



GOP Analysis Center report

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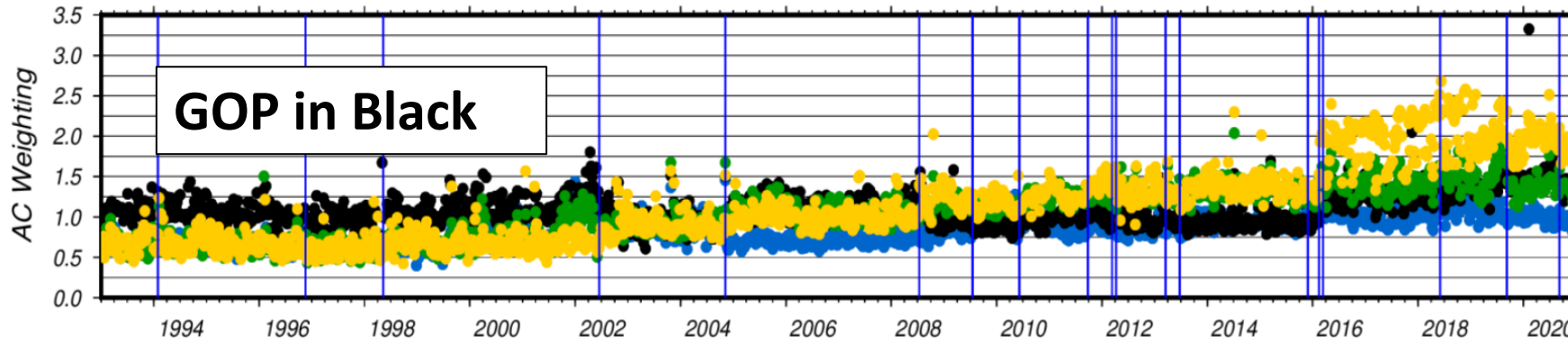
Geodetic Observatory Pecný, VÚGTK

GOP ITRF 2020 DORIS reprocessing

Solution wd66 (wd65 before Hy-2A data)

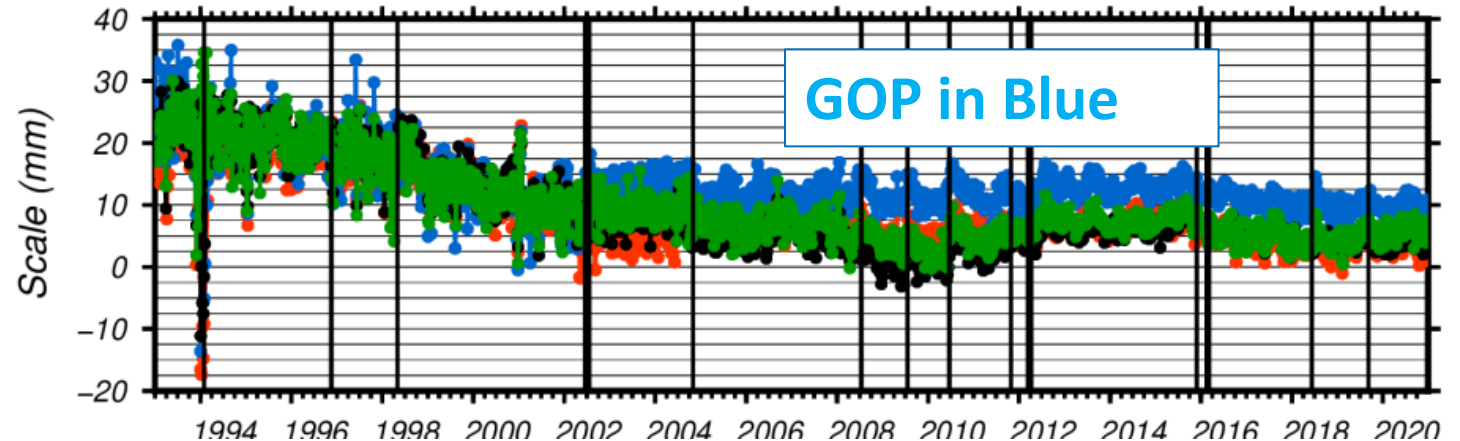
Specific results in comparison to other Acs

