Results of CONT02 combination studies

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IERS Workshop 2004
„IERS Combination Pilot Project (CPP)“
December 11, 2004, Napa

CONT02 VLBI Campaign, 16.-30. Oct. 2002

Co-locations between:

▲ VLBI and GPS ▲ SLR and GPS

VLBI:

- 8 stations co-located with GPS
- Continuous obs.
- OCCAM software

GPS:

- 150 stations
- Bernese GPS Software

SLR:

- 22 stations
- LAGEOS 1 and 2
- DOGS Software/ Bernese GPS Software

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CONT02 processing strategy

Advantage: same models and parameterization in the software packages

Parameters	VLBI	GPS	SLR
Station coordinates	Daily	Daily	Daily
ERPs	2h/1h	2h/1h	Daily
Nutation offsets	Daily	Daily	Daily
Troposphere zenith delays	2h/1h	2h/1h	-
Troposphere gradients	Daily	Daily	-

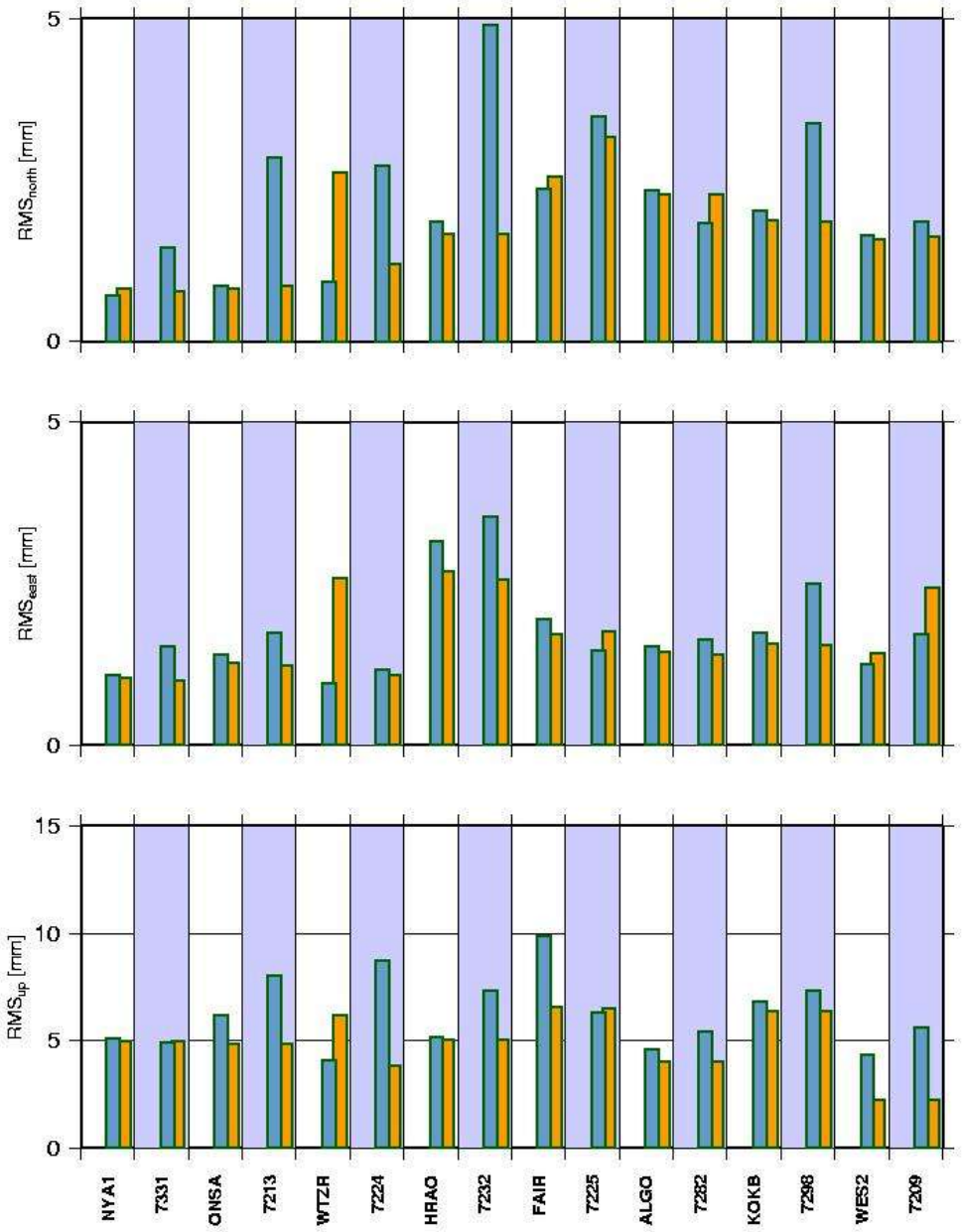
free daily normal equations for VLBI, GPS (and 14 days for SLR):
- absolute PCVs for GPS
- improved axis offsets for VLBI antennas

