

Performance of Saral/AltiKa over inland water — effects of atmospheric water content

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Introduction

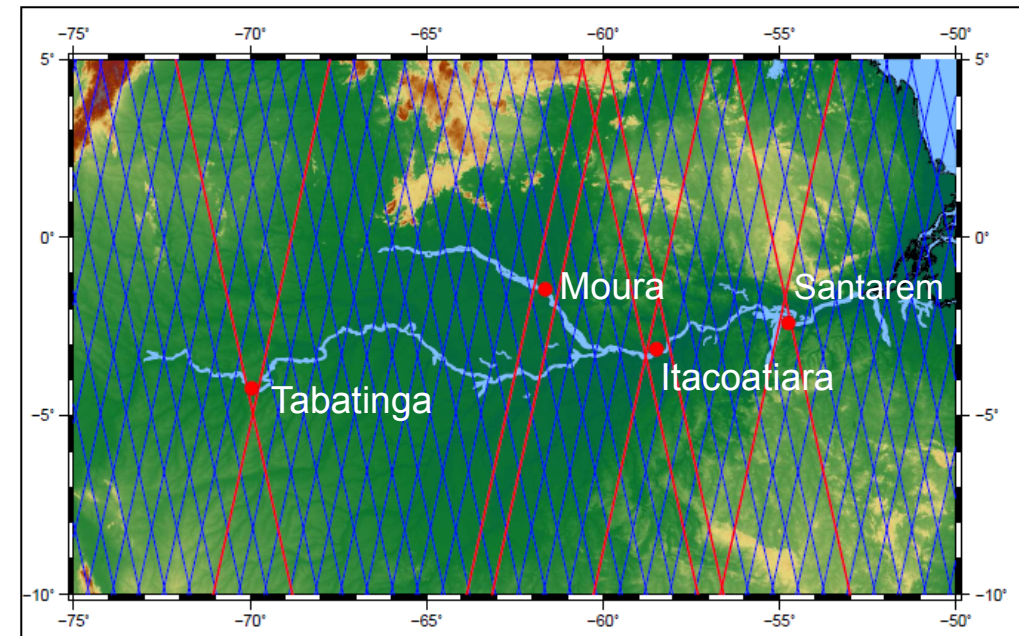
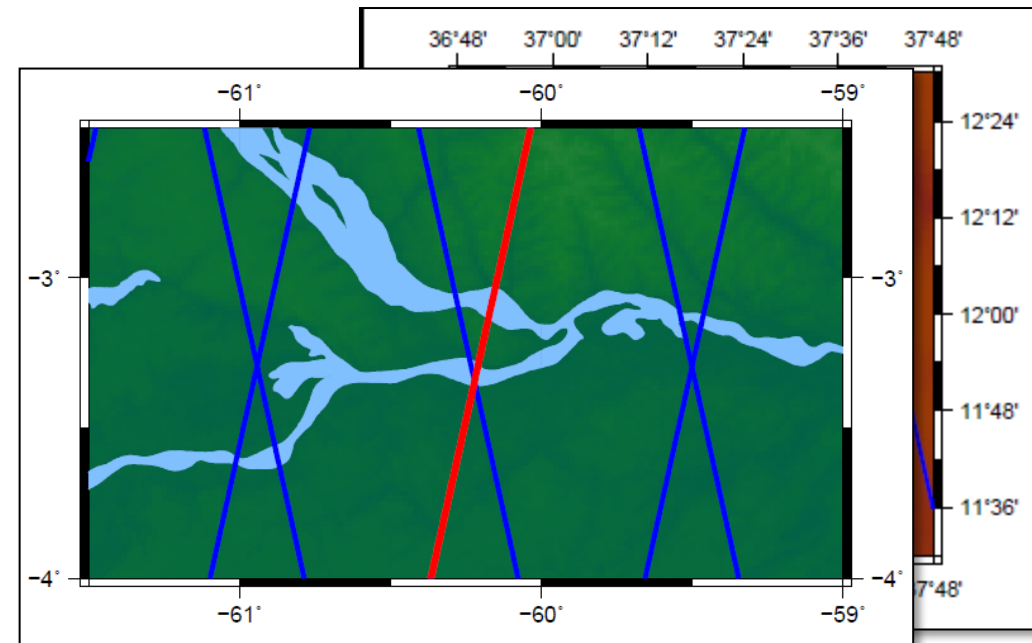
- The Saral altimeter mission is equipped with a Ka-band instrument (AltiKa), specially suitable for inland waters due to smaller footprint
- But more sensitive to tropospheric aberrations due to atmospheric water content
- The mission is continuing the Envisat (and ERS-1/2) missions
- Therefore, a comparison of the advantages and disadvantages of AltiKa measurements over inland waters with respect to the weather dependence is possible

Altimeter missions

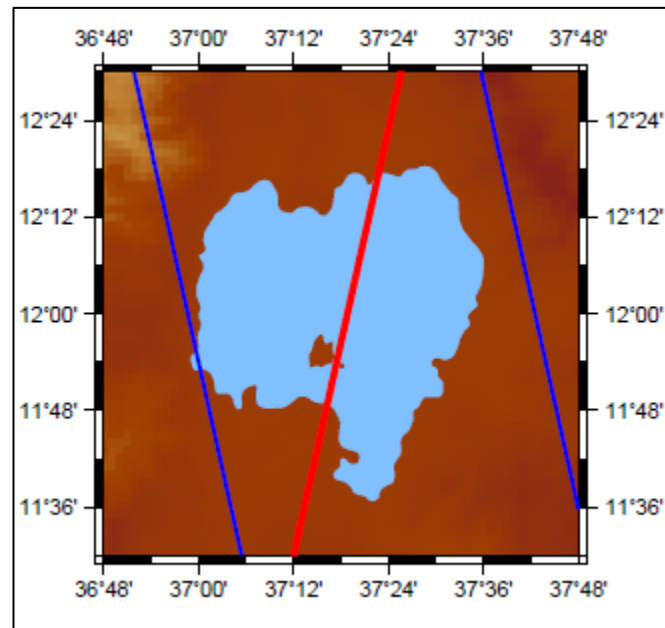
	Envisat	Saral/AltiKa
Mission	Mar 2002-Oct 2010 (till Apr 2012 EM)	Feb 2012 -
Orbit	35 days repeat cycle, inclination 98.5°	
Altimeter band (GHz)	13.575 (Ku)	35.75 (Ka)
Bandwidth (MHz)	320, 80 and 20	500
Antenna beamwidth (°)	1.29	0.61
Pulse repetition frequency (kHz)	1.795	3.8
Pulse duration (msec)	20	110

