

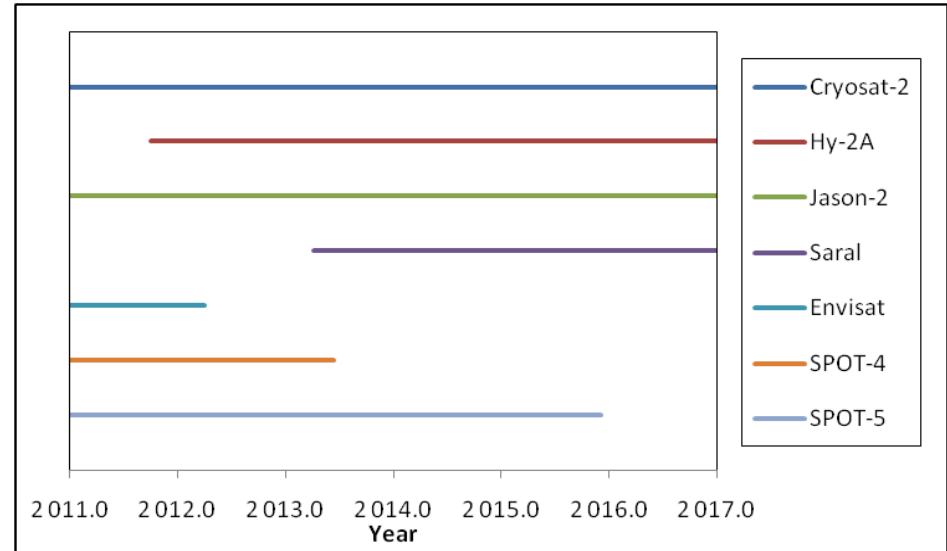
Consistent DORIS scale series 2011.0 – 2017.0

Petr Štěpánek

IDS AWG meeting, Toulouse, 11.6.2018

Campaign

- 2011.0 – 2017.0
- DORIS Doppler (2.2) data
- Consistent series of one AC
- 2012 and 2015 scale issues
- DPOD2014 (version 1) as a reference
- 4 solutions (V1-V4)
 - V1-V2 difference = downweighting
 - V3-V2 difference = Validity indicator
 - V4-V3 difference = CoM correction
 - elevation cut off 10 deg for all