- Slightly worse station WRMS before 2002 (first generation of DORIS receiver)



*Figures by
Guilhem Moreaux*

- Scale higher about 5-10 mm
- After 2002



Major differences in standards for ITRF 2014 and ITRF 2020 reprocessing

	ITRF 2014	ITRF 2020	comment
Orbit parameters once per rev.	Along track only	+ cross track (constrained)	Pole coordinates improvement
Mesured Sat. Attitude (qaternions)	no	Body and Panel for Jasons	
Onboard antenna offset	Corrections from observation file	Nominal or measured attitude	
Antenna PCV modeling	Alcatel (old) and Starec	Alcatel (new) and Starec	
Gravity filed	EIGEN-6S2	EIGEN-GRGS.RL04	
Mean pole	IERS 2010	Linear IERS 2017	
Subdaily pole model	IERS 2010	Deasi and Sibois	
Ocean tide model	FES 2004	FES 2014b	
Observation downweighting	No	1/sin E	
Elevation cut off	12 deg	10 deg	
Satellites	All available except Jason-1	All available except Jason-1	Jason-3, Sentinel-3A, -3B



Satellite specific issues (1)

T/P

problem: manoeuvre changing attitude - Yaw flips, ramps, etc.

solution: model these changes according to the available file of T/P issues

SPOT-5

Problem :sawtooth pattern in scale

Experiment: exclude SPOT-5 contribution on the scale. But this resulted in overall instability of the scale before 2002

Solution: keep SPOT-5 to contribute on the scale = no action

Problem: Changes in solar panel angle

Solution: Included proper history of these changes

Cryosat-2

problem: periodical variations in Tz and also in some other parameters

solution: not found

Hy-2A

problem: Scale bias

solution: New value of antenna offset (obtained from satellite provider) introduced

problem: Tz bias

solution: Use GSC-tuned satellite macromodel instead of the nominal macromodel.

Sentinel-3B

problem : Tz bias

solution: use +15 mm antenna Y-offset (to be consistent with +20 mm offset already applied for Sentinel-3A)

SAA strategy

Sat	data	SAA station „renaming“	ITRF 2014
SPOT-5	Doppler (corrected)	No	Corected data
Jason-1	ALL DATA EXCLUDED		
Jason-3	RINEX	Yes	N/A

Jason-1: experiments with various SAA strategies. Improvements of the solution in some parameters, but degradation in the others. Final decision was not to include Jason-1 data at all.

- **Stations Positioning Height difference at the level aprox. of 10-15 mm between both models**
- **For ITRF 2014 old model applied, for ITRF 2020 new model applied**

Verification of new model:

- **Comparison of the estimated station height difference for pairs of Starec-Alcatel Antenna stations. Verification of Starec-Alcatel model compatibility**
 - From DORIS-DORIS local ties
 - From DORIS data (new Alcatel model applied)
 - *From DORIS data (old Alcatel model applied) – TBD*
- **Campaigns 1994 and 2003 – DORIS solutions using both Alcatel models**
 - Residual analysis (selection by type of antenna and ascending/descending pass)

Comparison of the estimated station height difference

1. Height (position and velocity) for Alcatel station was calculated from weekly coordinate series of last 2 years of the station observation, i.e., not 2 years cumulative solution but linear approximation from weekly coordinate estimates (not transformed solution)
2. The same approach for Starec station (first 2 years of observation)
3. Removing pairs with the break between Alcatel and Starec station observation longer than 1 year
4. Calculation of height difference for the epoch of local tie measurement
5. Note, that the **new Alcatel antenna model** was **applied**

RESULT: Difference (27 pairs of stations) for new Alcatel is -2.7 ± 3.0 mm (Mean, std. error)

Notice: A height bias between applying an old and new Alcatel model in GOP DORIS solutions is about -15.4 mm (average from campaigns 1994 and 2003)

Observation residuals by antenna type/model

2003

Sat	Old Alcatel (mm)	New Alcatel (mm)	Old-New Alcatel (mm)	Starec (mm)
SPOT-2	5.208	5.187	0.021	4.524
SPOT-4	5.034	5.020	0.014	4.427
SPOT-5	5.555	5.538	0.017	4.573
Envisat	4.864	4.844	0.020	3.922
T/P	4.564	4.556	0.008	4.246

