

Exploring the behaviour of a Ka-band altimeter over the Arctic Ocean

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Introduction

The SARAL/AltiKa mission was launched on February 25th, 2013 and has been delivering high quality satellite altimetry data since then; on an orbit close the Envisat one. This is the first time that a radar altimeter operates in the Ka band, and a different behaviour is expected with respect to Ku-band operating systems.

These expected differences include:

- higher sensitivity to atmospheric water content,
- increased performance in coastal areas,
- and a different behaviour regarding surface roughness.

Interesting new results are also expected from the cryosphere community. In this poster, we present very explorative results of SARAL/AltiKa collected over this year's melt season in the Arctic Ocean, over ocean and sea ice.

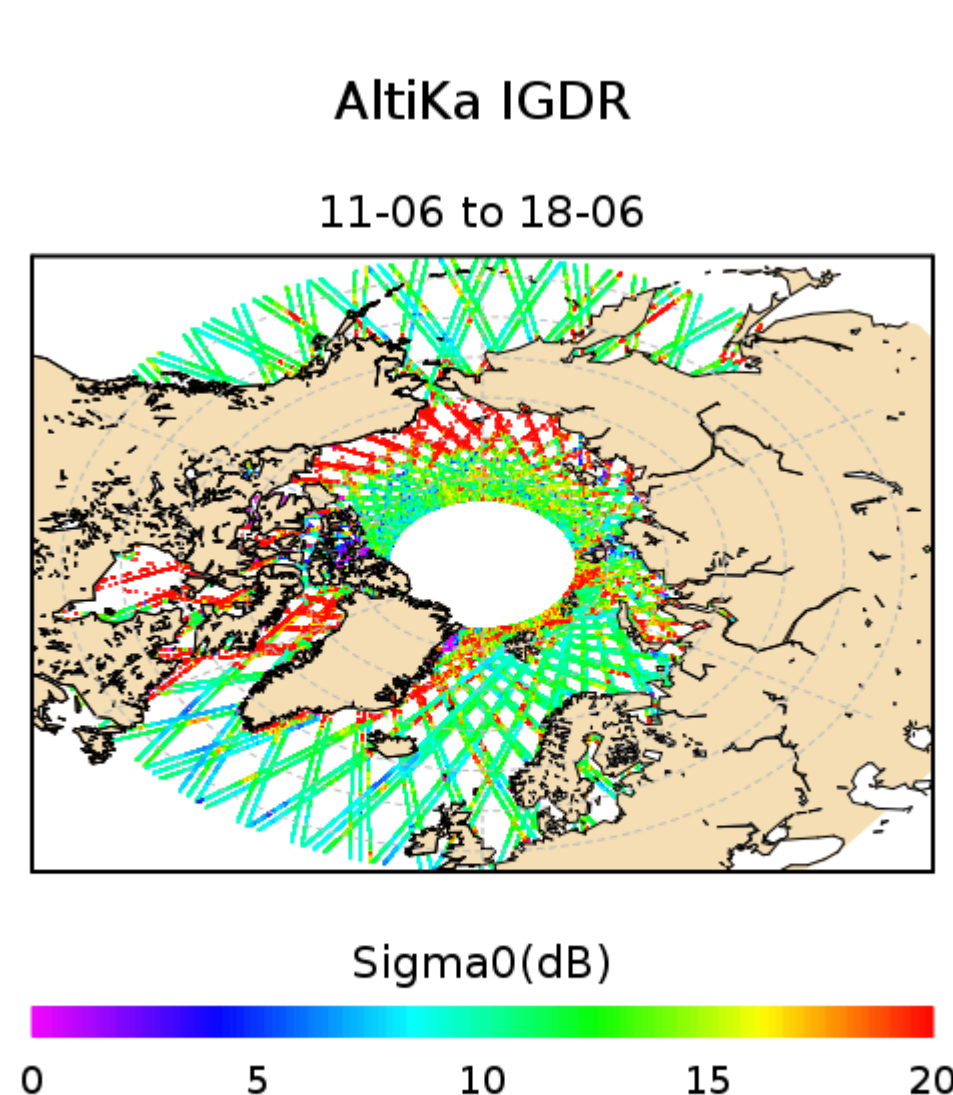
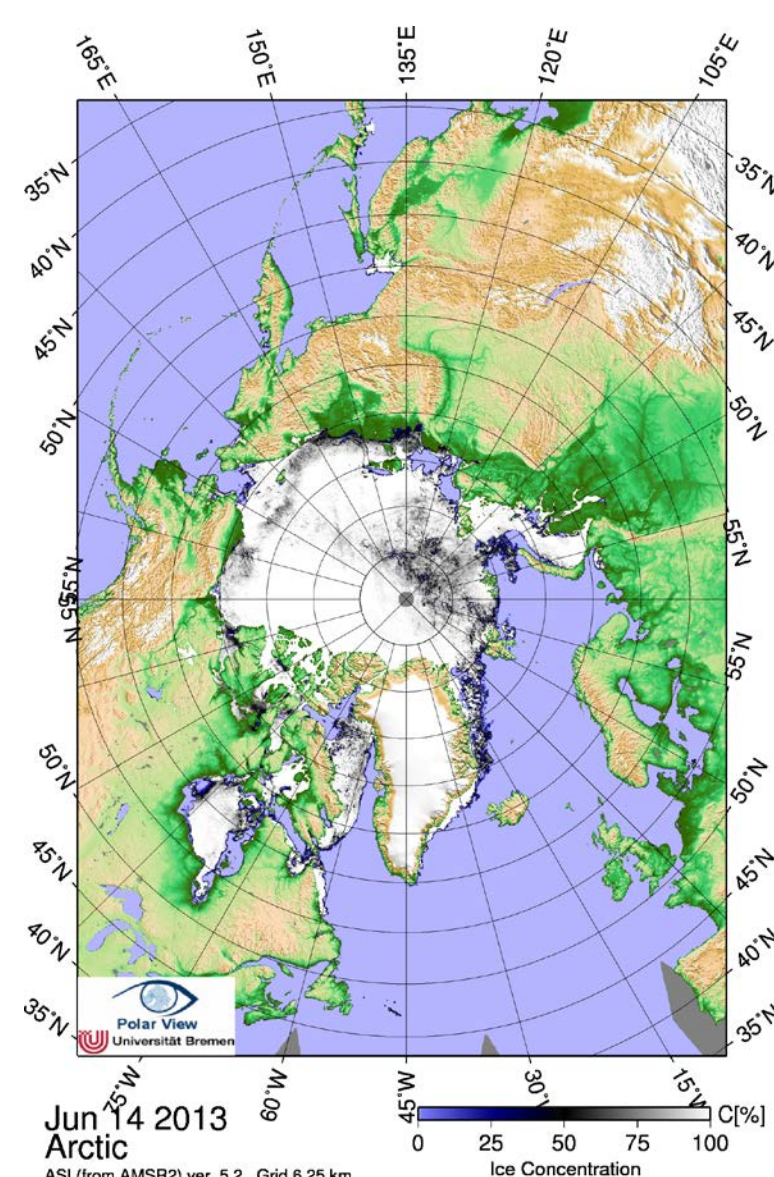
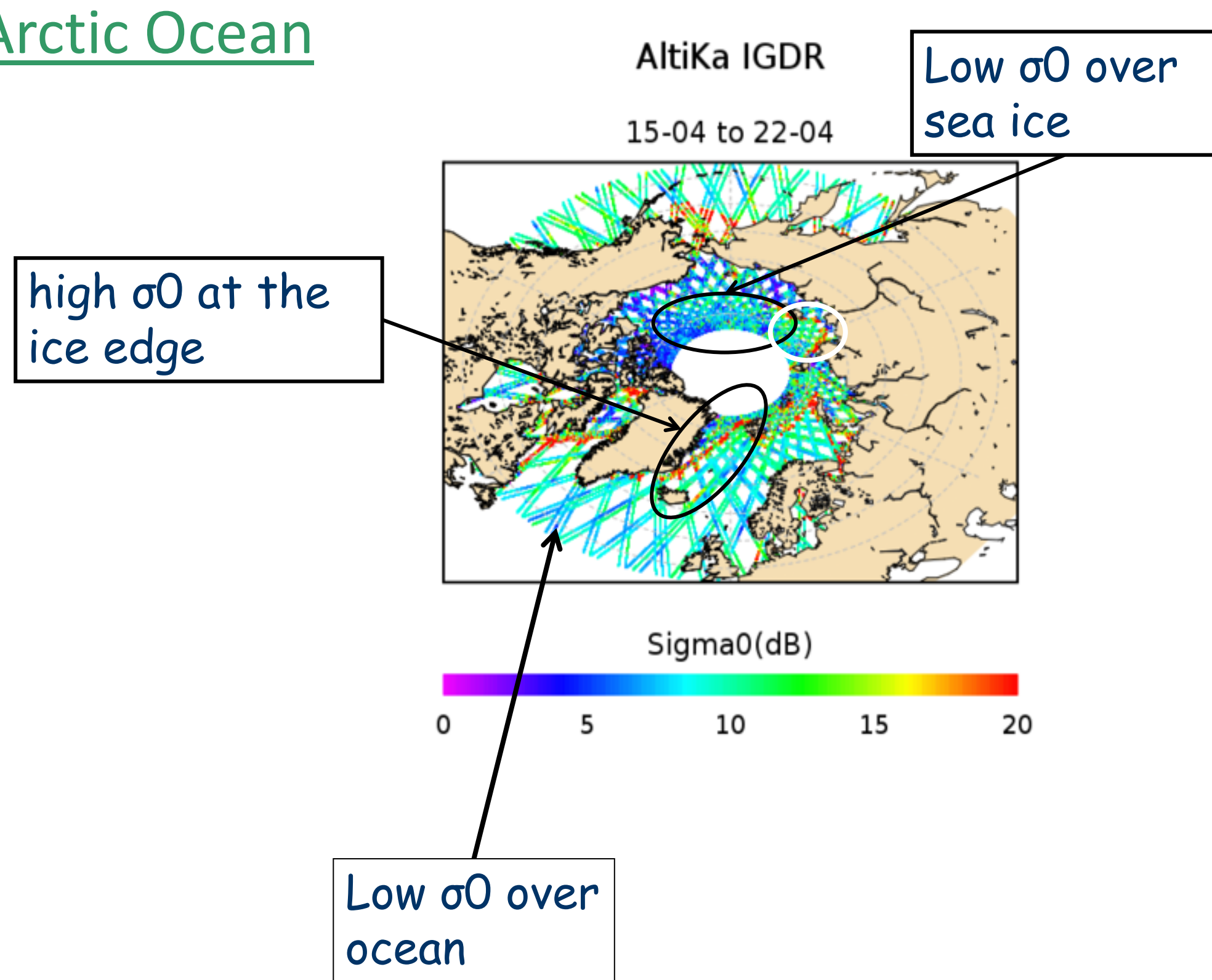
We explore the behaviour of SARAL/AltiKa backscatter coefficient over sea-ice, and compare it to EnviSat data.

