



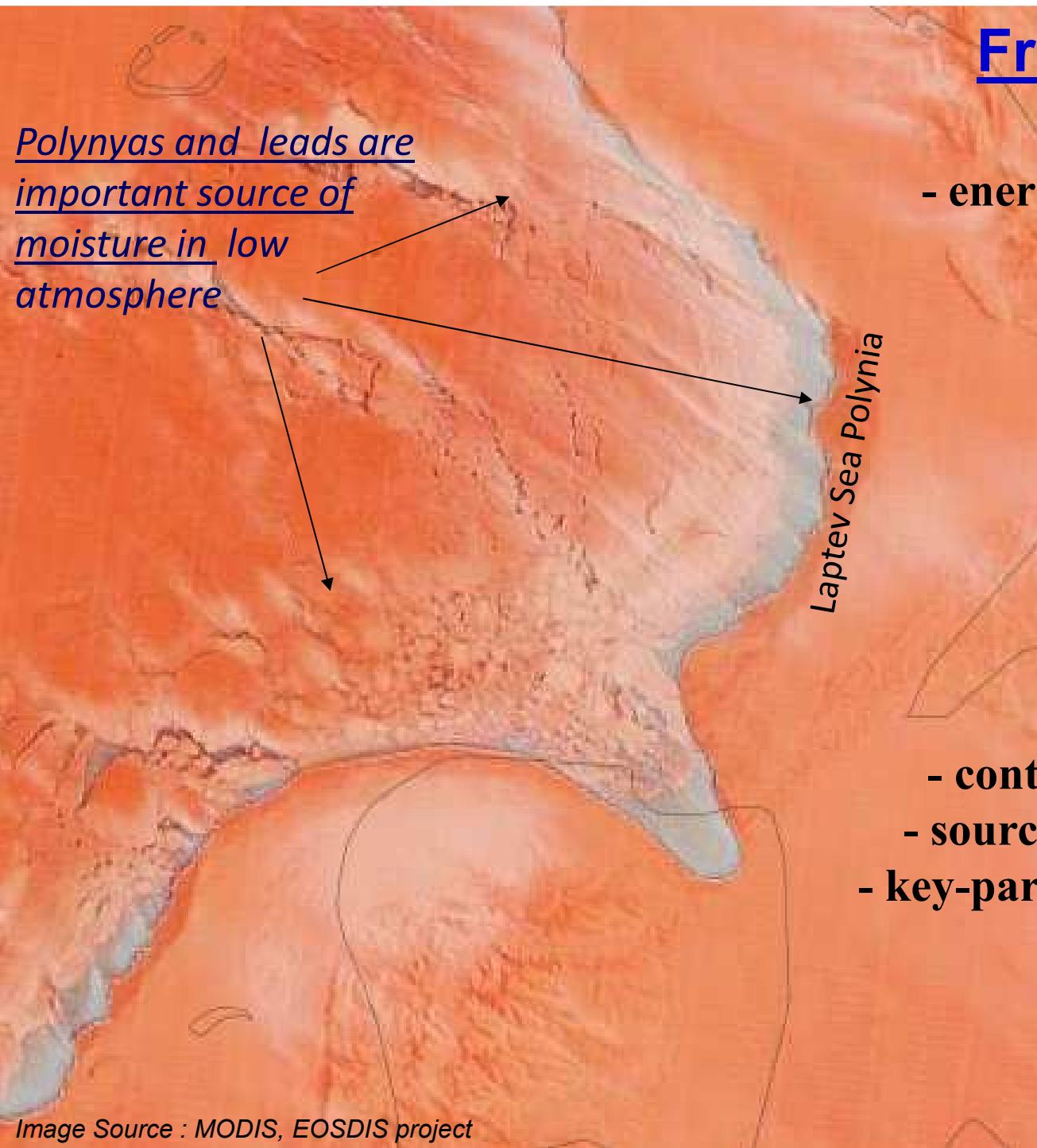
# Testing a performance of SARAL/AltiKa for leads and polynyas detection in Arctic

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Willmes,  
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## Fractures importance