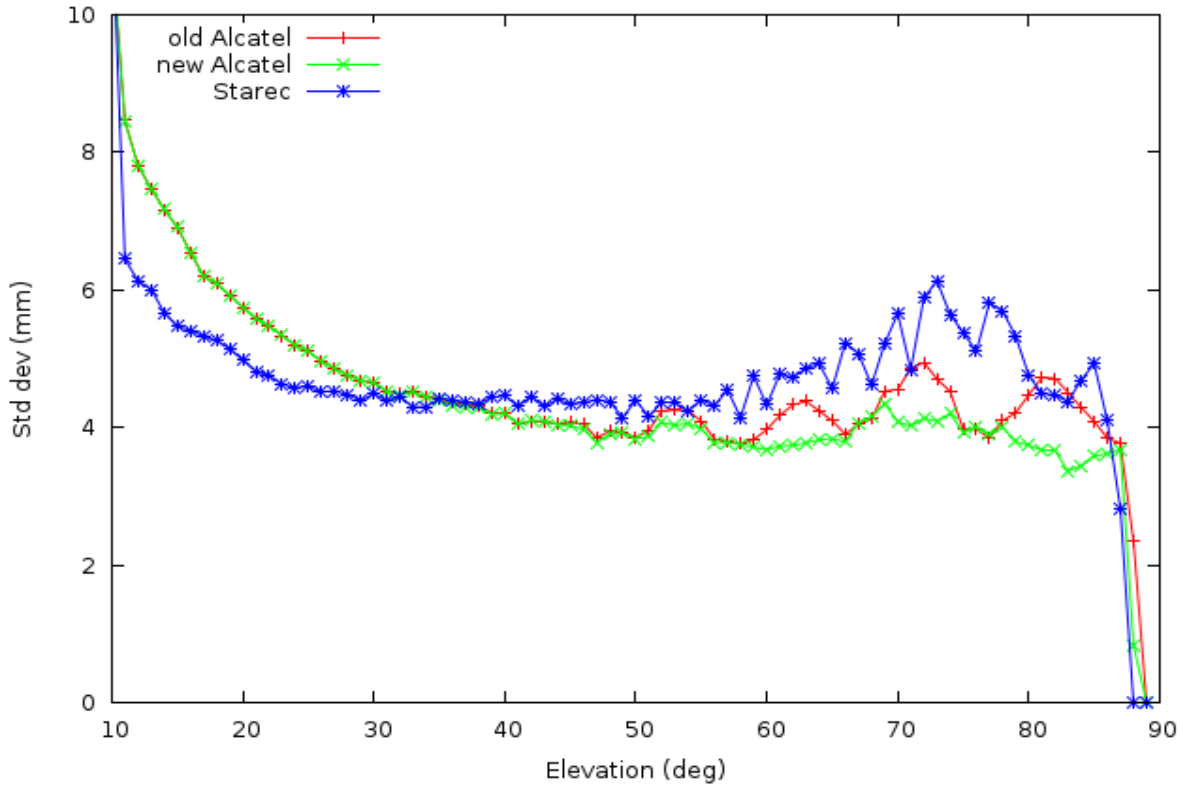
1994

Sat	Old Alcatel (mm)	New Alcatel (mm)	Old-New Alcatel (mm)	Starec (mm)
SPOT-2	5.300	5.272	0.028	4.869
SPOT-3	4.765	4.740	0.025	4.302
T/P	4.814	4.806	0.008	4.942