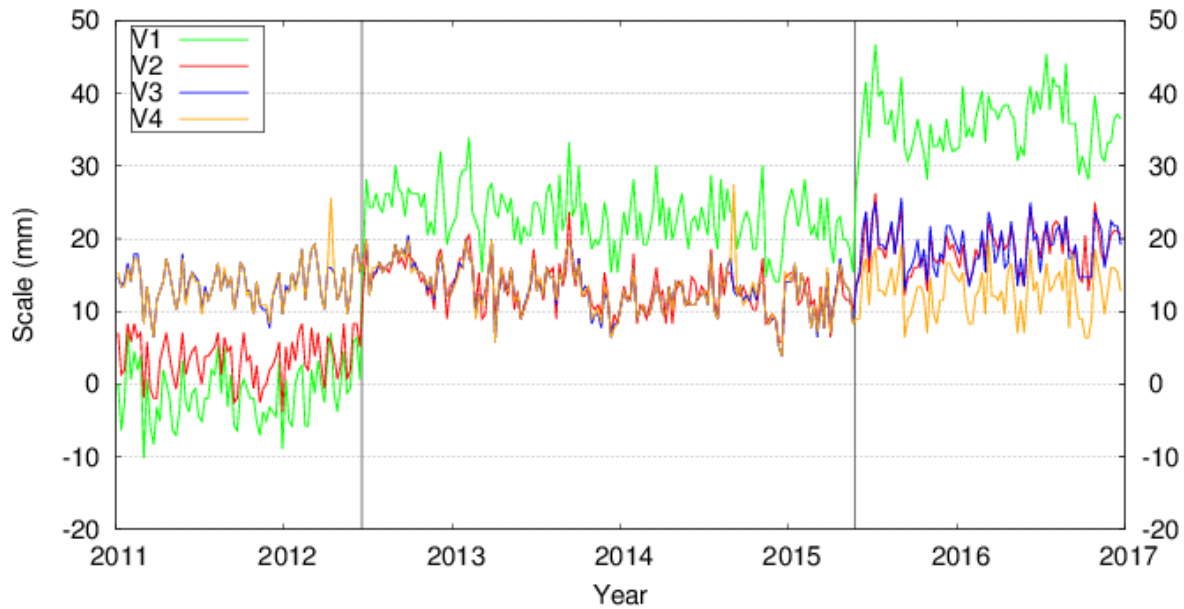


ITRF2014 GOP reprocessing standard

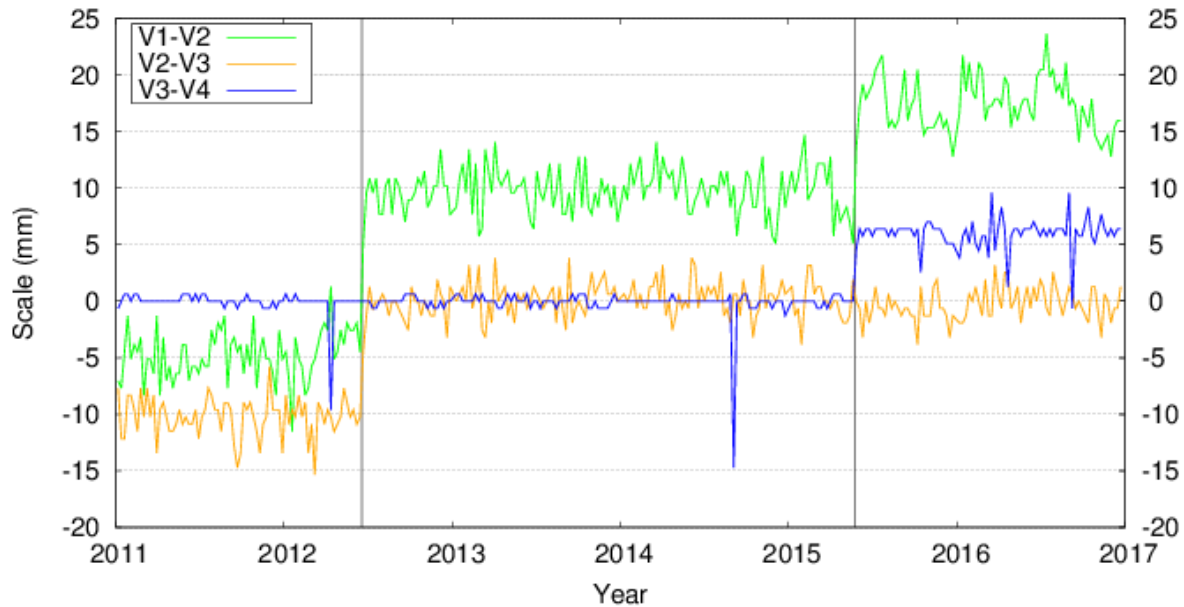


Solution	Observation weight	Validity indicator from data file	CoM correction from data file
V1	1	Yes	Yes
V2	$\text{Sin}^2 E$	Yes	Yes