Polynyas and leads are important source of moisture in low atmosphere



- energy, moisture and gas exchange with atmosphere

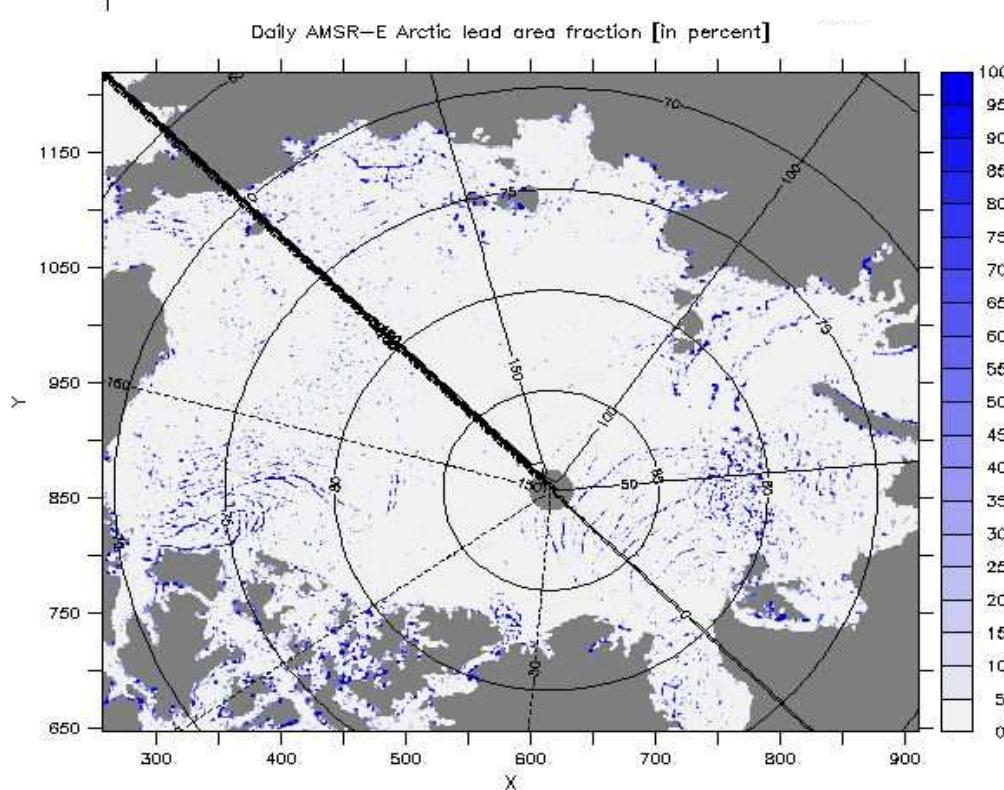
- decreasing of regional albedo
- contribution to the ice production

- impact on ocean circulation
- contribution to ocean acidification
- source of mercury at sea ice surface
- key-parameter in freeboard retrievals