Local ties for VLBI and GPS

Station	Differences Estimated – local measurements [mm]			New Differences Estimated – local measurements [mm]			Δantenna offsets
	North	East	Up	North	East	Up	[mm]
Ny Alesund	4.5	3.2	-31.5	-0.2	2.1	4.8	15
Onsala	3.6	0.8	-10.6	5.0	-1.2	-2.7	-8
Wettzell	0.6	0.8	-5.7	3.0	0.7	8.9	0
Hartebeesthoek	3.2	18.3	36.5	-3.1	16.8	22.9	-3
Algonquin Park	-2.5	-3.3	20.2	-2.2	-1.1	1.7	2
Fairbanks	-17.7	-0.4	-43.1	11.7	-0.2	-31.8	5
Kokee Park	8.3	0.8	10.2	6.9	4.7	0.5	13
Westford	1.4	9.5	23.9	0.6	12.5	8.9	-2

New: antenna axis offsets for VLBI are changed

Combination of station coordinates



Repeatabilities of station coordinates:

single technique solutions

combined solution

background:

GPS VLBI

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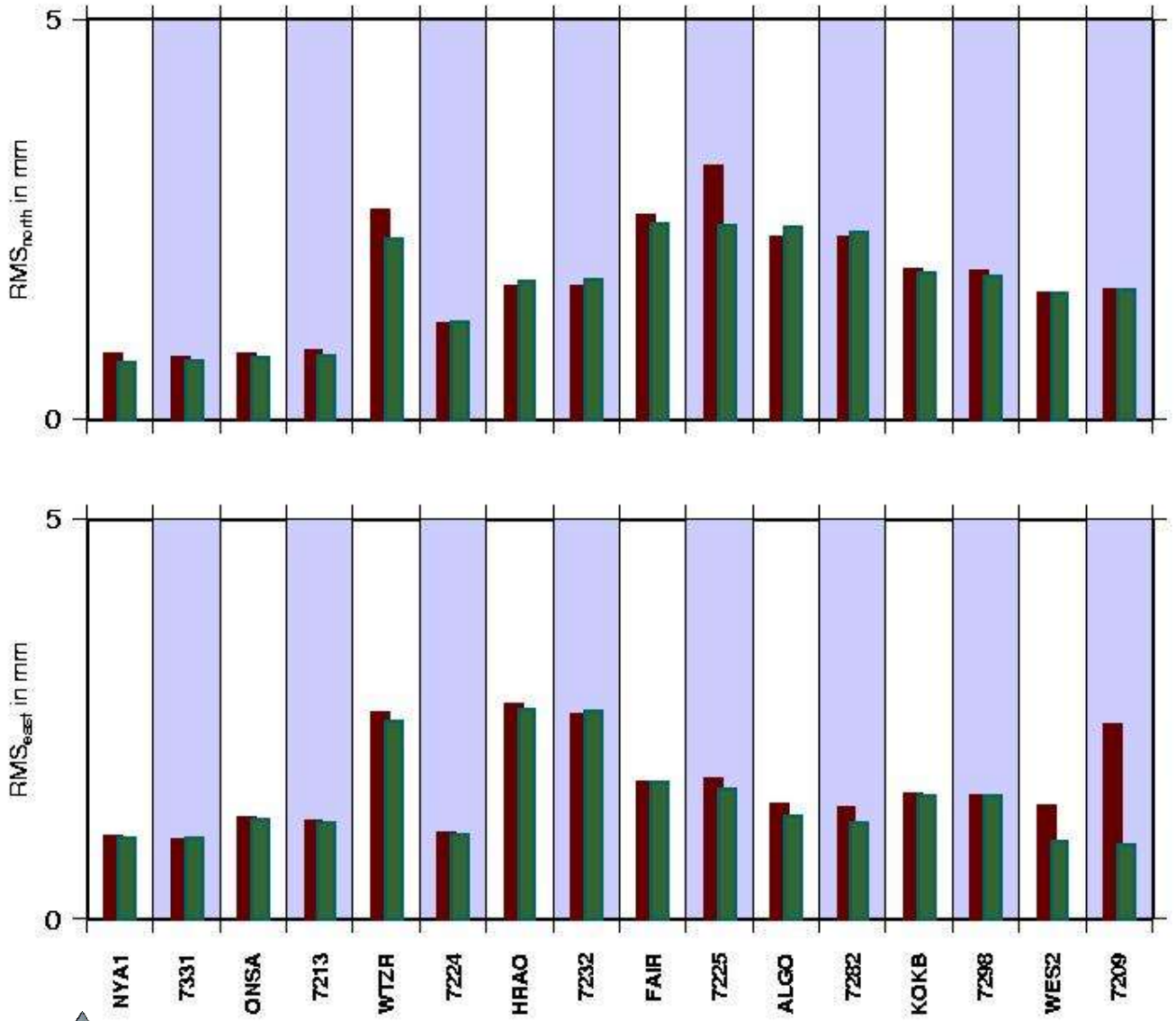
Problems in local ties



Repeatabilities of station coordinates:

combination with all available local tie information

combination without Fairbanks: north Westford: east component of the local tie

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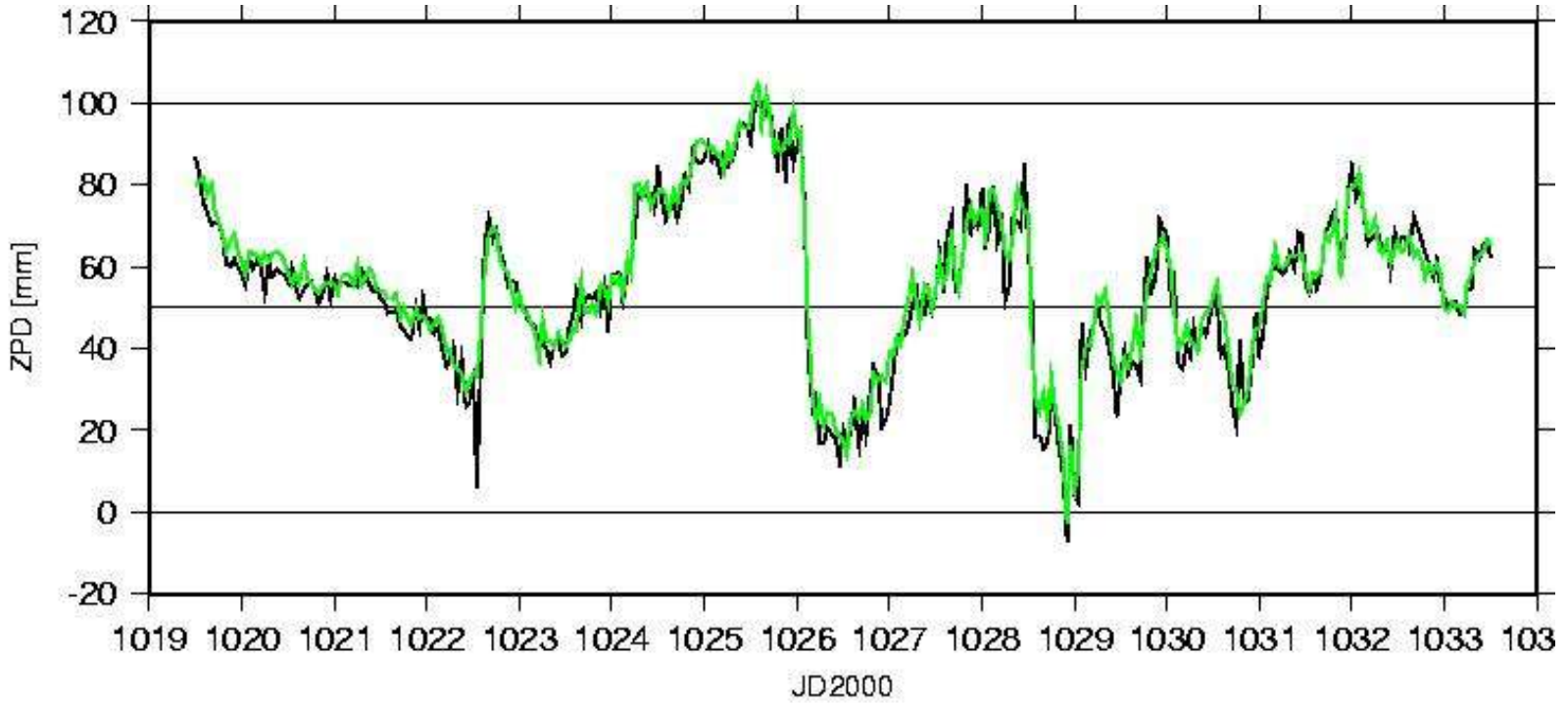
Tropospheric zenith delays

Zenith path delays from VLBI ■ and GPS ■ for Onsala
temporal resolution: one hour



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Tropospheric zenith delays

Station	ΔH [m]	ΔZD [mm]	Model [mm]	Difference ΔZD-Model [mm]	Radome
Ny Alesund	3.1	0.15	1.1	-0.95	SNOW
Onsala	13.71	1.42	4.3	-2.88	OSOD
Wettzell	3.1	1.19	0.8	0.39	
Hartebeesthoek	1.54	0.77	0.3	0.47	
Algonquin	23.11	7.55	6.2	1.35	
Fairbanks	13.08	0.92	3.5	-2.58	JPLA
Kokee Park	9.24	7.94	2.3	5.64	
Westford	1.75	4.51	0.5	4.01	