Examples

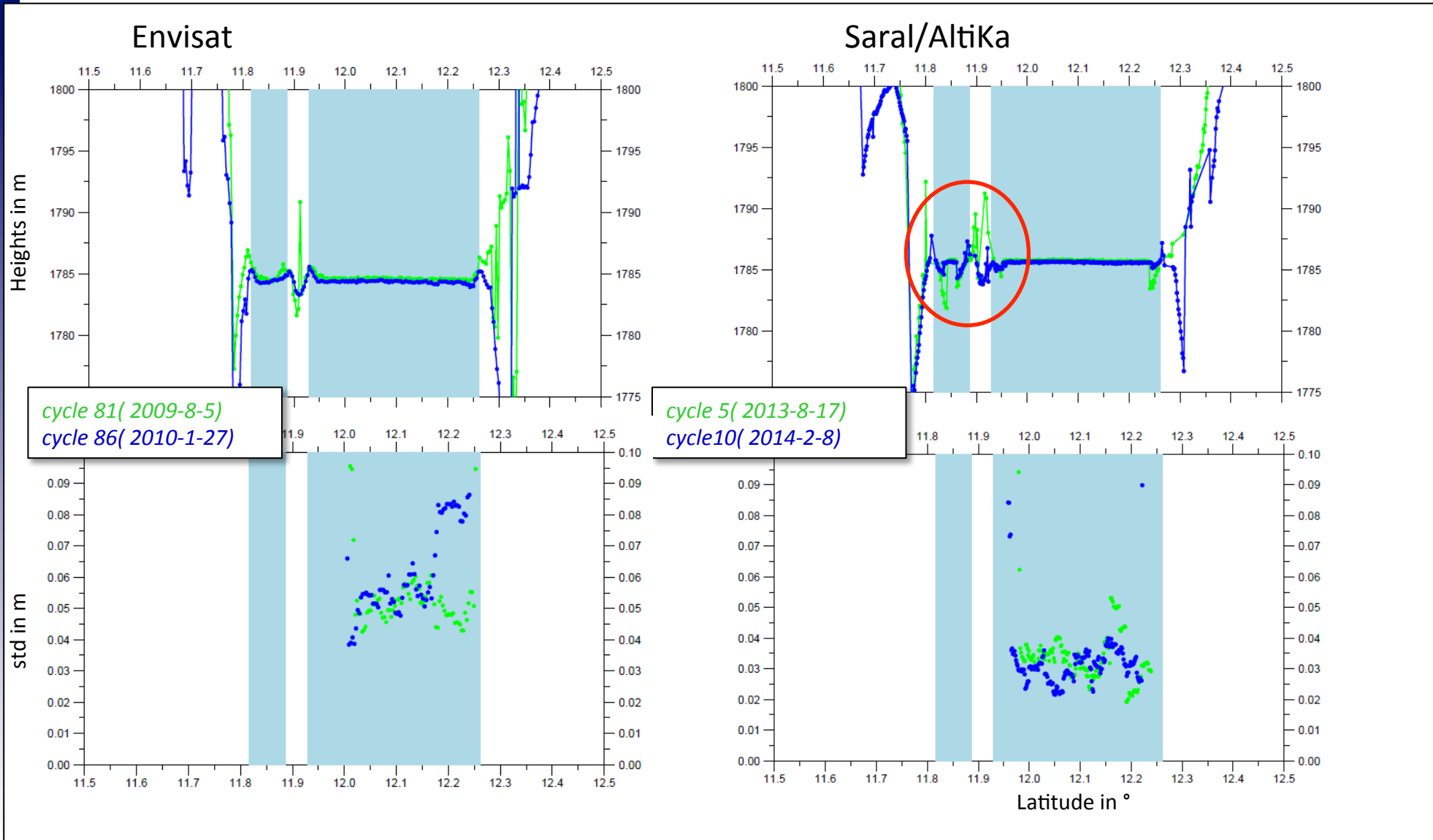
- Lake Tana
 - medium sized lake
 - high seasonal weather variations
- Amazon:
 - well investigated region for inland water altimetry
 - gauge data for validation
 - mostly high atmospheric water content