V3	$\text{Sin}^2 E$	No	Yes
V4	$\text{Sin}^2 E$	No	No

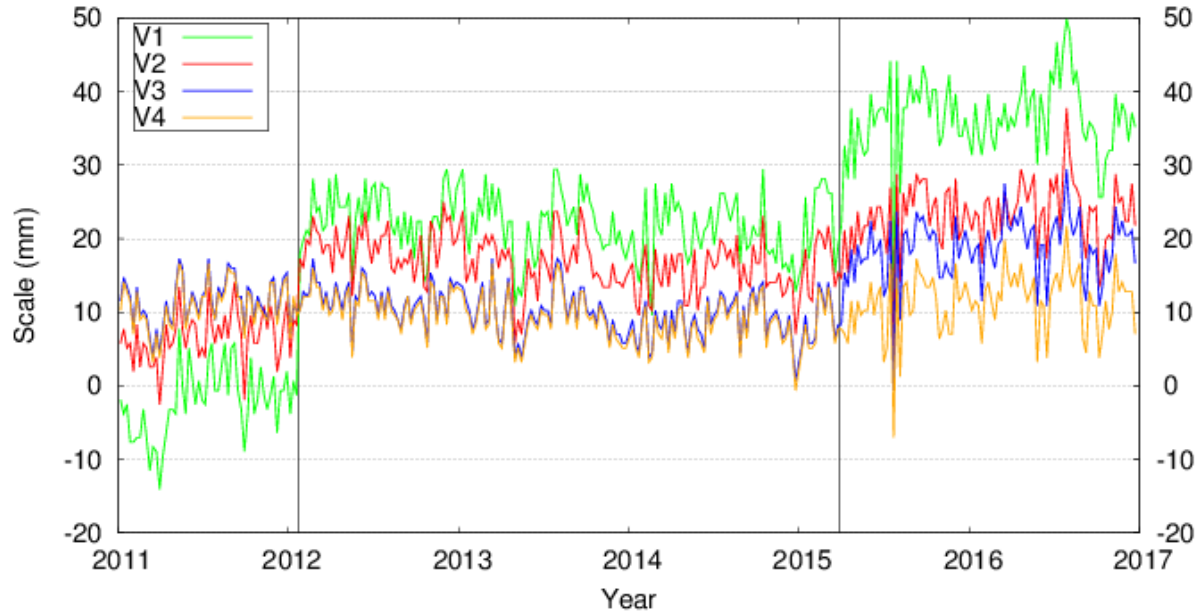
Jason-2



- CNES POD standards changes – vertical lines
- Data downweighting reduced the effect
- 2012 – validity indicators
- 2015 – CoM corrections