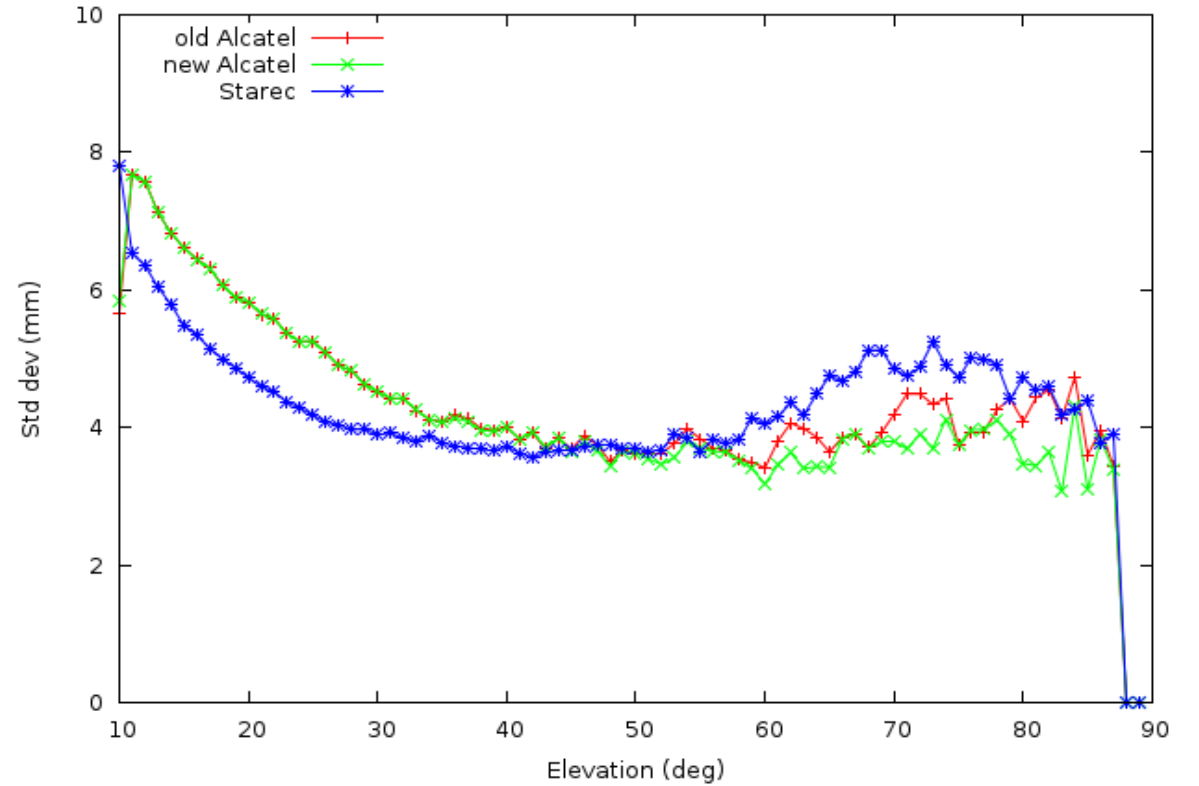
Observation residuals std. dev. by elevation