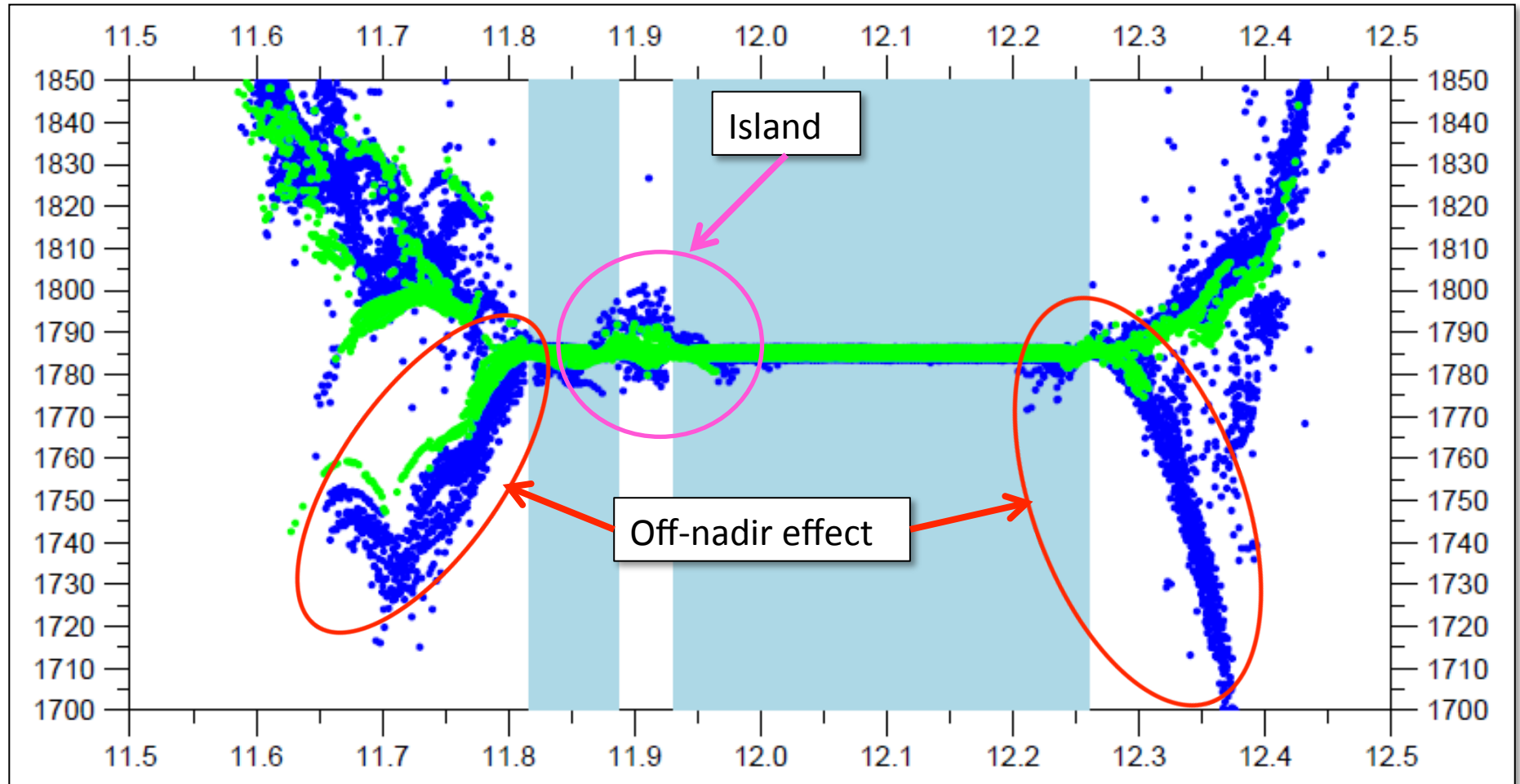
Lake Tana



Lake Tana - Weather



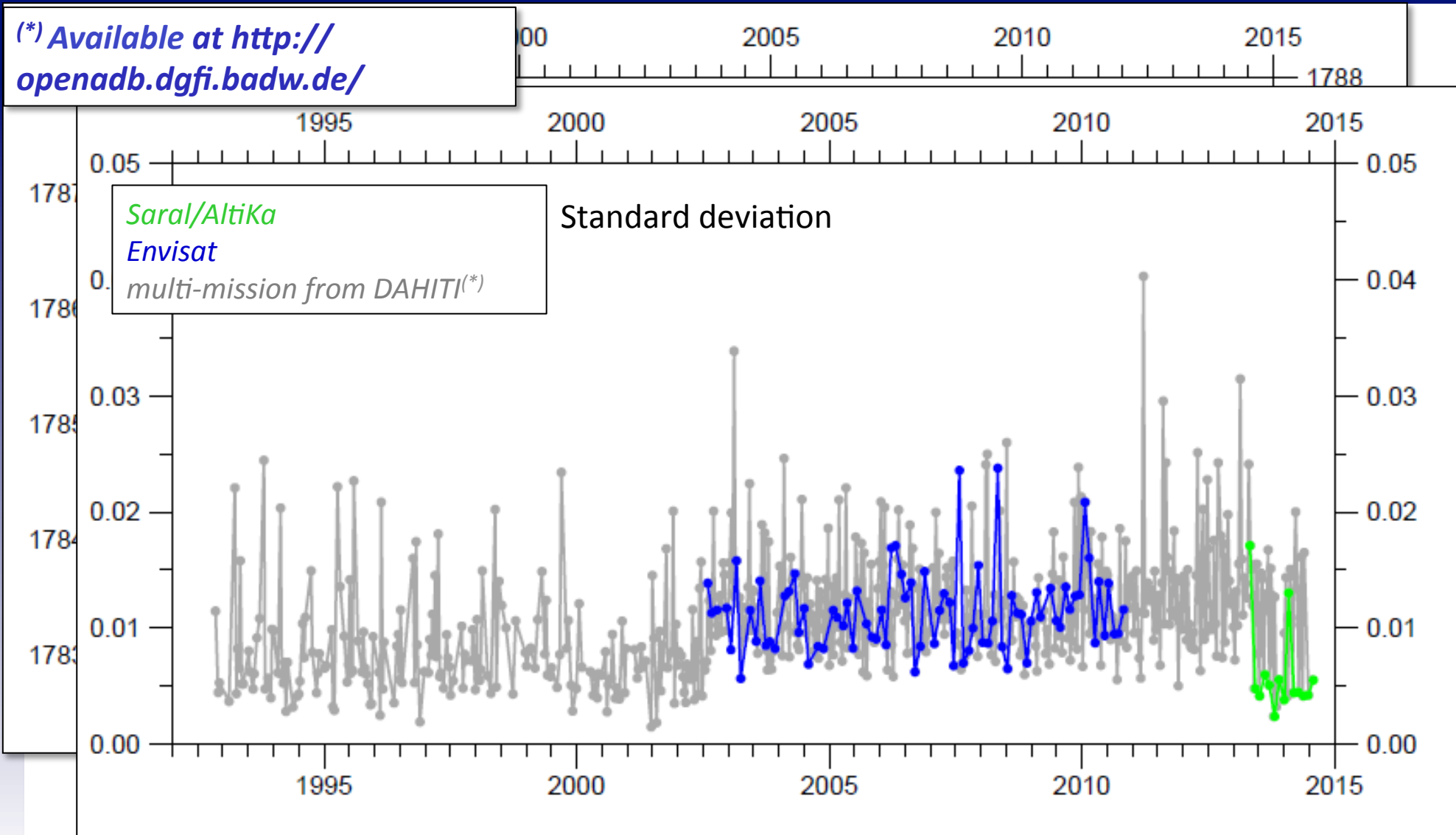