SARAL/AltiKa in the Arctic Ocean

Beginning of the melt season :

- **high** backscatter values are observed at the ice edge,
- **low** backscatter values are observed over the ice pack

Early opening of the ice in the Laptev Sea is observed (inside the white circle).



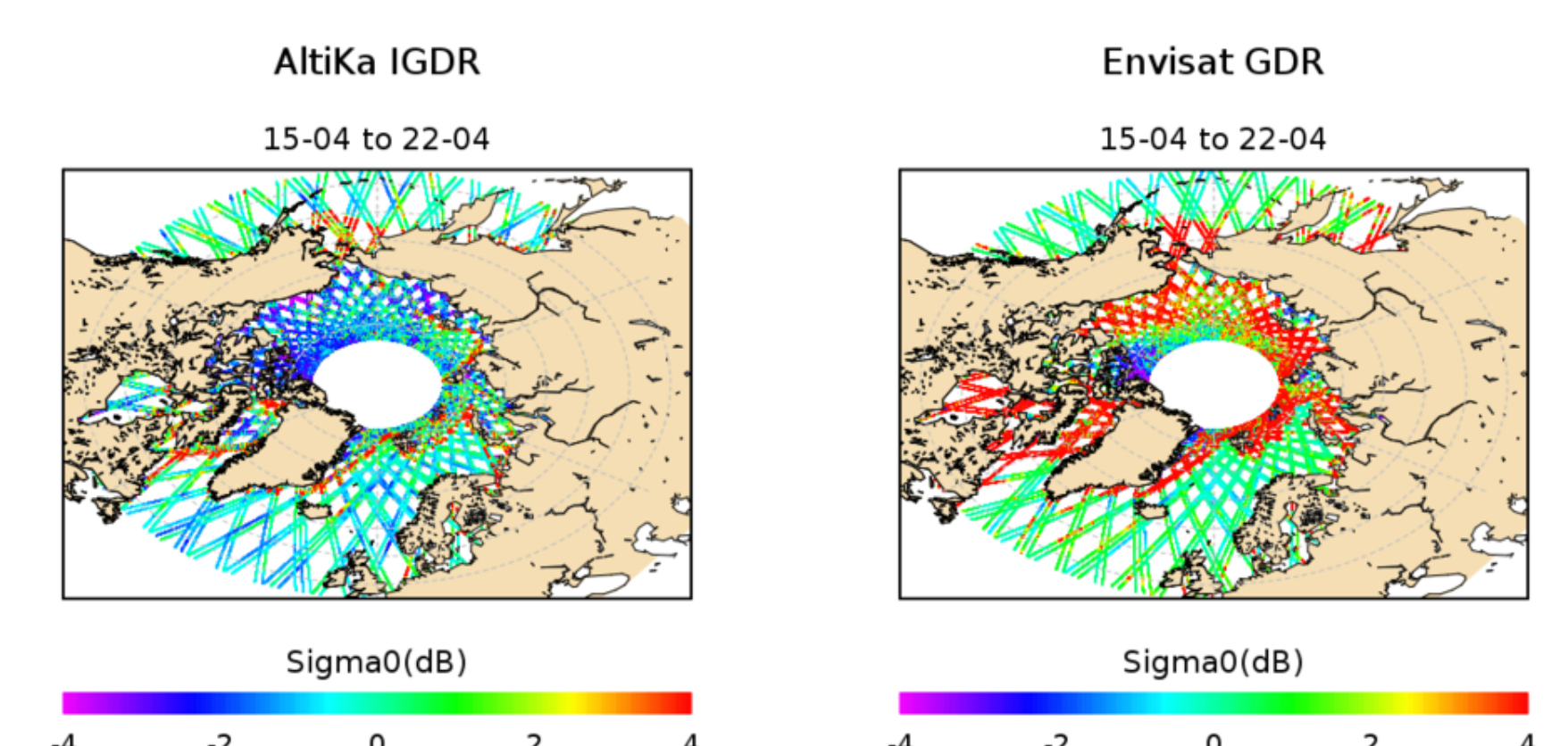
Later in the melt season :

- melt propagation from Bering Strait towards the North Pole (also observed on radiometer data),
- coincident **rise** of backscatter values,