- ecosystems
- navigation

# Fractures distribution and available global products

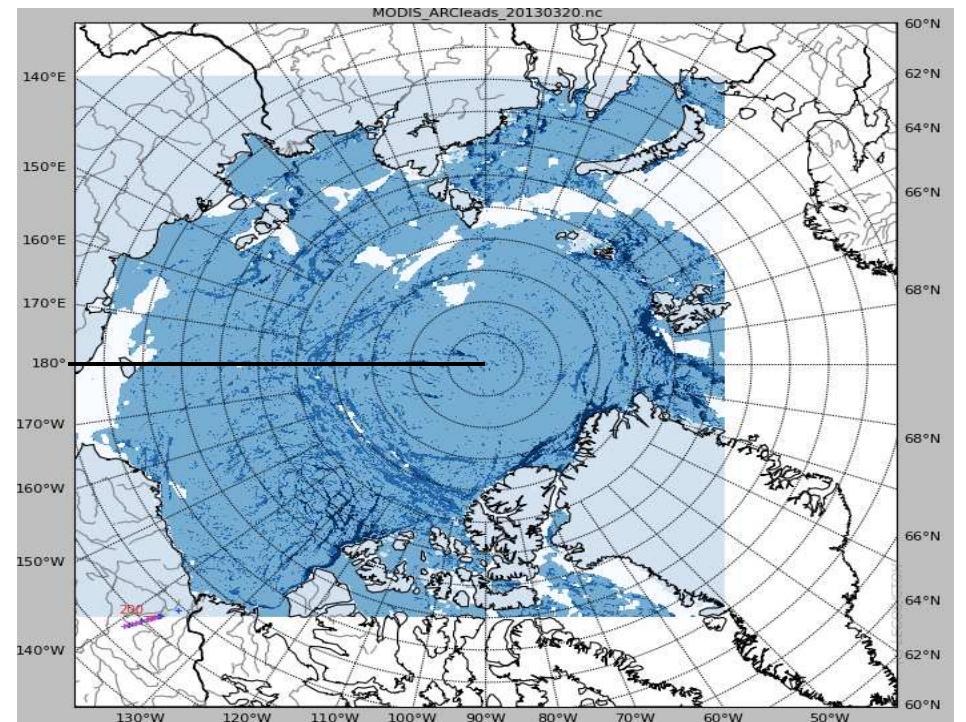
March 2003



*AMSR-E lead area fraction,  
OSISAF product*

Resolution: width > 3 km

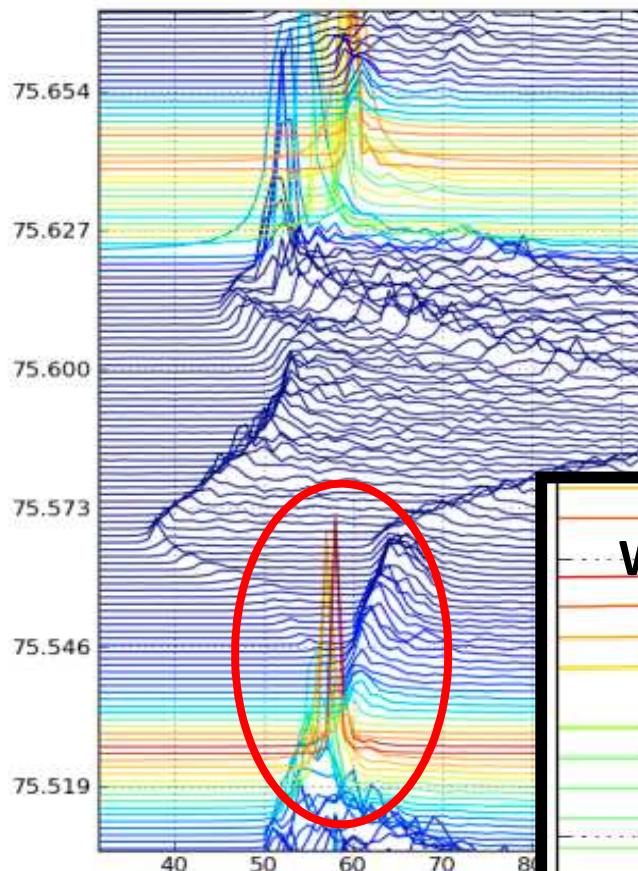
March 2013



*MODIS-DMLP leads distribution  
Willmes et al., 2014*

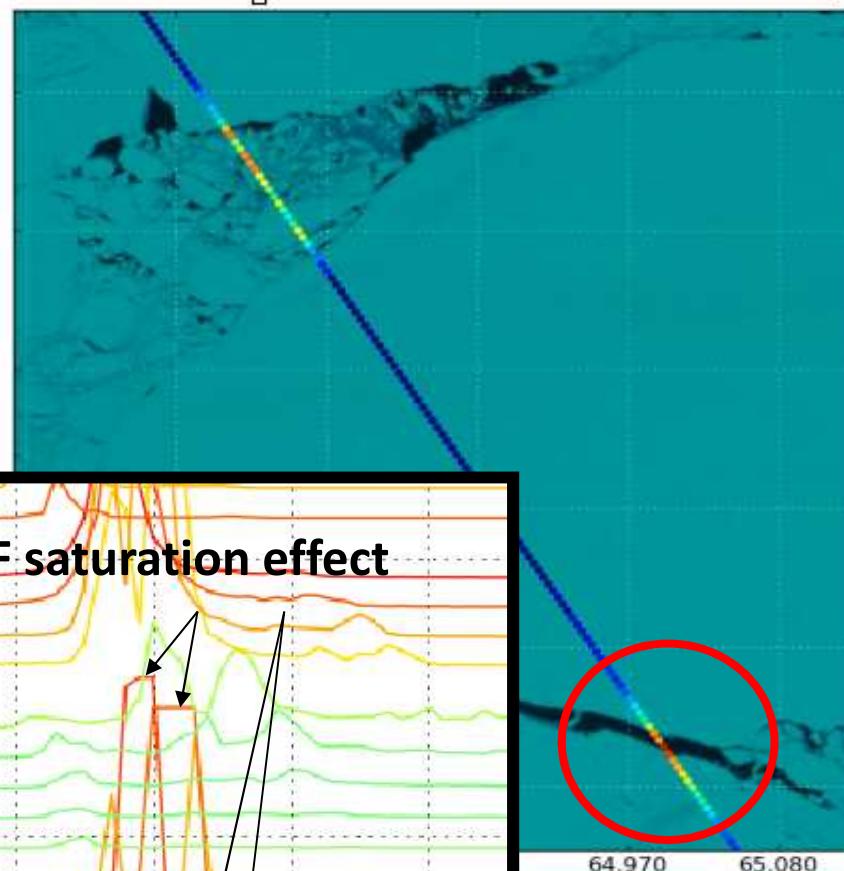
Resolution: width > 1 km

## Altimetric methods



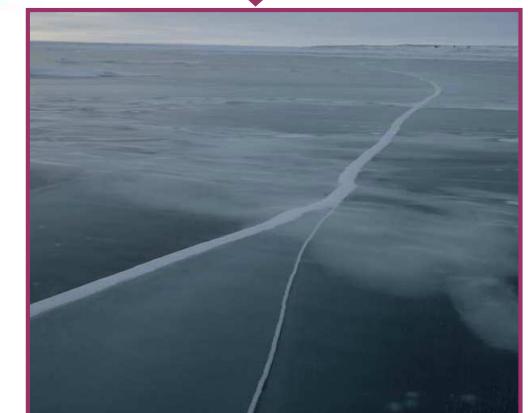
1. *Pulse peakiness (I)*  
(Laxon, 2004, ENV)

