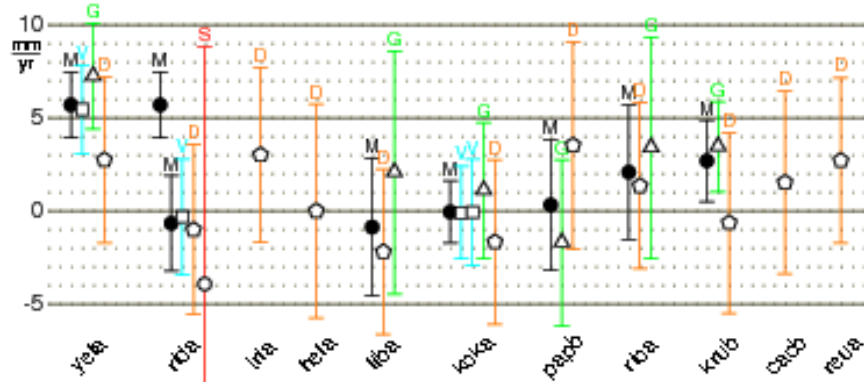
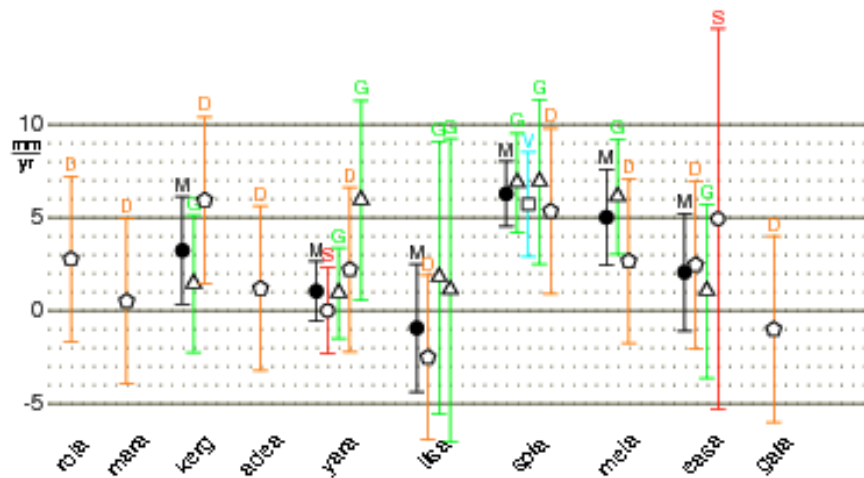
Nubia–Antarctica



Nubia–South America



### Vertical motion



# CONCLUSIONS

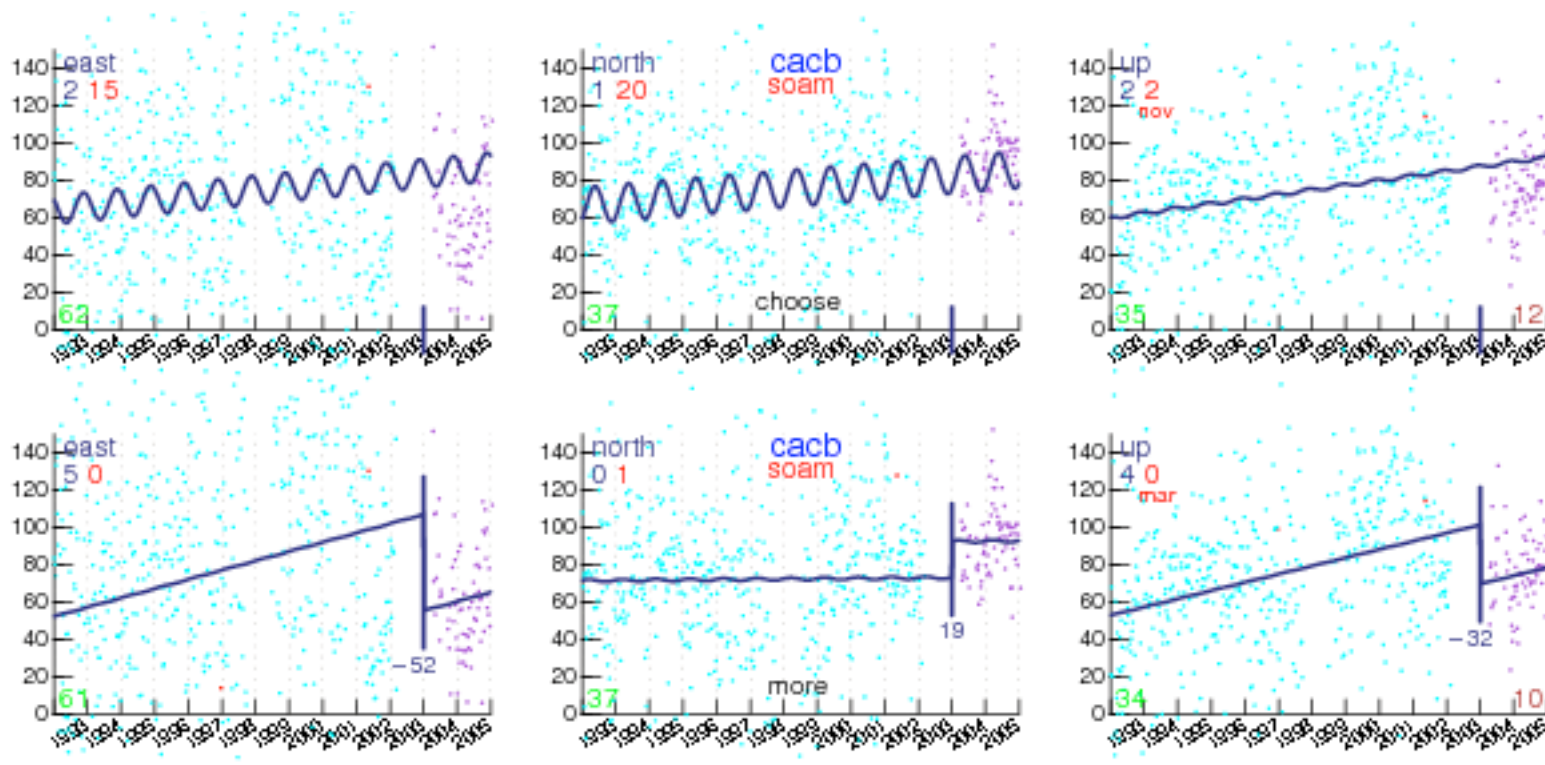
- Local ties (SIMB) were checked and are good  
( when formal errors  $\leq 5$  mm)
- DORIS accuracy in velocity
  - Horizontal: 1.5 mm/yr
  - Vertical: 2.0 mm/yr
- DORIS is becoming useful for geodynamics
  - specifically in vertical
  - When no other technique or just GPS is present



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# BACK-UP SLIDES

# Analyzing STCD files: offset + rate + annual signal + discontinuities





# Analyzing STCD files: offset + rate + annual signal + discontinuities