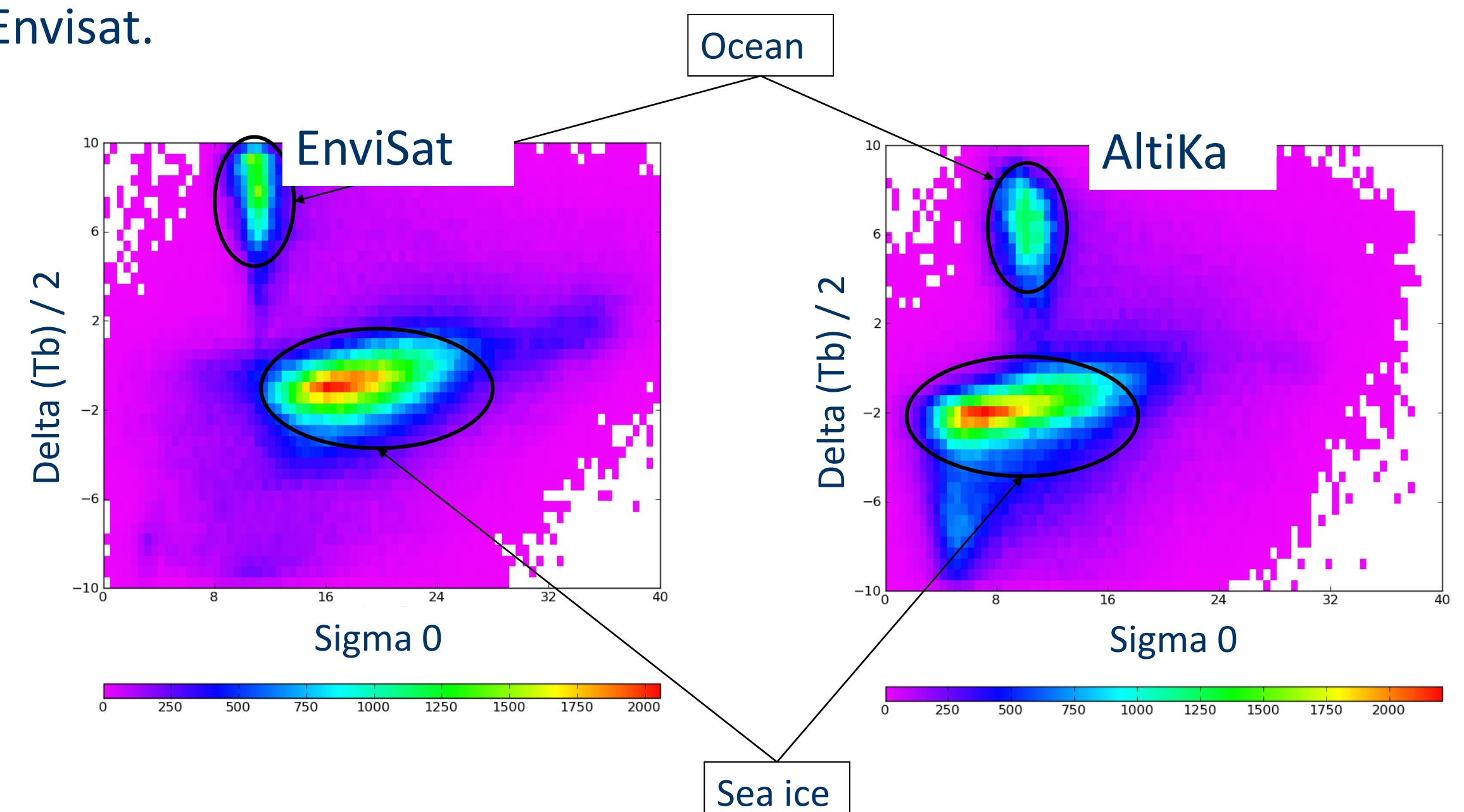
Comparison with Envisat

Envisat was operating on an orbit very similar to SARAL/AltiKa, and operated in Ku-band. It therefore provides an interesting data to compare SARAL's behavior to. Comparisons are performed over the same period of the year, but 5 years apart (2008 is chosen for Envisat data).

Comparing AltiKa and Envisat backscatter values (right) highlights the differences between the two missions. Envisat shows high values of the backscatter all over the ice pack, regardless of melting.