- Std. dev. displayed for SPOT-2

SPOT-2 residual std. dev. per elevation, 1994



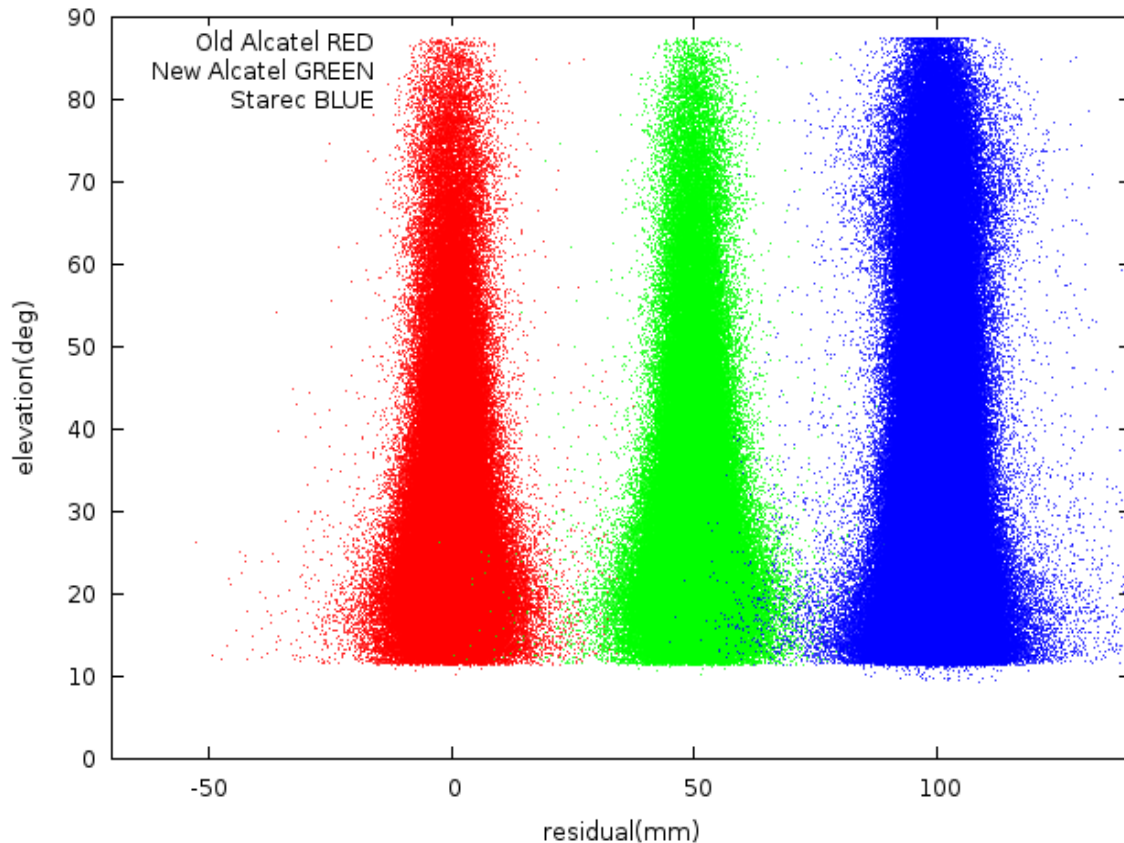
SPOT-2 residual std. dev. per elevation, 2003