Model: Saastamoinen with standard atmosphere

for 4 stations the agreement is very good

biases in Onsala and Fairbanks are possibly caused by radome effects

biases in Kokee Park and Westford are still unclear

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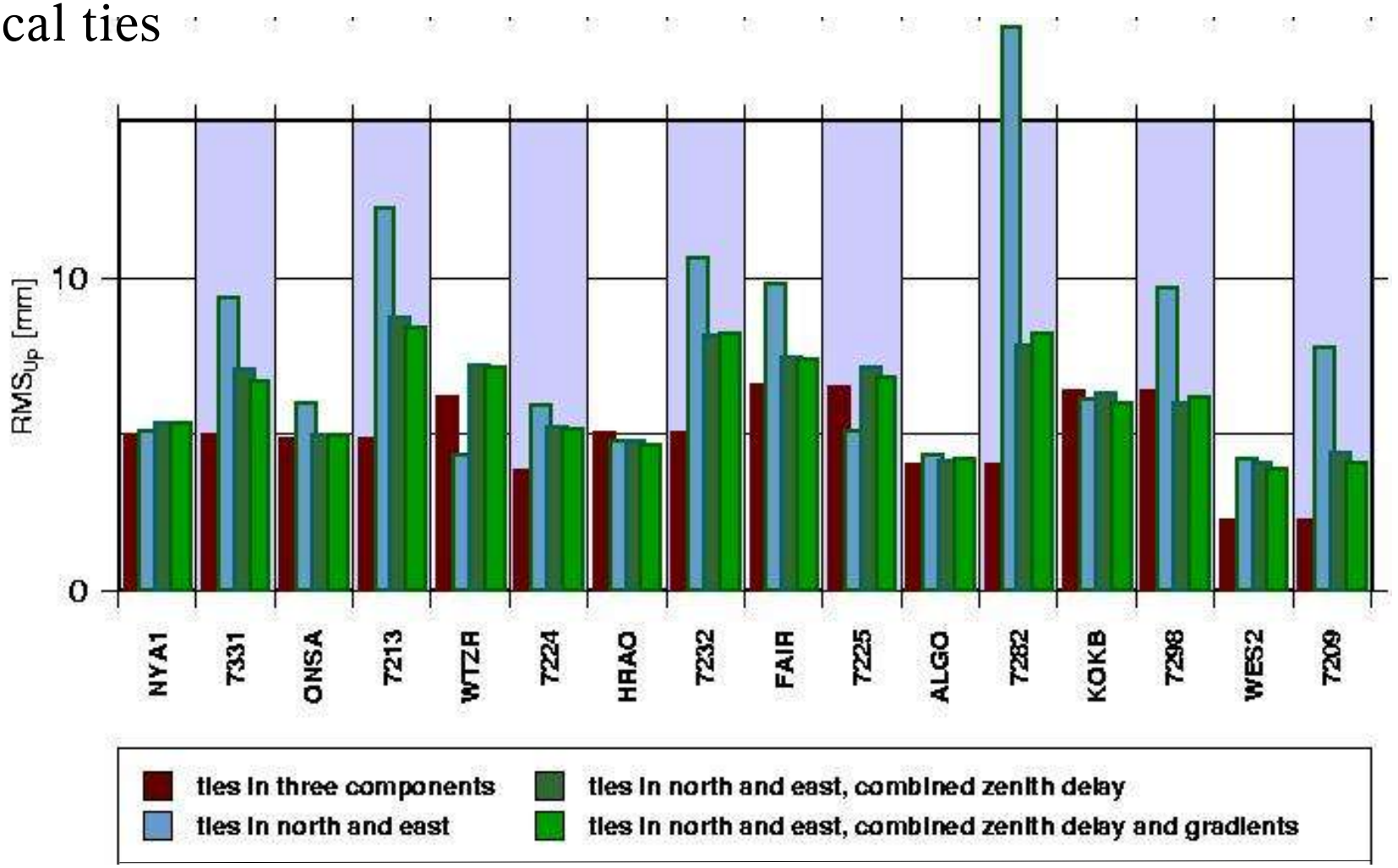
Combination of tropospheric zenith delays

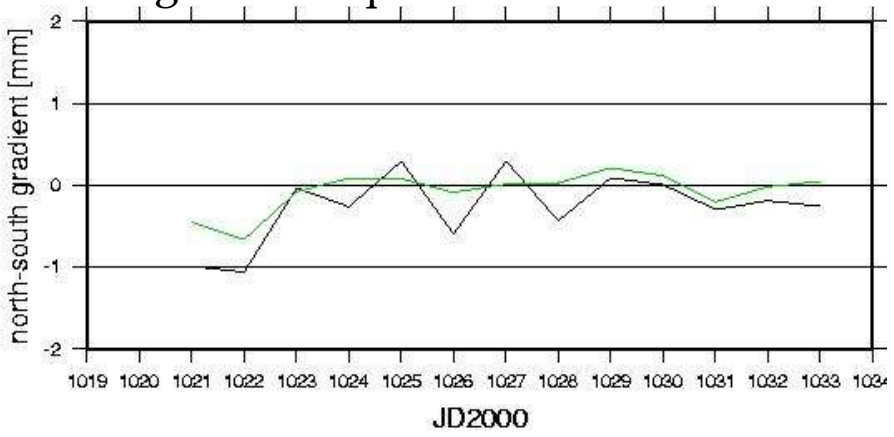
Combination of zenith delays instead of introducing height component of local ties