Cryosat-2

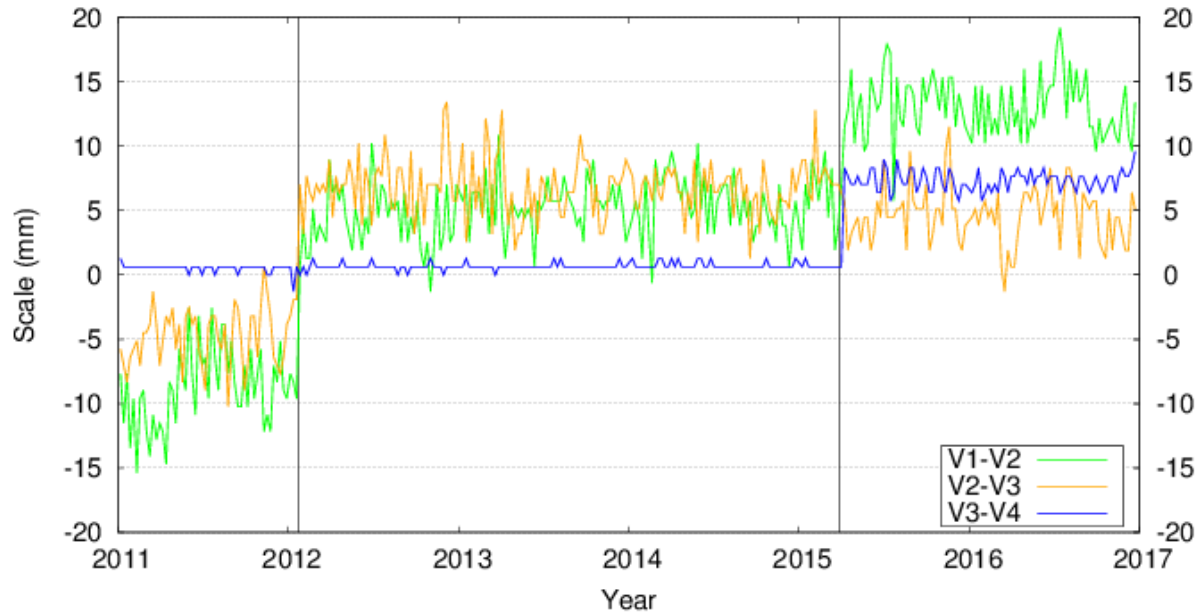


➤ CNES POD standards changes – vertical lines

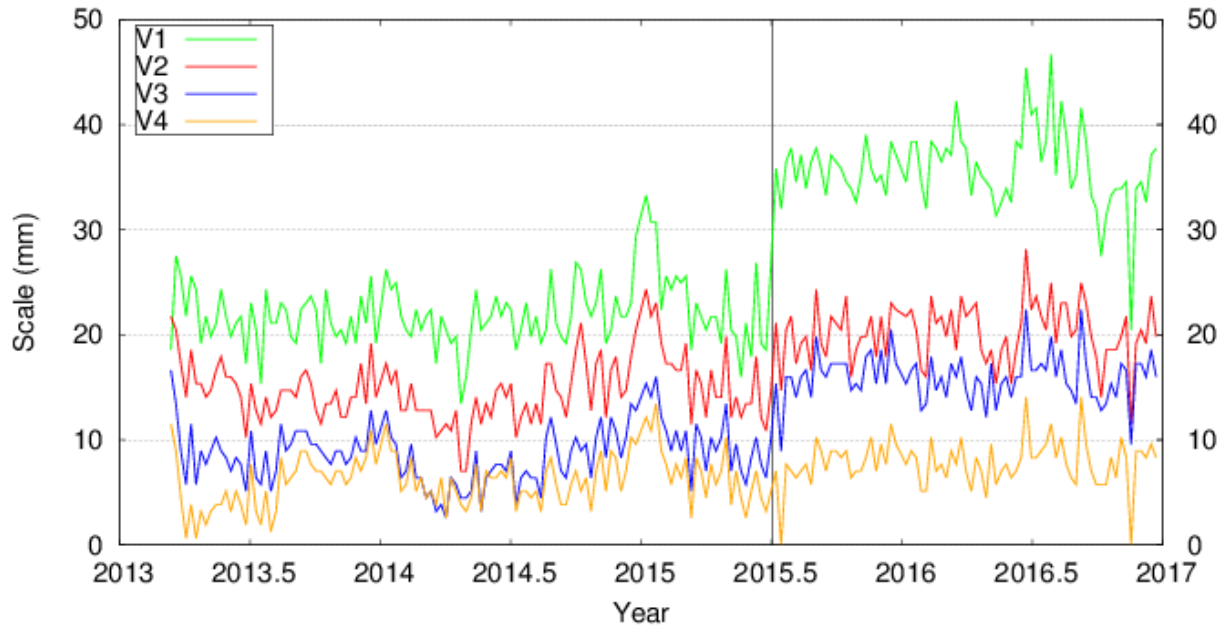
➤ Data downweighting reduced the effect

➤ 2012 – validity indicators

➤ 2015 – CoM corrections (and validity indicators with opposite sign)