Lake Tana – Land Influence



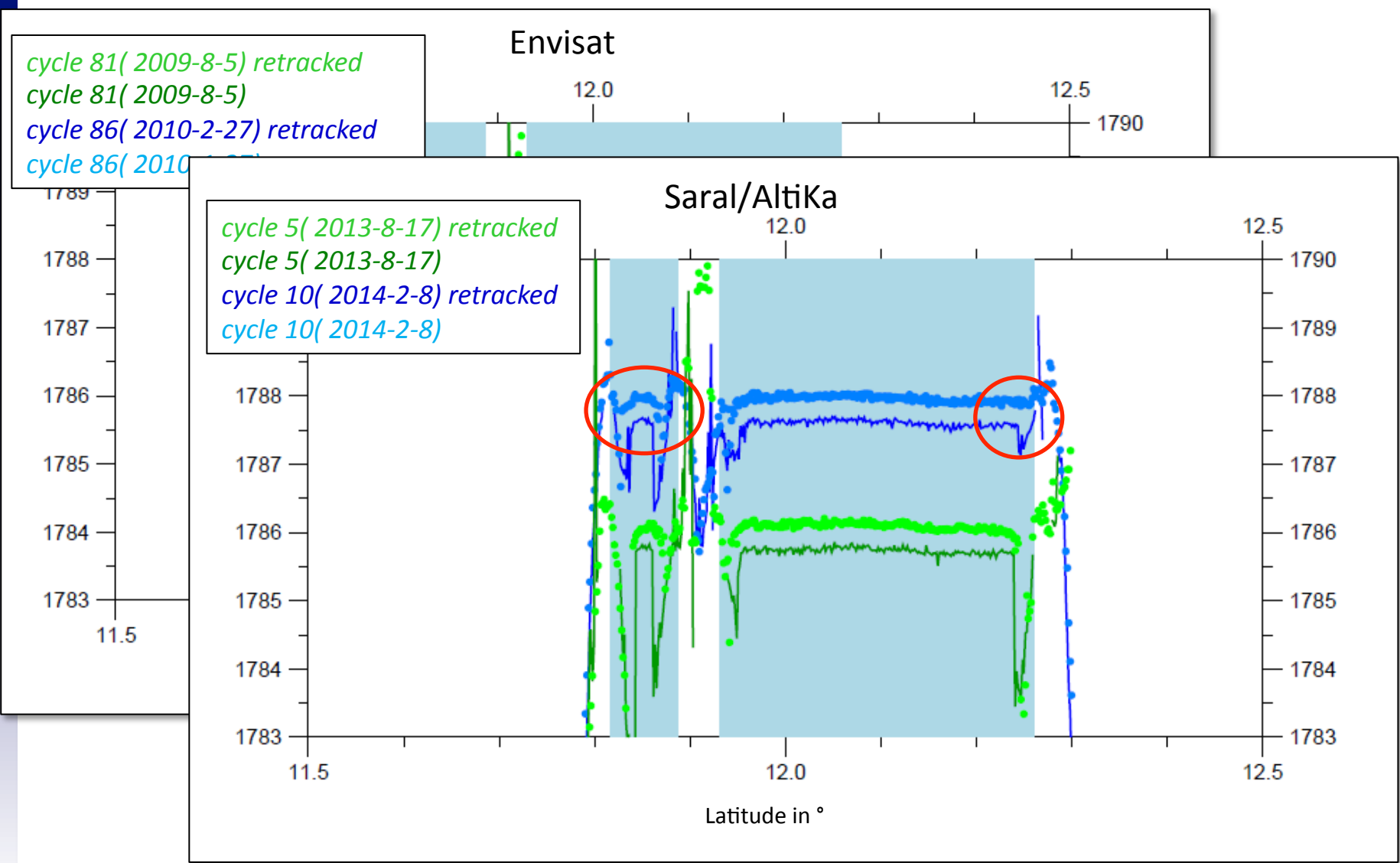
Saral/AltiKa (cycle 2-15)
Envisat (cycle 7-93)