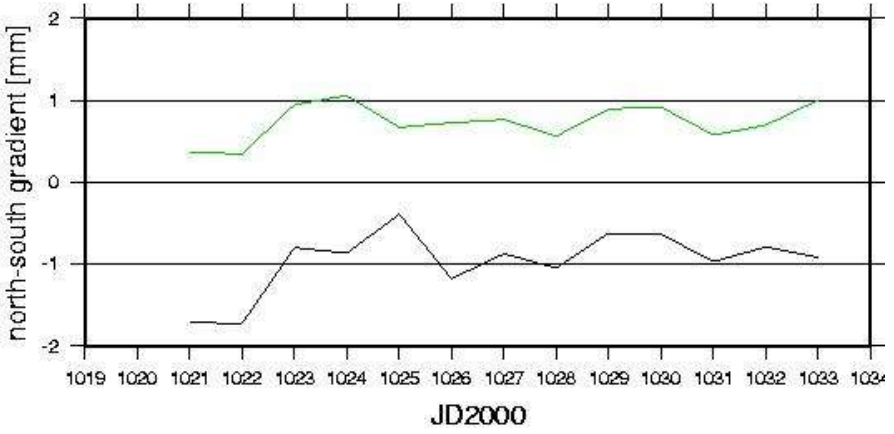
Local ties and tropospheric gradients

Tropospheric gradients from VLBI ■ and GPS ■ for Fairbanks

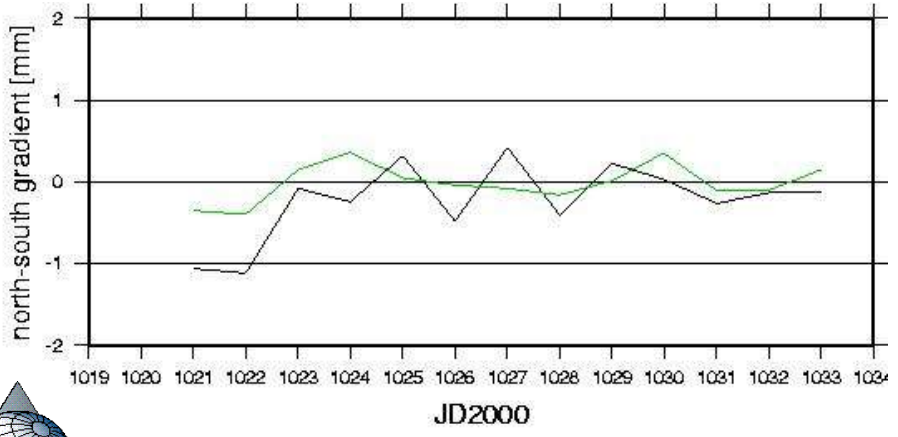
Single technique solutions



Combination with all tie information



Combination without north component



tropospheric gradients can be used as indicator for local tie problems

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Conclusions

- CONT02 optimal for combination studies
  - identical models and parameterization for GPS and VLBI
  - all combined parameters benefit from a combination

- common parameters (EOP and tropospheric parameters) can be used as indicators for problems in local ties

- combination of tropospheric zenith delays instead of the directly combination of the height components gives comparable results, even if this method could not replace the direct combination in cases of good local tie information

- still not explained biases in local ties and tropospheric parameters between the two techniques have to bee investigated more intensively