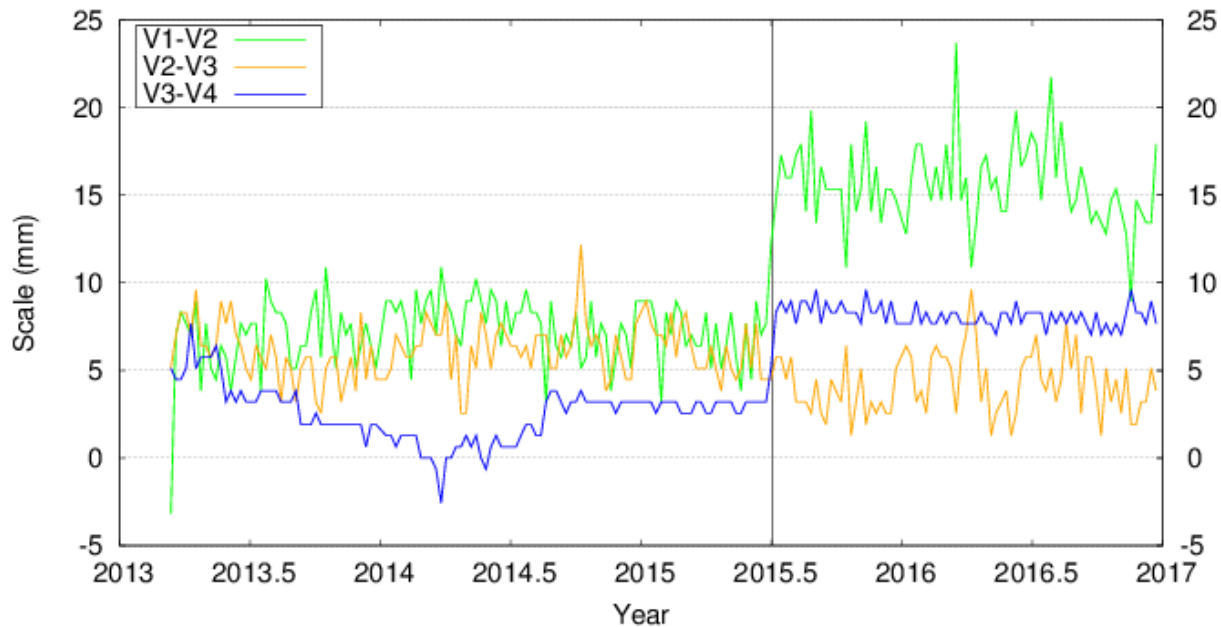
Saral



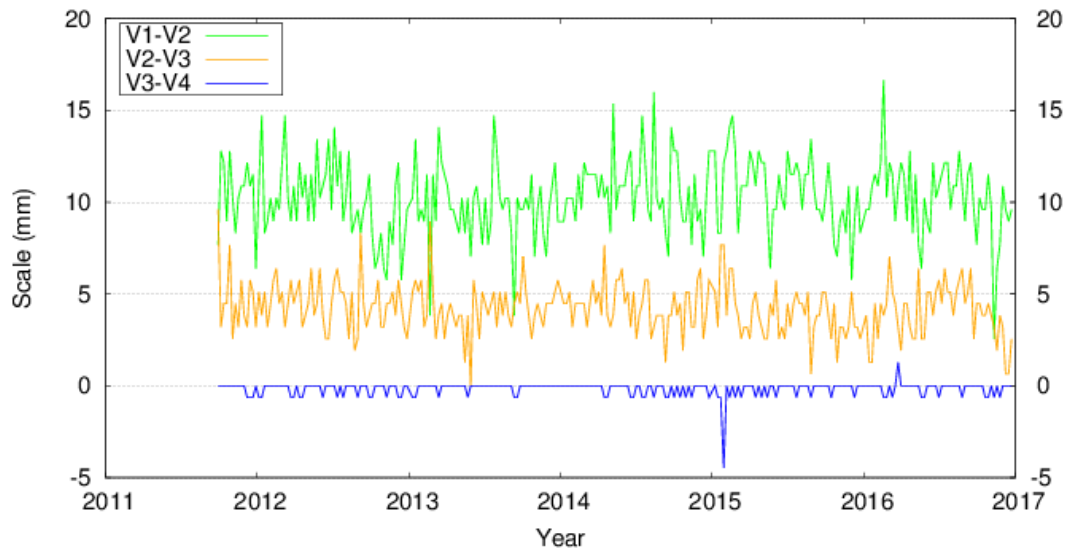
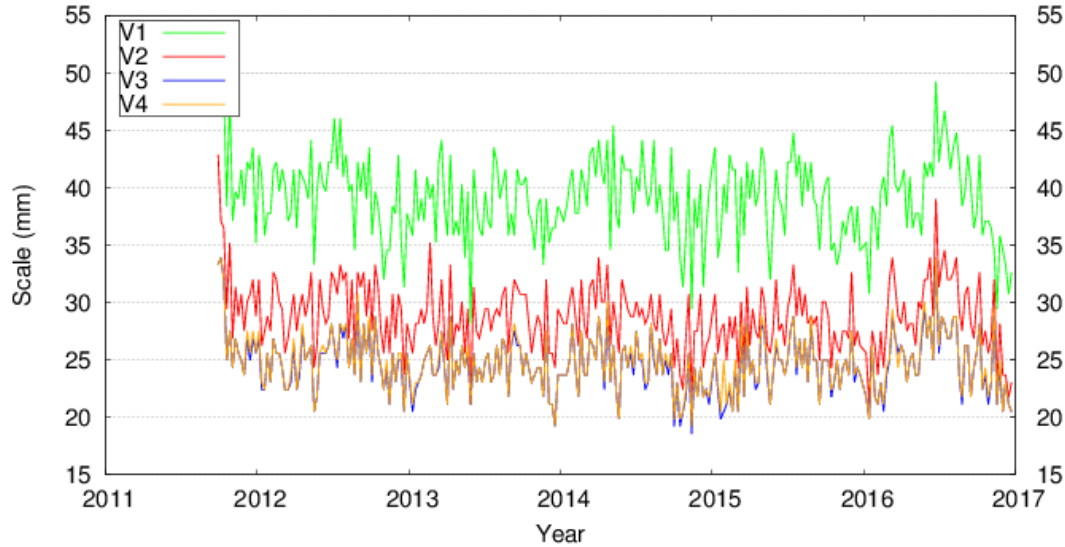
➤ CNES POD standards changes – vertical lines

➤ Data downweighting reduced the effect

➤ 2015 – CoM corrections (and validity indicators with opposite sign)