Lake Tana – Time Serie

(*) Available at <http://openadb.dgfi.badw.de/>



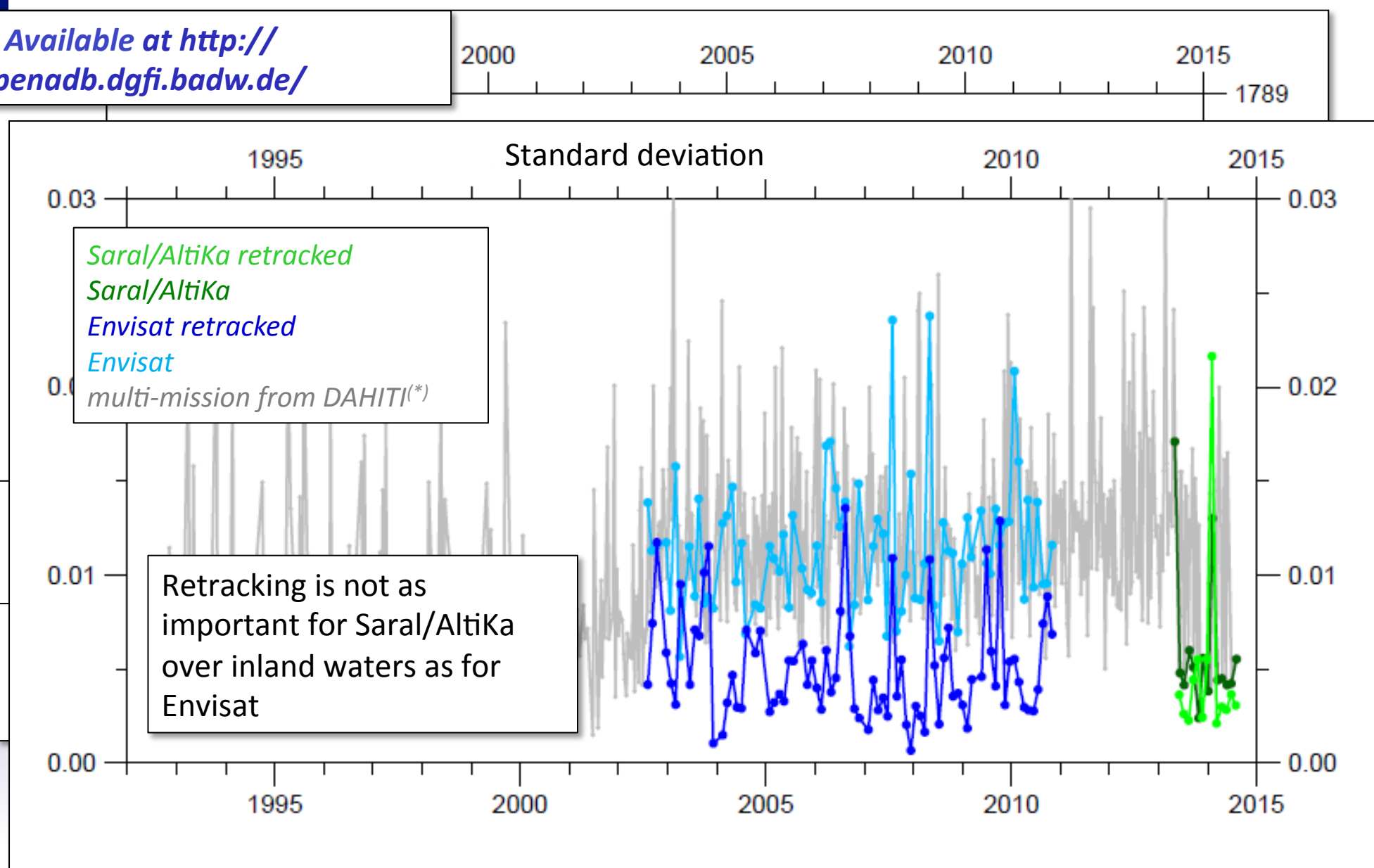
Lake Tana - Retracking



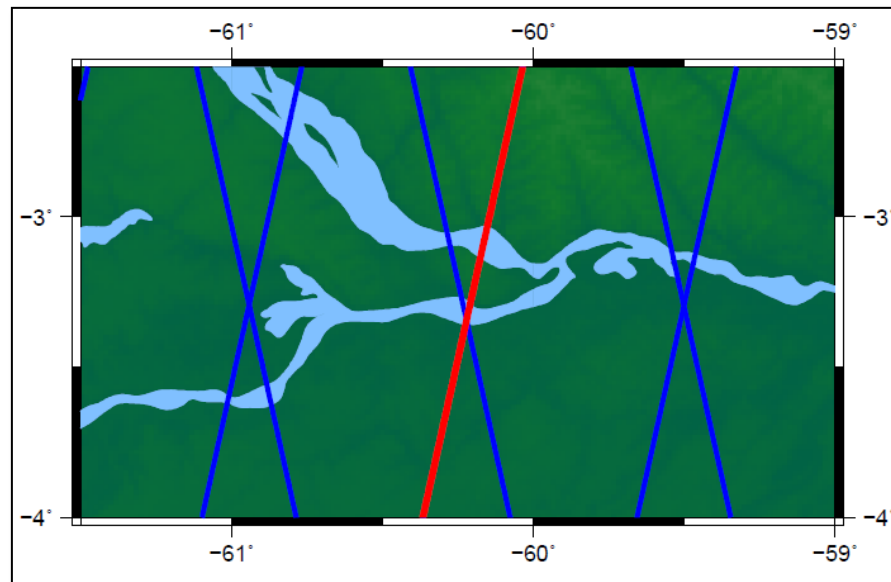
Retracked with Improved Threshold Retracker 10%
Original Data retracked with Ocean Retracker
Off set of the time series for better reading