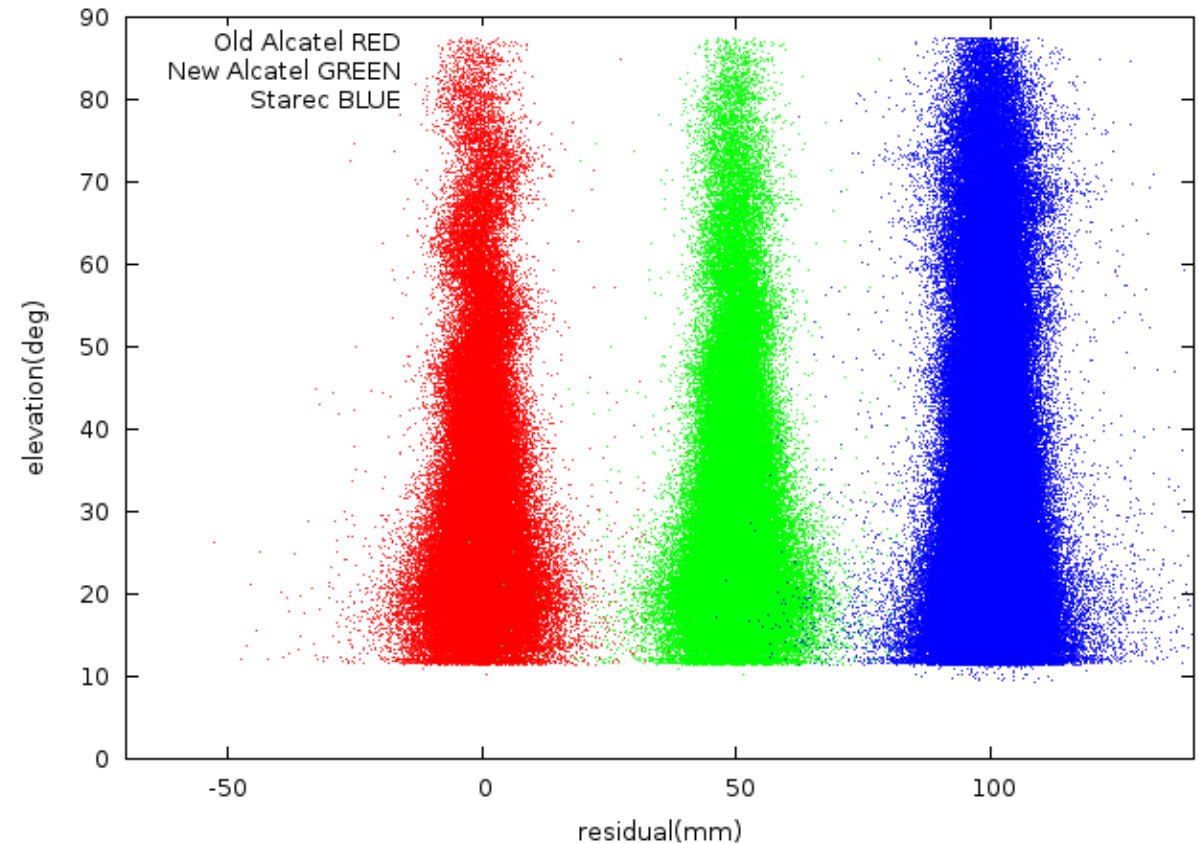
Observation residuals by elevation

- In mm
- Old Alcatel, New Alcatel, Starec
- All residuals (left), ascending residuals only (right)