2. *PP, kurtosis, std S*  
(Ricker et al., 2014)



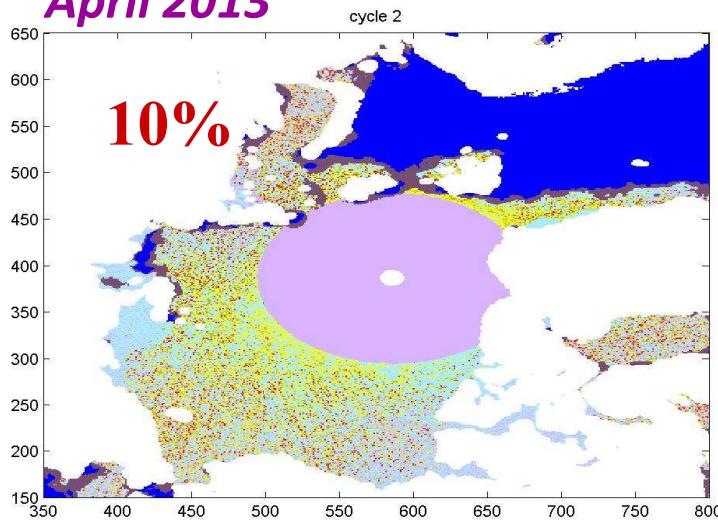
<4 portes

**Strong specular return echo of refrozen or small open water leads**

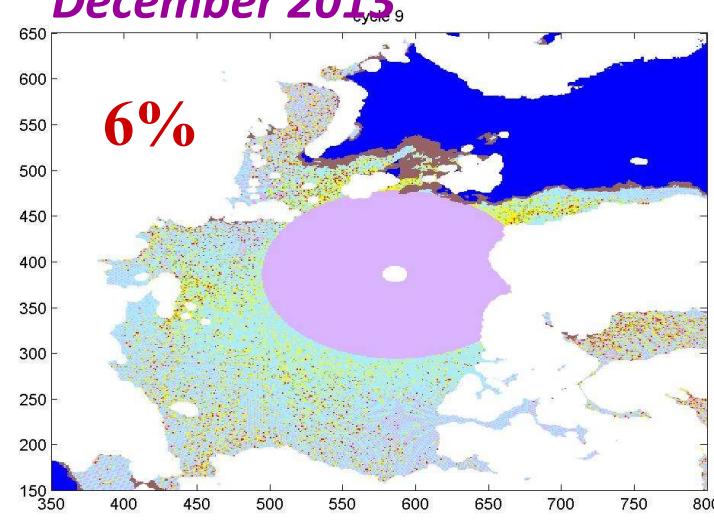


# Spatio-temporal variability of AltiKa waveform saturation

April 2013



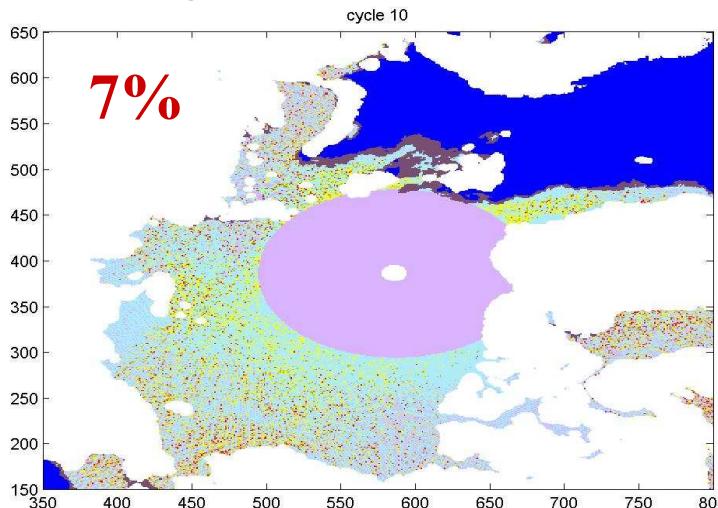