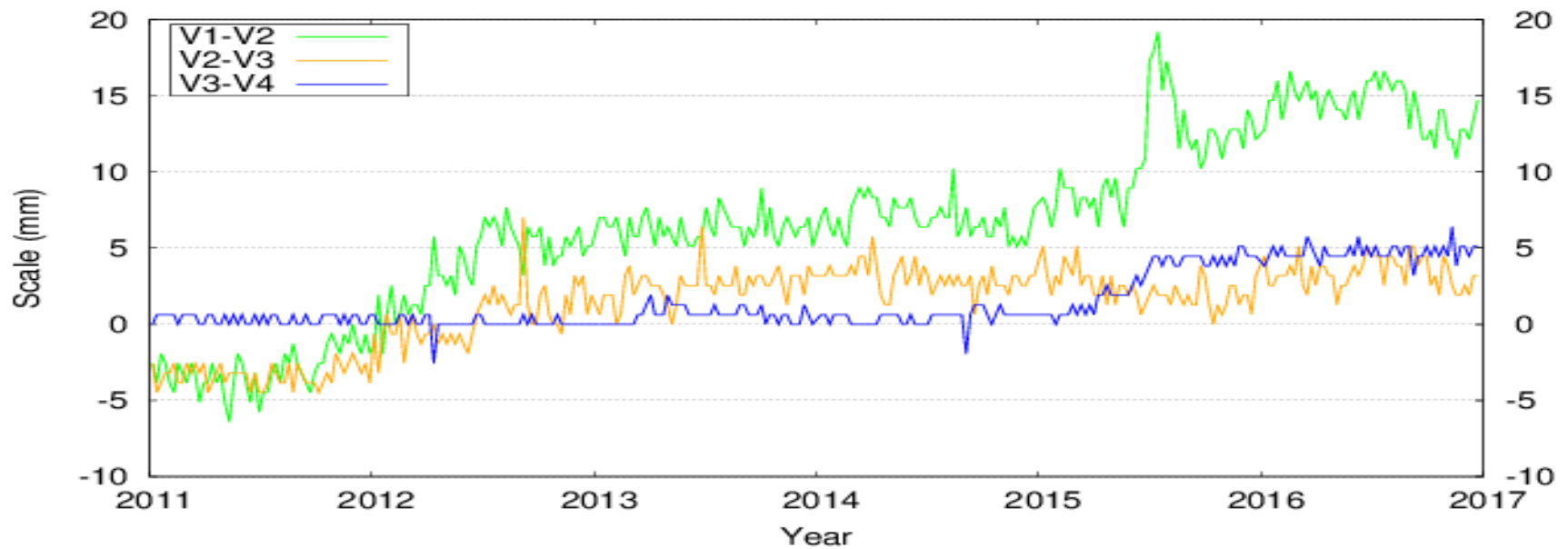
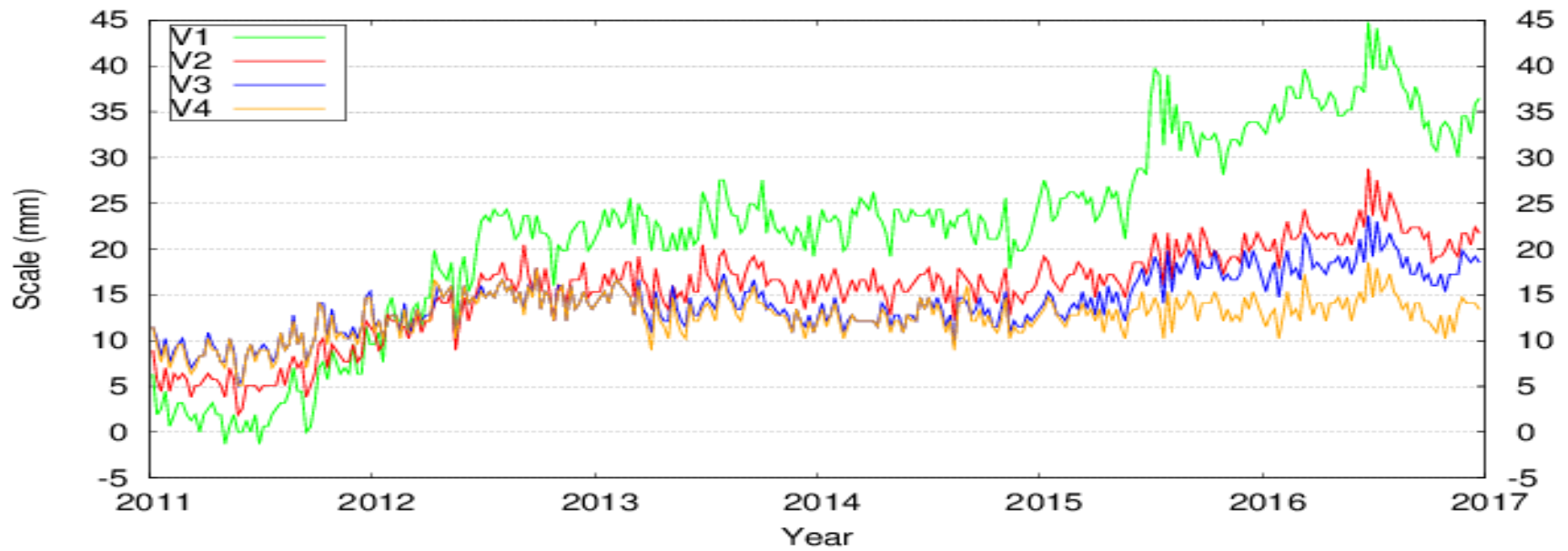


Hy-2A



- No CNES POD standards changes
- Data downweighting reduced the bias
- 2015 – not using data validity indicators reduces the bias
- Recently proposed change of CoM-antenna vector by CNES (25 mm) **not applied**