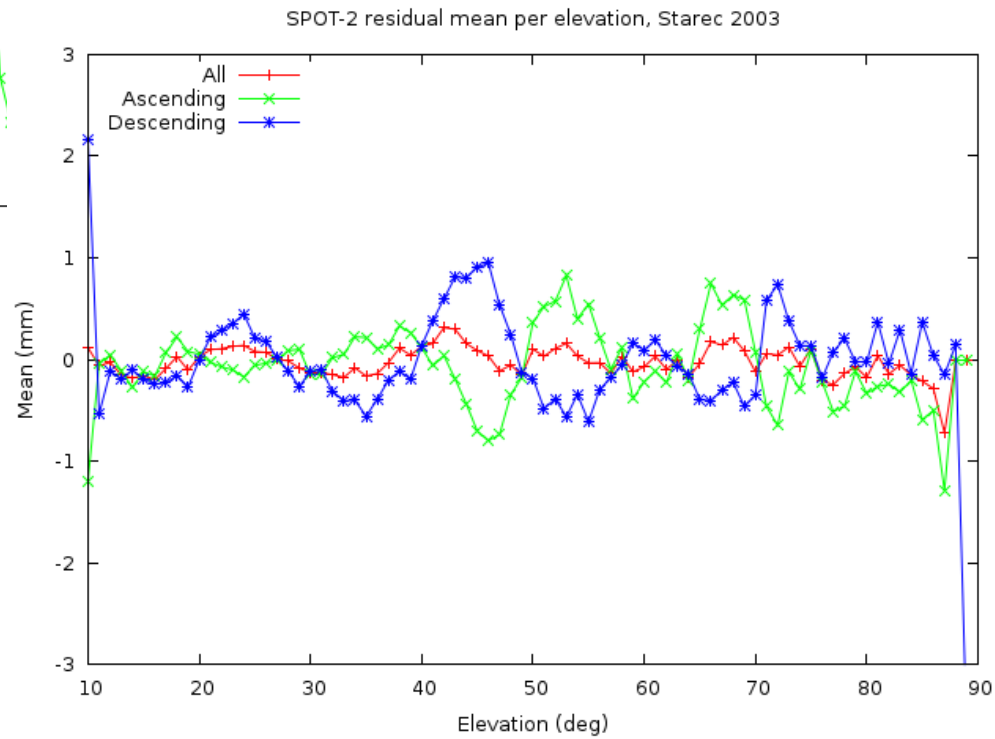
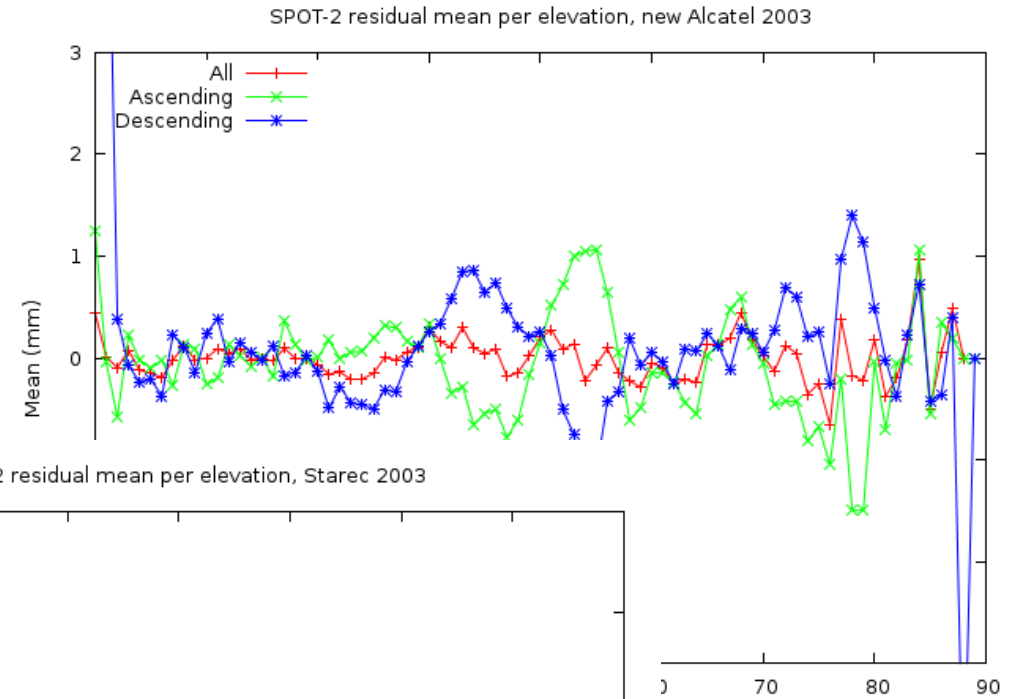
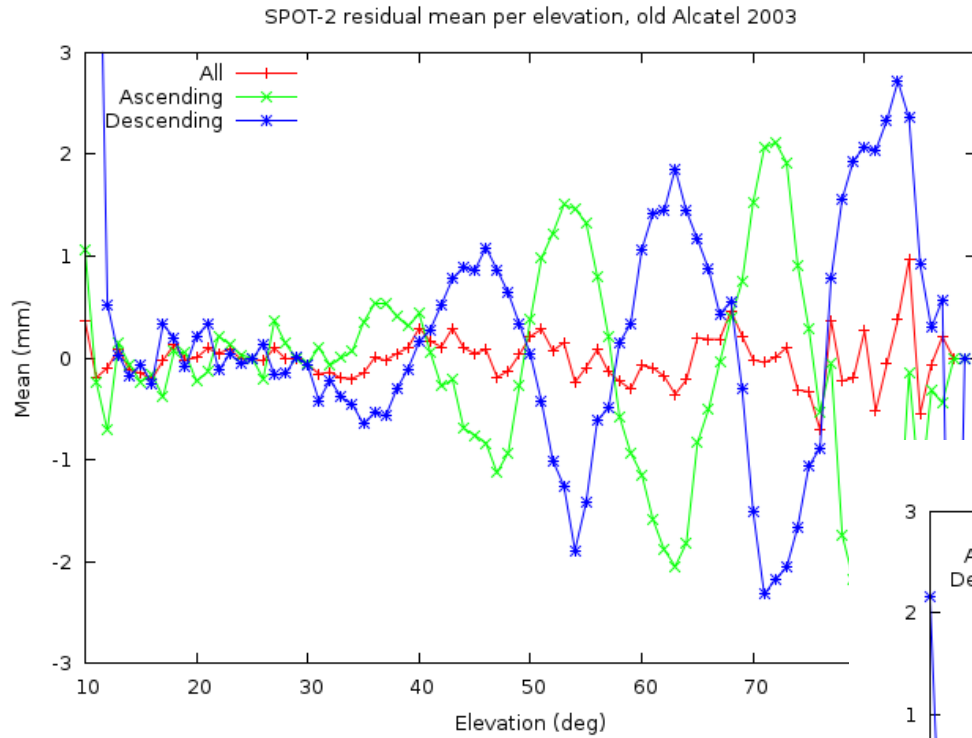
SPOT-2 residuals from 2003



SPOT-2 ascending residuals from 2003



Observation residuals Mean by elevation





Conclusions : New Alcatel model is better than the old model

Thanks for your attention