December 2013



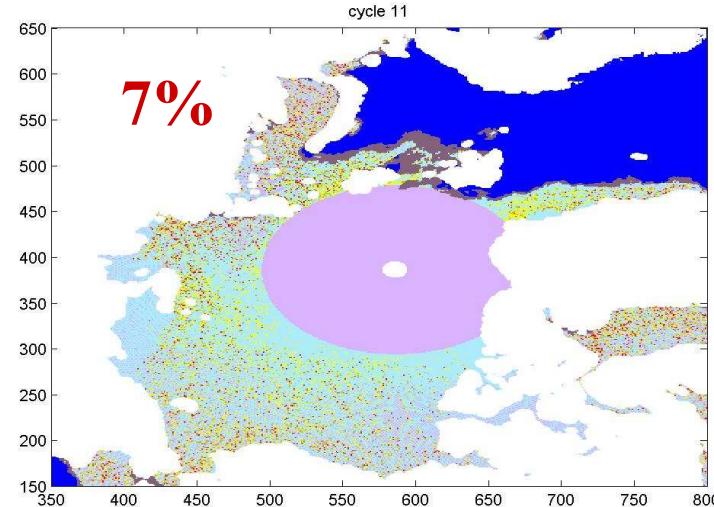
**AltiKa  
return  
echo  
saturation**



January 2014

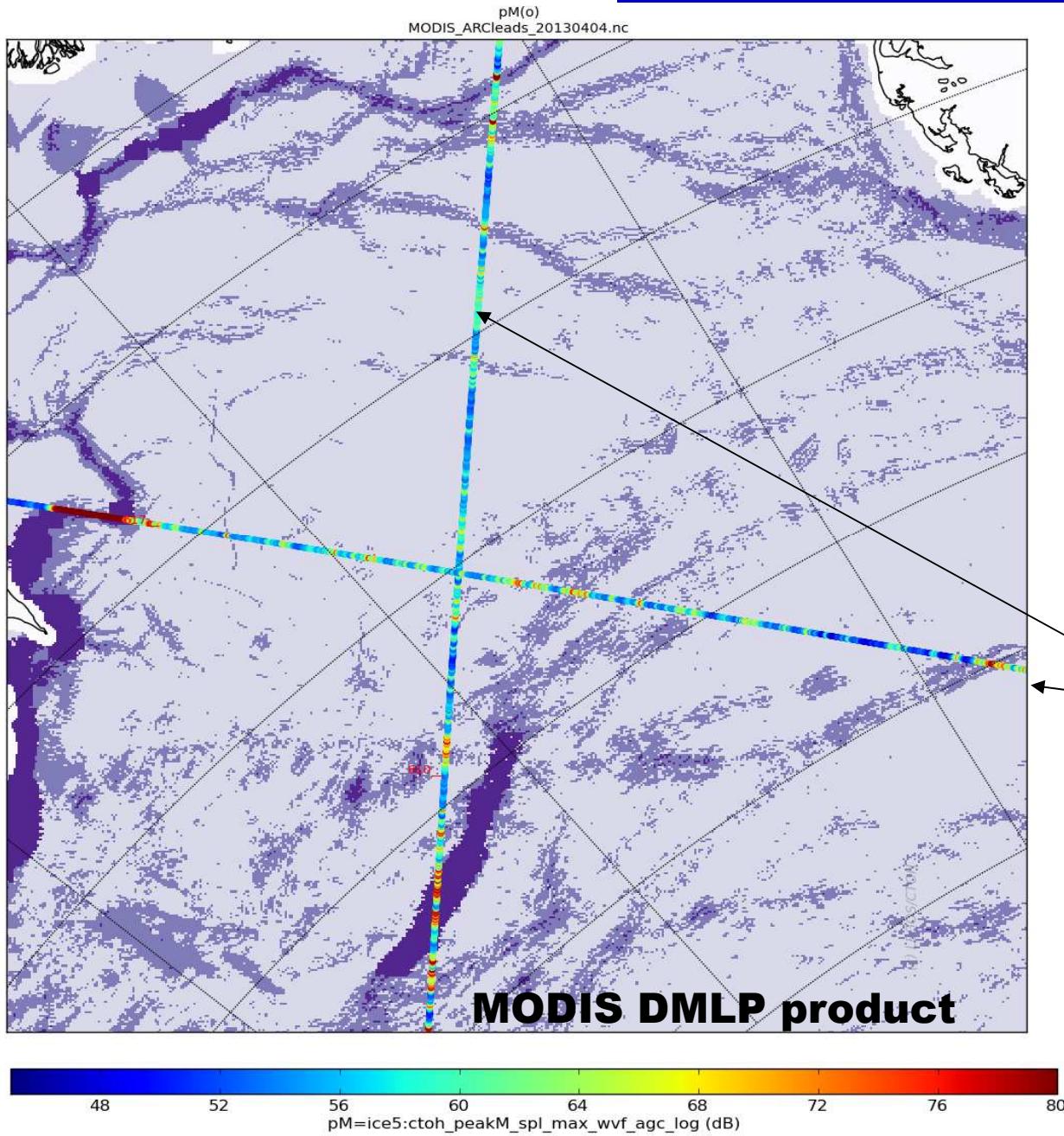


February 2014



**use of  
Pulse  
Peakness  
is  
problematic**

# AltiKa lead detection algorithm

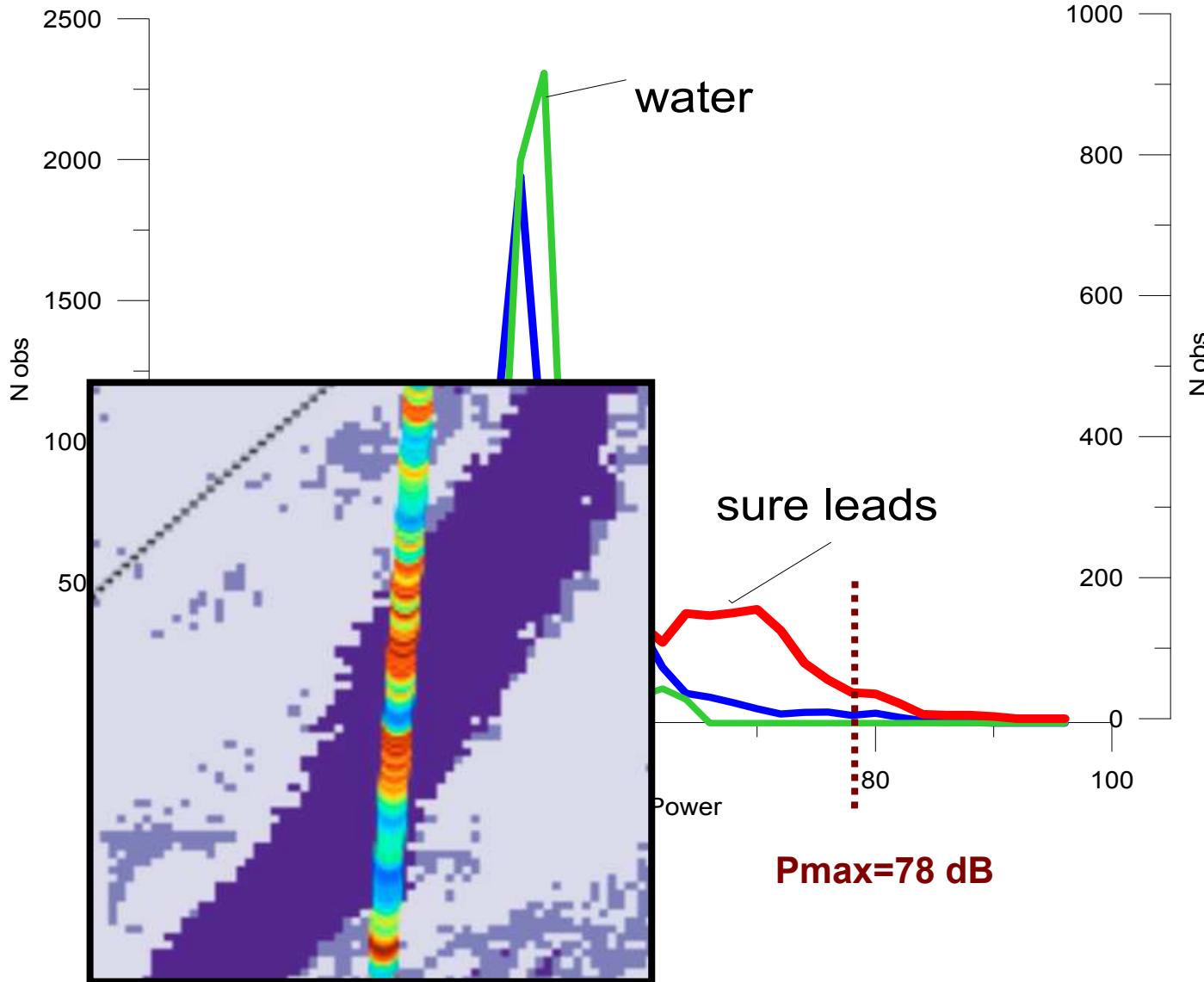