Lake Tana – Time Series Retracked

(*) Available at <http://openadb.dgfi.badw.de/>

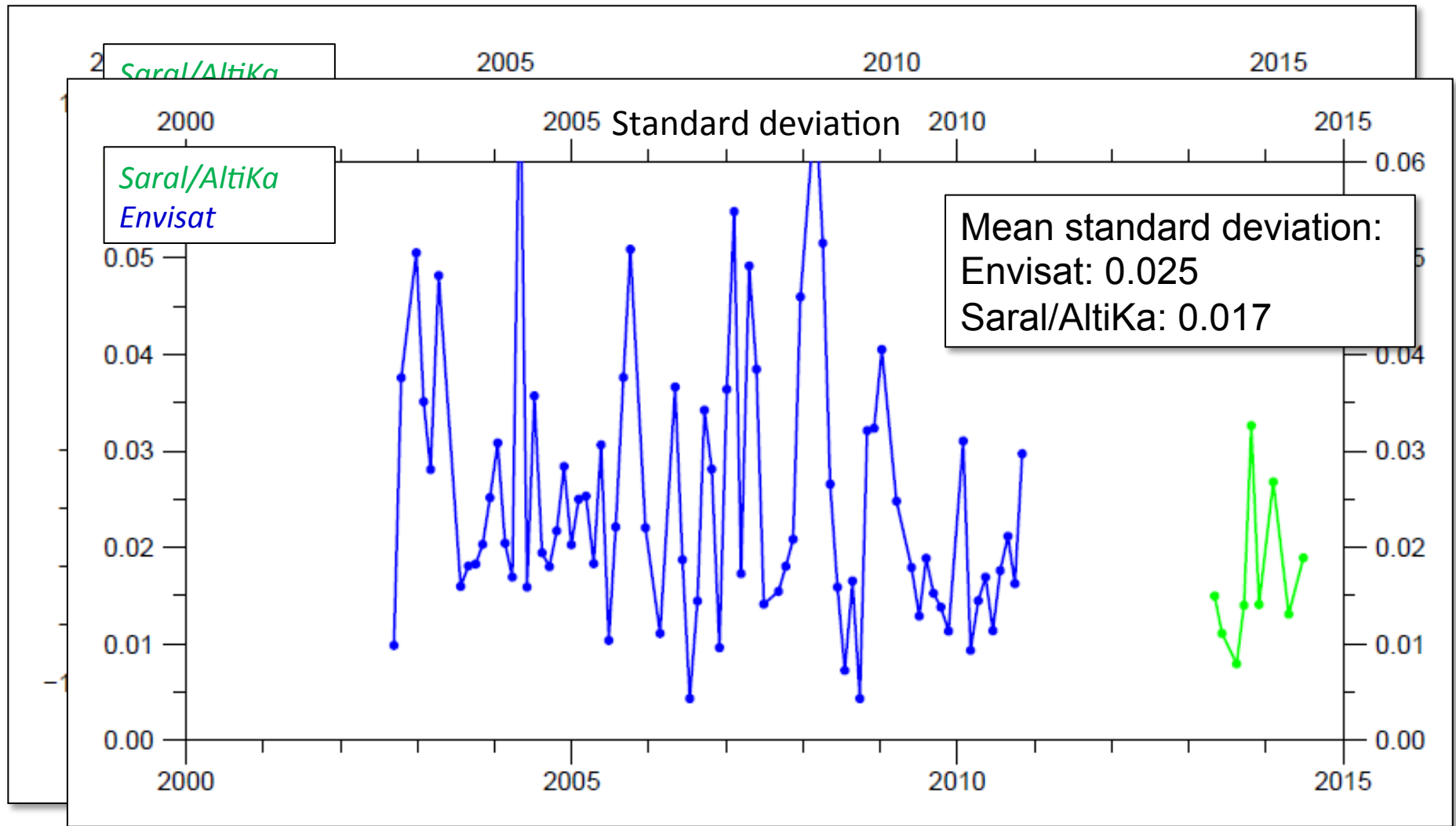


Amazon - Rio Negro



Rio Negro – Time Series

Rio Negro near Manaus



* everything retracked with Improved Threshold Retracker 10%

Rio Negro – Time Series

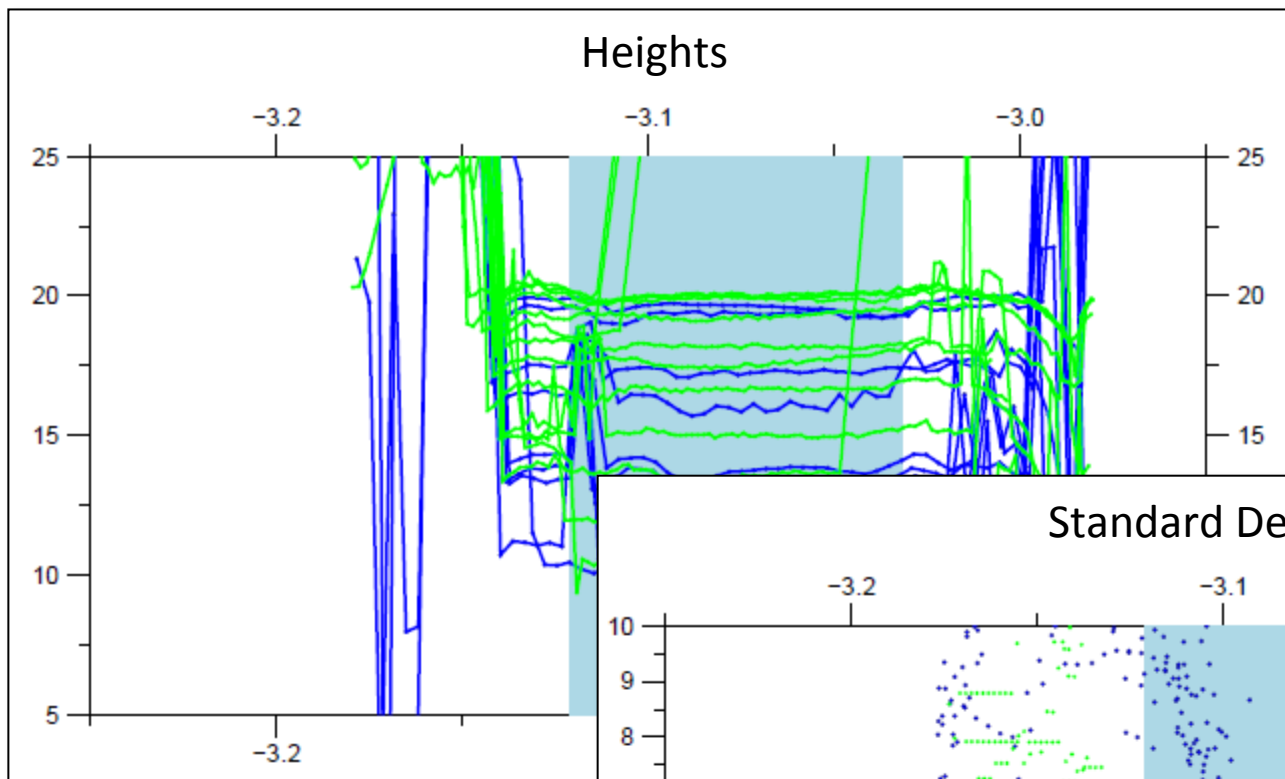
Why is the standard deviation not improving for Saral/AltiKa?