The dispersion (below) of backscatter coefficient versus half the difference between the two radiometer channels shows that sea-ice backscatter is shifted toward low values with respect to ocean values on AltiKa with respect to Envisat.

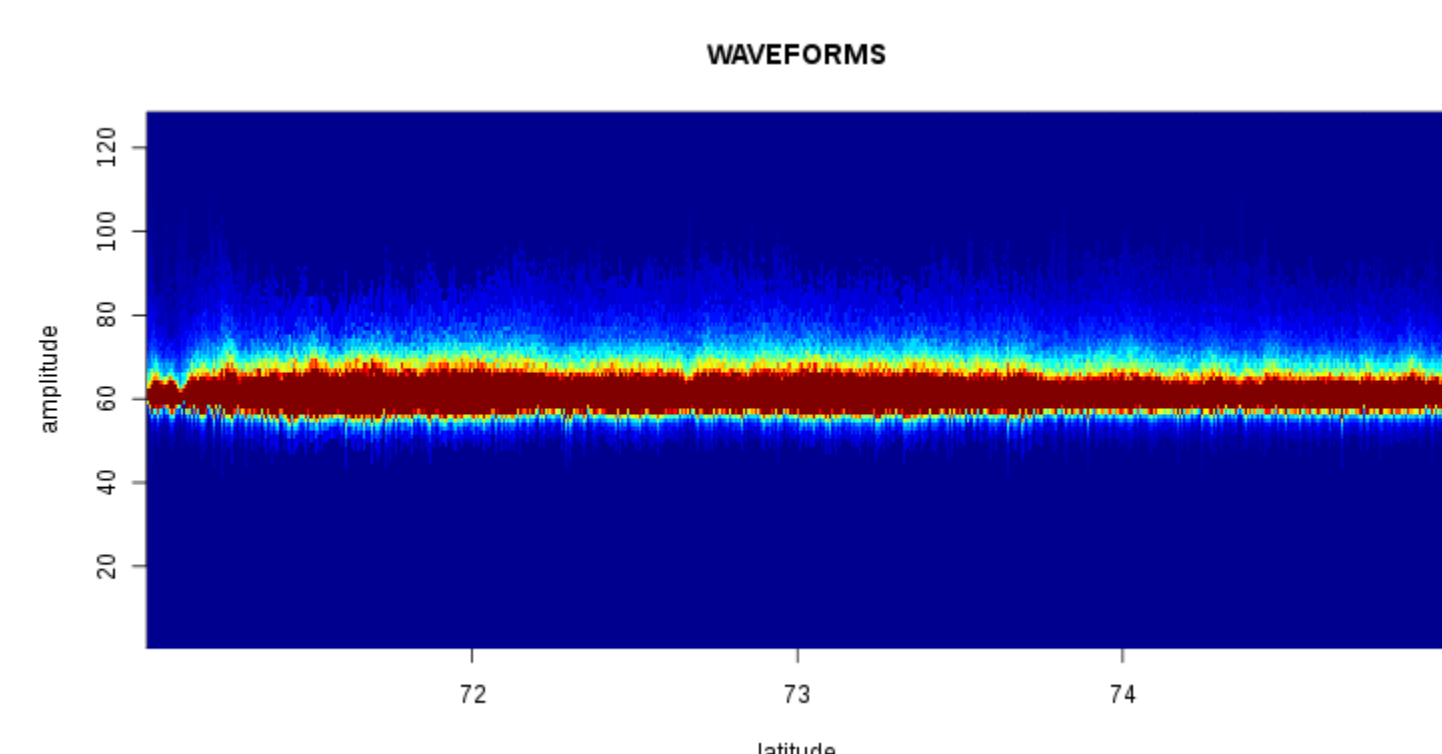
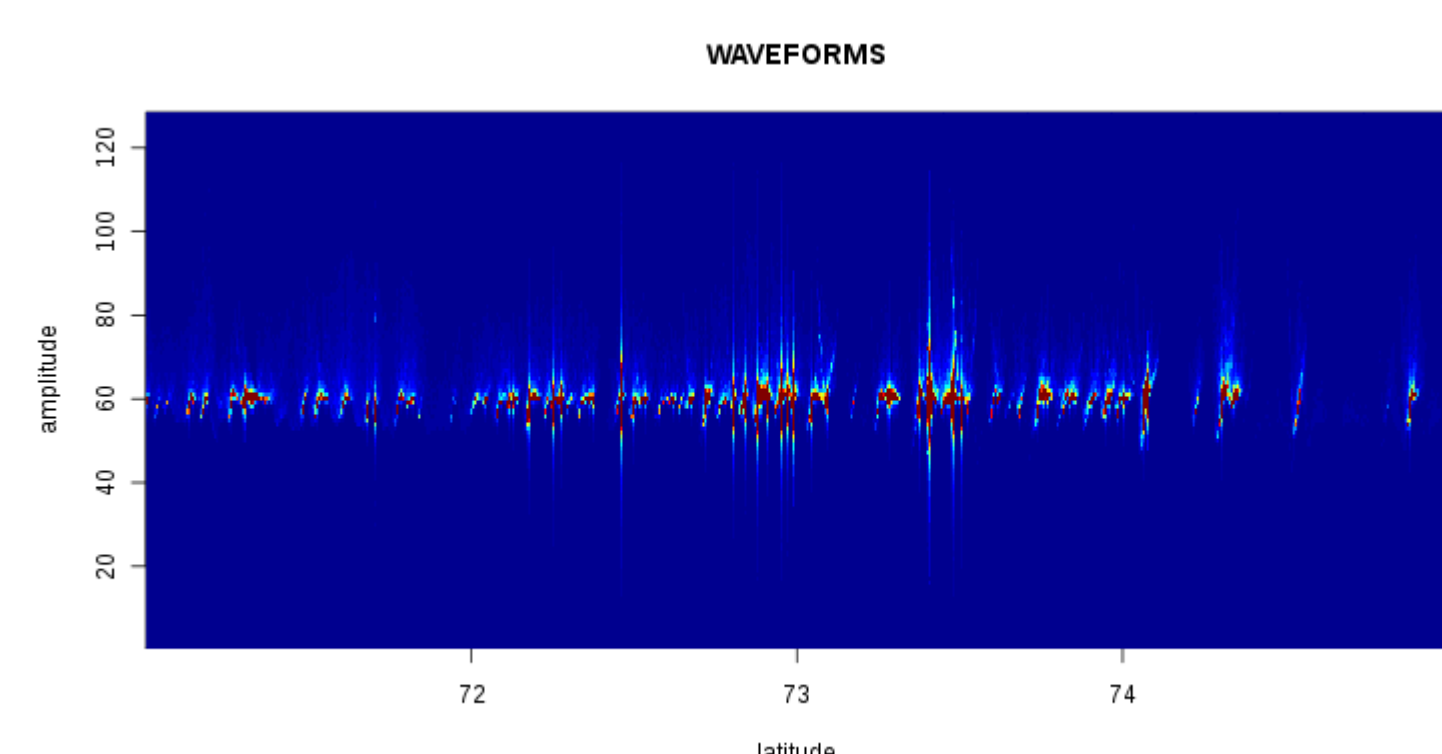


Waveforms over sea-ice

AltiKa waveforms along a portion of track 529 which crosses the East Siberian Sea

On May 6th, melting has not begun:

- low backscatter,
- very inhomogeneous surface echo along track,



On July 17th, surface melting is ongoing:

- very peaky waveforms,
- high backscatter,
- homogeneous surface echo along track,

Conclusions

- SARAL/AltiKa seems to show a different behavior over sea-ice than other altimetry missions operating in the Ku frequency band,
- Therefore it might provide new information about the state of the sea-ice,
- Further work will be needed to fully understand Ka band altimetry interaction with sea-ice roughness,