**Maximum of waveform power corrected on AGC**

**Pmax along track variability**

# AltiKa lead detection algorithm:

## Pmax over different surfaces



**Sure  
leads:**

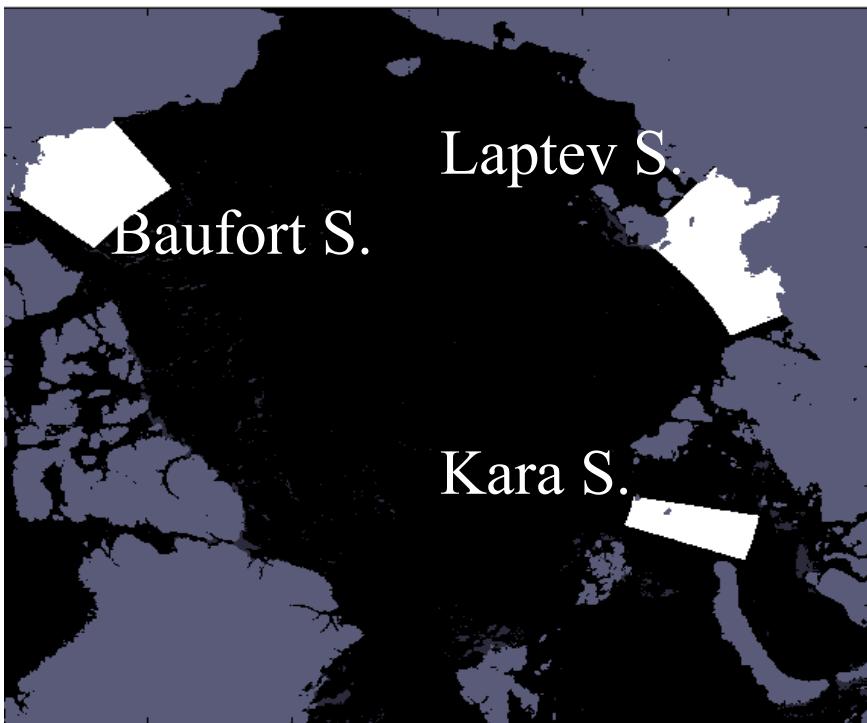
**Pmax  $\geq 78$  dB**

**7% of  
MODIS-AltiKa  
cross-detection**

**Pmax  $78 \pm 3$  dB**

**2 % errors**

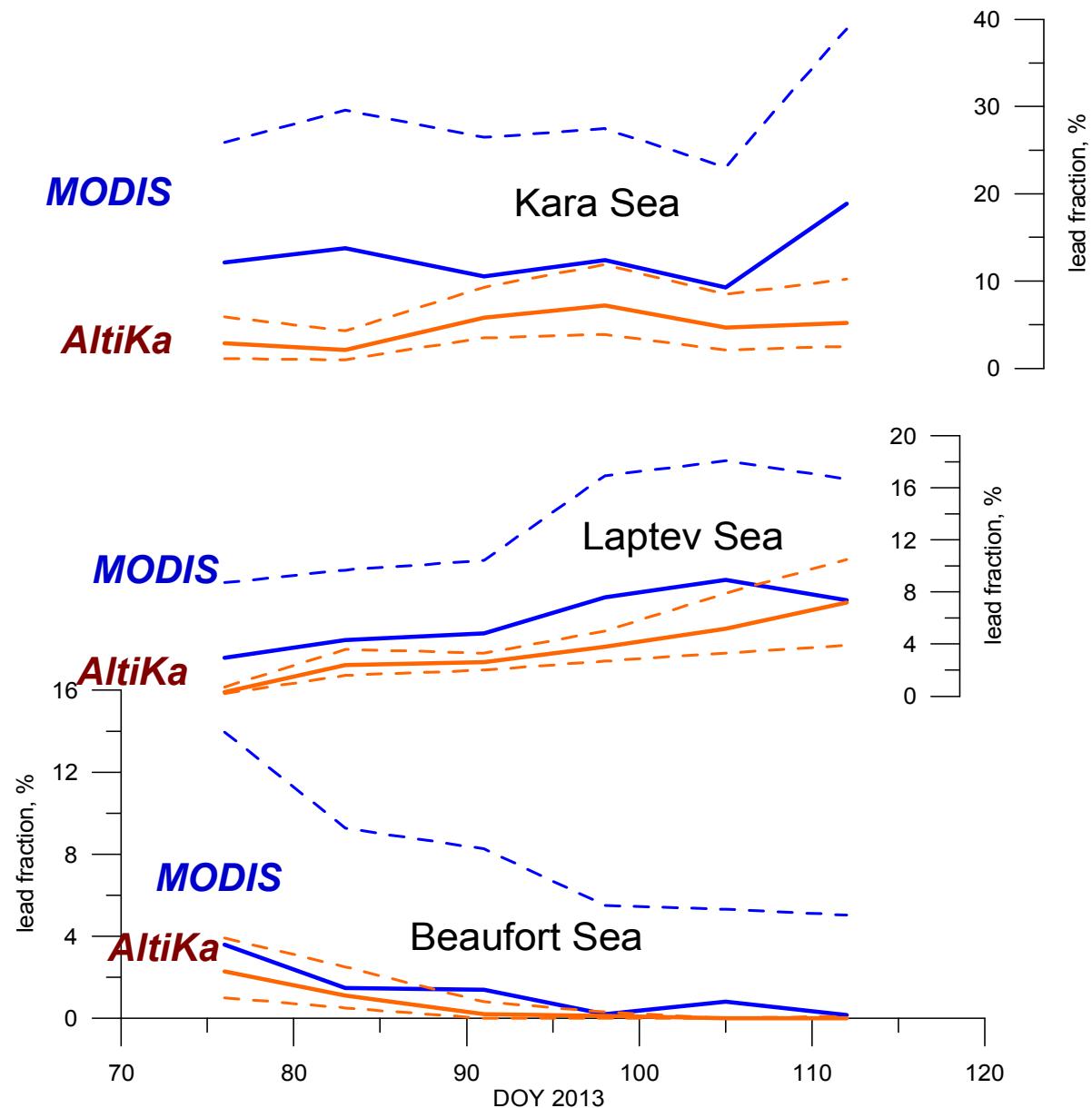