Caused by land influence or weather?

- width of the river ~10 km
- Saral passes at 6 pm local time
 - rain around sun rise and set
 - > high humidity

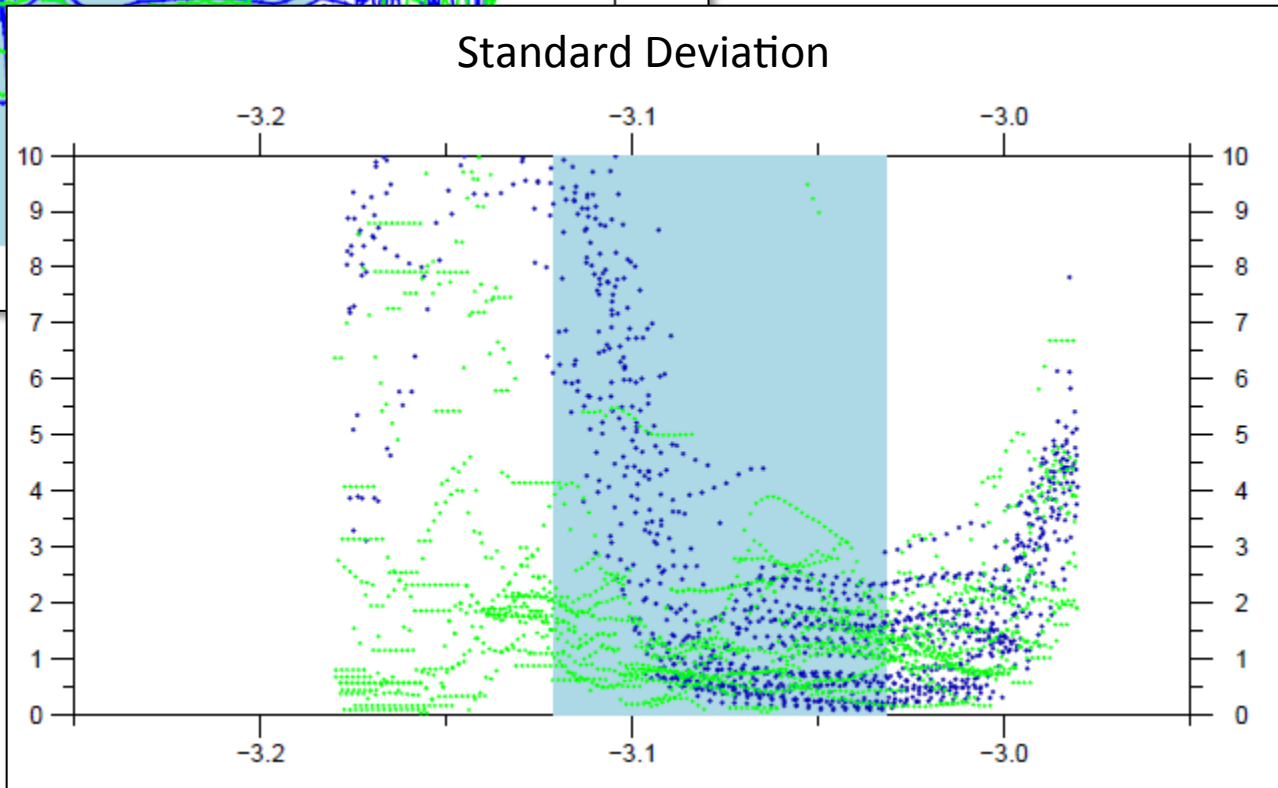
Land influence would be visible in heights, weather in the standard deviations