Combination

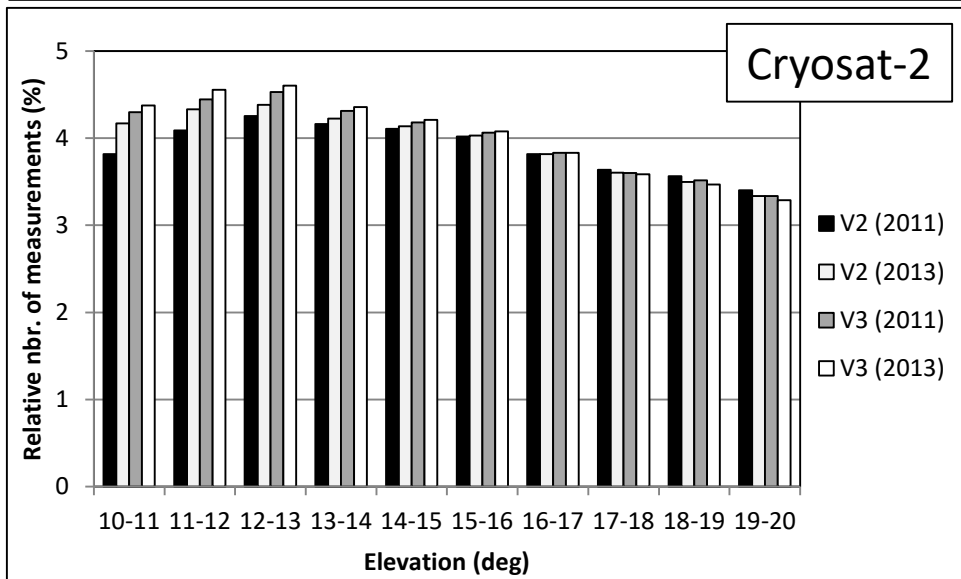
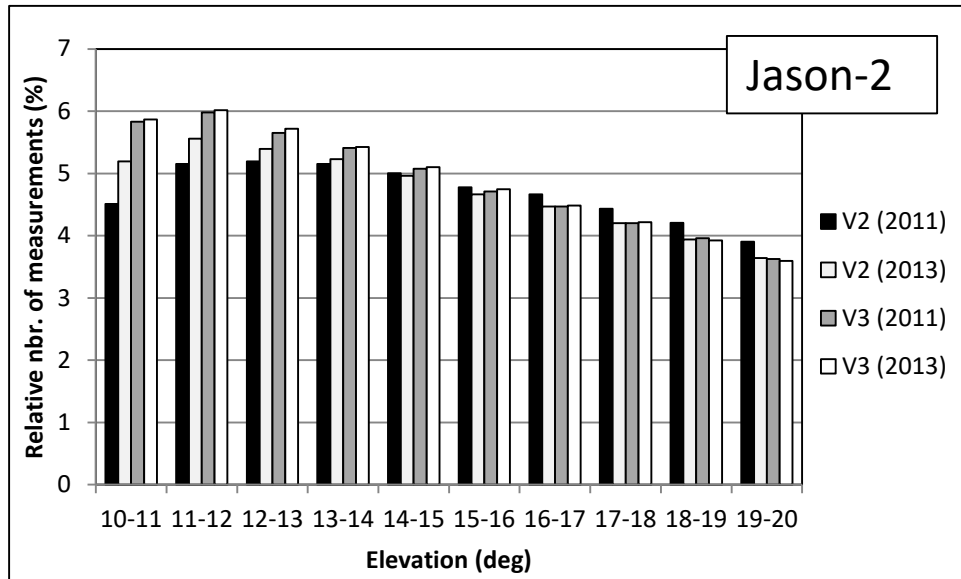


Summary

- for complete time span 2011.0 – 2017.0
- only minor improvement (if any) for SPOT-4, SPOT-5 and Envisat
- ITRF2014 reprocessing strategy V1, recommended strategy V4
- Bias w.r.t. DPOD2014(1) reduced from 22.1 mm to 12.7 mm
- RMS reduced from 10.7 mm to 2.3 mm
- when applying Hy-2A new antenna-phase center offset , another improvement is expected (possibly Mean < 10 mm, RMS < 2 mm)

Sat/Sol	V1 (mm)	V2 (mm)	V3 (mm)	V4 (mm)
Saral	27.4 ± 7.6	16.9 ± 4.0	11.5 ± 4.4	6.8 ± 2.6
Hy-2A	39.2 ± 3.6	28.9 ± 2.9	24.6 ± 2.6	24.8 ± 2.6
Cryosat-2	21.9 ± 13.7	16.9 ± 6.8	12.8 ± 5.2	10.2 ± 3.6
Jason-2	20.4 ± 14.1	12.2 ± 6.3	14.7 ± 4.0	13.4 ± 3.3
SPOT-5	10.9 ± 3.5	10.4 ± 2.6	12.4 ± 2.8	12.4 ± 2.8
SPOT-4	5.5 ± 6.3	2.7 ± 4.5	3.4 ± 5.8	3.5 ± 5.7
Envisat	-2.1 ± 2.9	1.0 ± 2.8	1.2 ± 2.9	0.0 ± 2.9
Combination	22.1 ± 10.7	15.5 ± 5.1	14.2 ± 3.3	12.7 ± 2.3