# AltiKa - MODIS Leads concentration



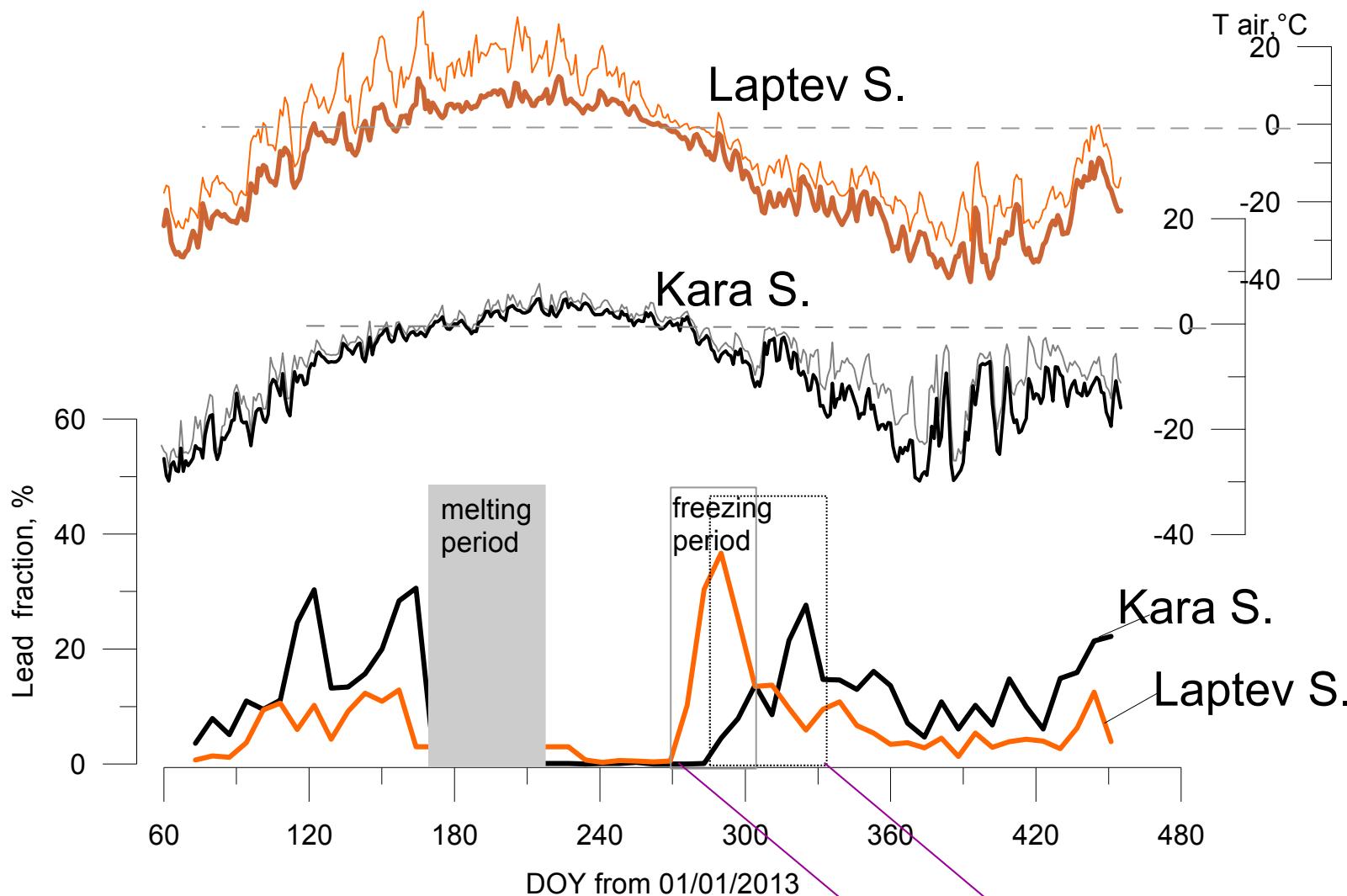
## Algorithm resolution

MODIS >1 km width

AltiKa 0.2 - 2÷3 km width



# AltiKa leads concentration: temporal variability



**Algorithm failure:  
mean daily  
 $T_{air} > 0$**

**Algorithm restores  
in Nov.-Dec.  
depending on  
regional  
conditions**

**Strong Pmax due to  
new ice**

# Outlook

## 1. Algorithm improvement:

**AltiKa Pmax does not detect large open water polynyas :**

**- possible combination with radiometer 20Hz data (5 km footprint);**

**- Combination with MODIS product :**

**Altika leads of 0.2-1km + MODIS leads of >1km**

## 2. Pan-arctic maps of sea ice fracturing