Rio Negro – Time Series

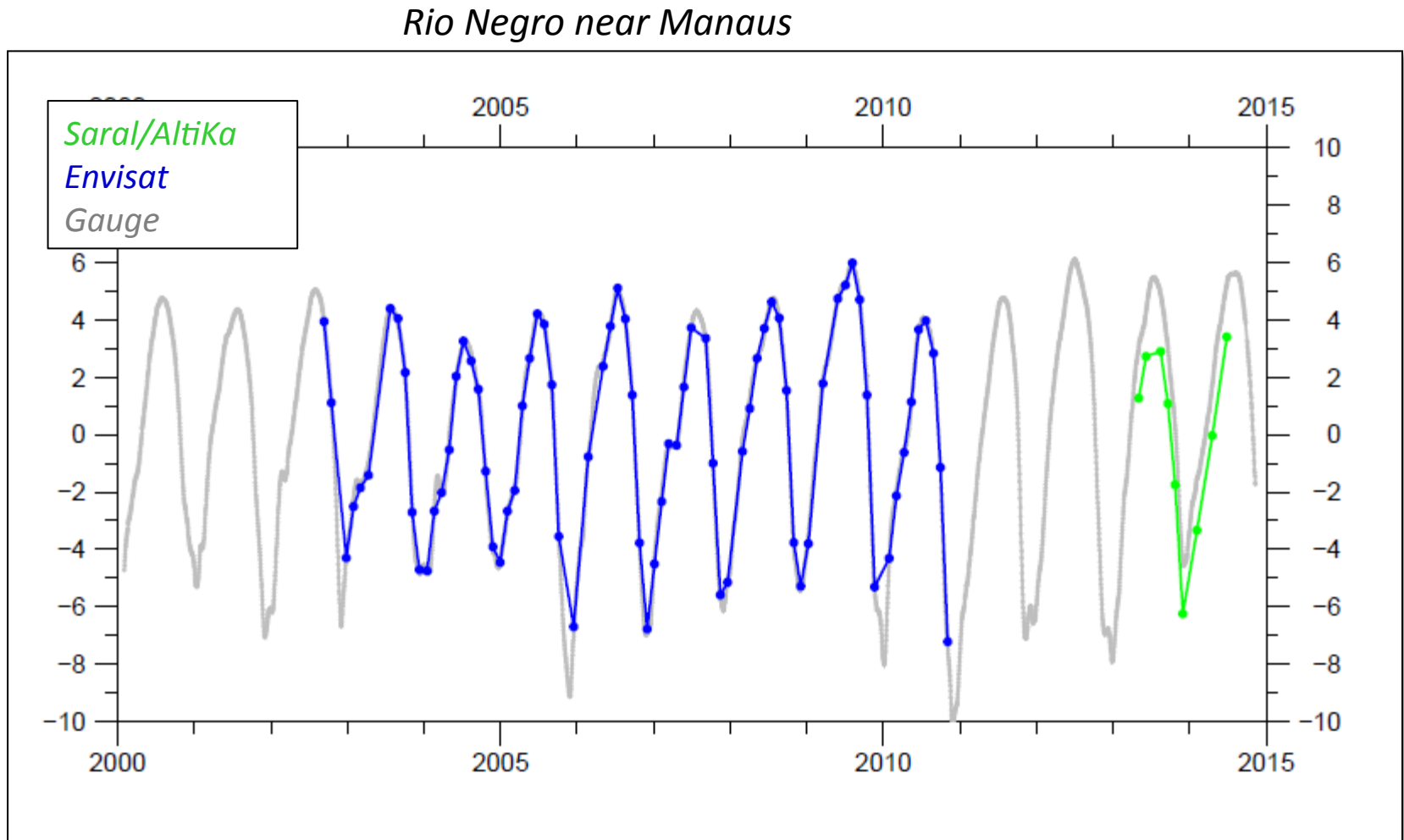


Saral/AltiKa (cycle 1-15)
Envisat (cycle 10-30)

It seems the weather is causing the lower accuracy of the time series of the Saral/AltiKa measurements

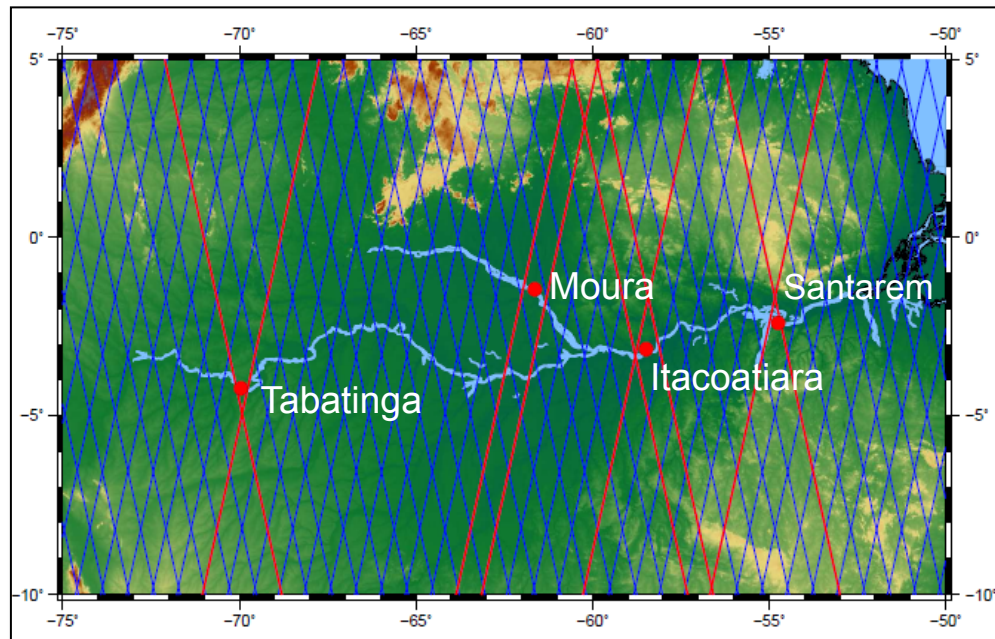


Rio Negro – Time Series RMS



	RMS [cm]
Envisat	14.5
Saral	7.5

Amazon



Amazon – Time series RMS

River	Gauging Station	Pass	Distance [km]	River width [km]	RMS Envisat [cm]	RMS SARAL [cm]	RMS Diff.
Rio Solimões	Tabatinga	0622 (-)	~22	~2.3	27.1	17.2	37 %
		0751 (+)	~24	~5.0	35.9	28.5	21 %
Rio Negro	Moura	0192 (+)	~33	~11.2	39.4	22.6	43 %
		0650 (-)	~68	~4.8	83.9	29.4	65 %
Amazon River	Itacoatiara	0063 (+)	~44	~4.6	32.5	15.4	53 %
		0478 (+)	~45	~4.6	36.6	16.8	54 %
		0521 (-)	~53	~4.2	53.3	18.9	65 %
Rio Tapajos	Santarem	0807 (-)	~6	~4.8	14.8	12.9	13 %
		0764 (+)	~27	~17.5	46.5	19.1	59 %
					∅ 41.1	∅ 20.1	∅ 51 %
				Std =	19.4	5.7	

* everything retracked with Improved Threshold Retracker 10%

Conclusion

In comparison to Envisat, Saral...

- has more reliable measurements close to the shore
- shows higher sensibility for atmospheric water content, especially near the shore
- yields improved accuracies; the percentage of improvement is depending on the amount of atmospheric water content

Thank you for your attention!

C. Schwatke et al. (2014). Potential of SARAL/AltiKa for inland water applications. *Marine Geodesy* (in review)