Relative number of valid low elevation measurements

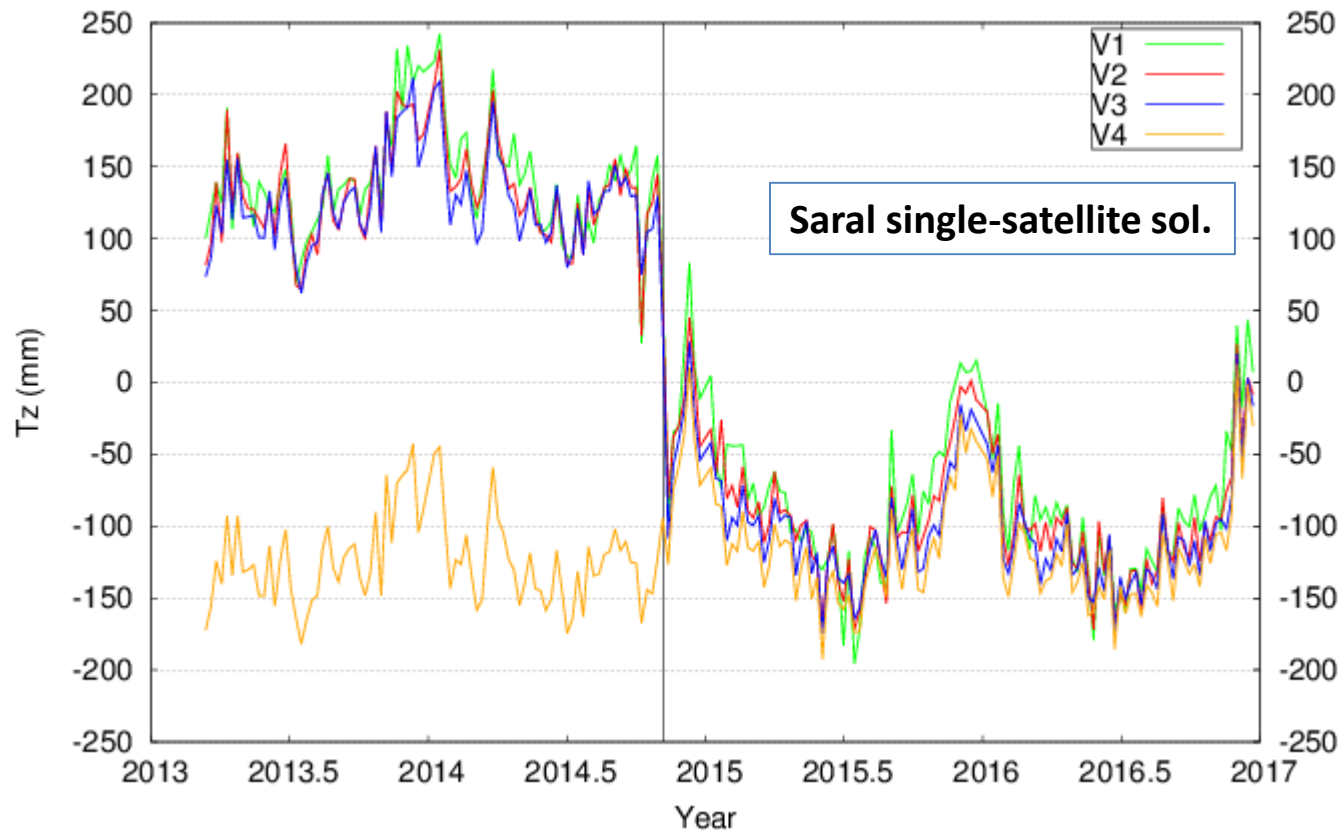


- 2012 scale inconsistency was in the past explained as the effect of the valid low elevation increment
- But this increment is only minor, for $E > 12$ deg negligible
- Data downweighting increases scale after 2012 issue, but decreases scale before 2012 issue for Both Jason-2 and Cryosat-2

Excursion: Geocenter (Tz)

Difference between V4 and V1-V3

-Relates to the change in CNES POD standards for Saral (phase center vector value changed by nearly 5 cm in Z component)



Conclusions

- Detailed results included in **Štěpánek P. and Filler V.: Cause of scale inconsistencies in DORIS time series, under review, *Studia Geophysica et Geodaetica***
- Both inconsistencies in 2012 and 2015 explained.
- CoM corrections and validity indicators from observations files (Doppler exchange format 2.2) should not be applied in DORIS consistent long-term series
- not an issue for RINEX, however ITRF reprocessing will combine both RINEX and Doppler data
- Unification of data downweighting and elevation cut off for all the ACs (various elevation cut off was not part of this experiment) ?
Explanation why scale bias is dependent on data downweighting (and elevation cutoff)?
- Challenge: Could DORIS contribute to the next ITRF scale ?