



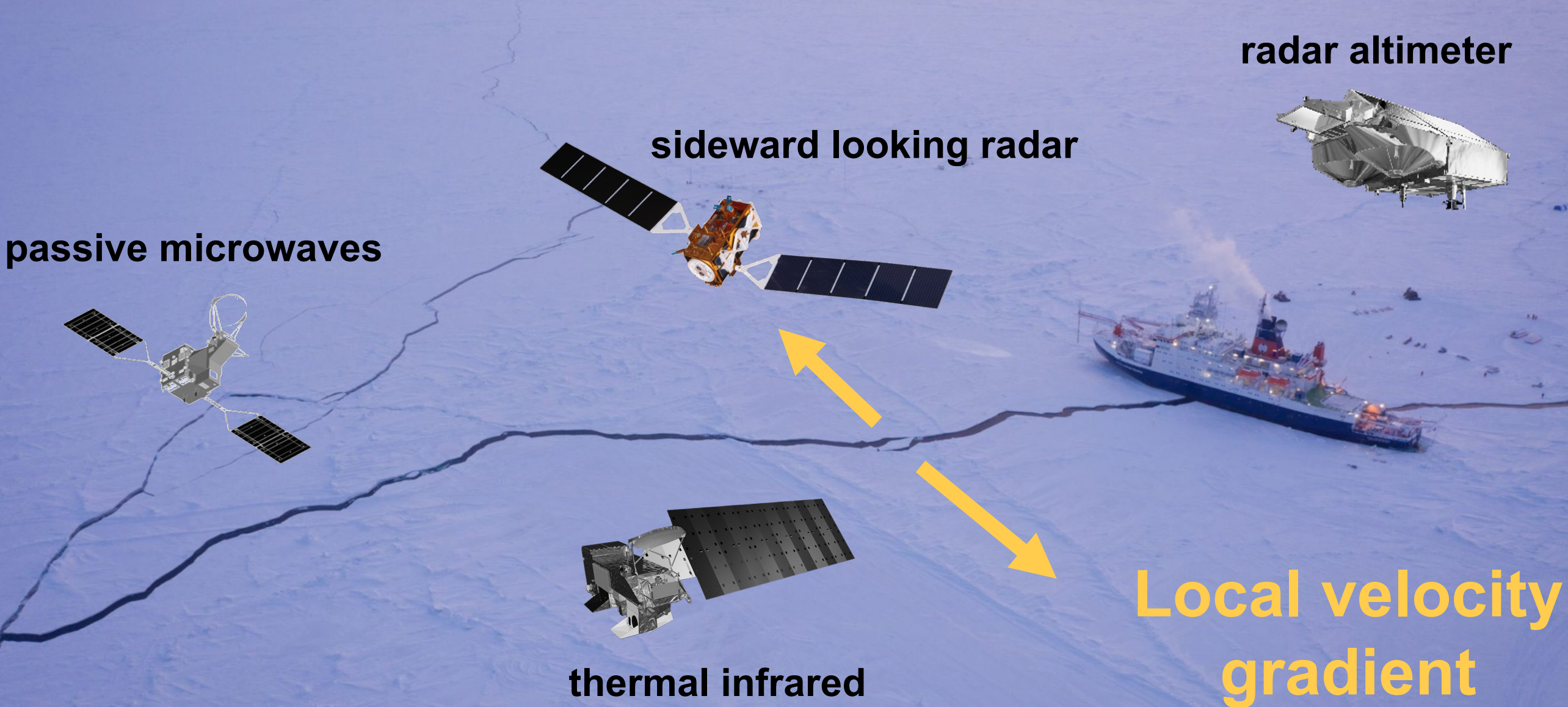
# *Same same, but different* Lead Fractions from divergence



**Luisa von Albedyll**

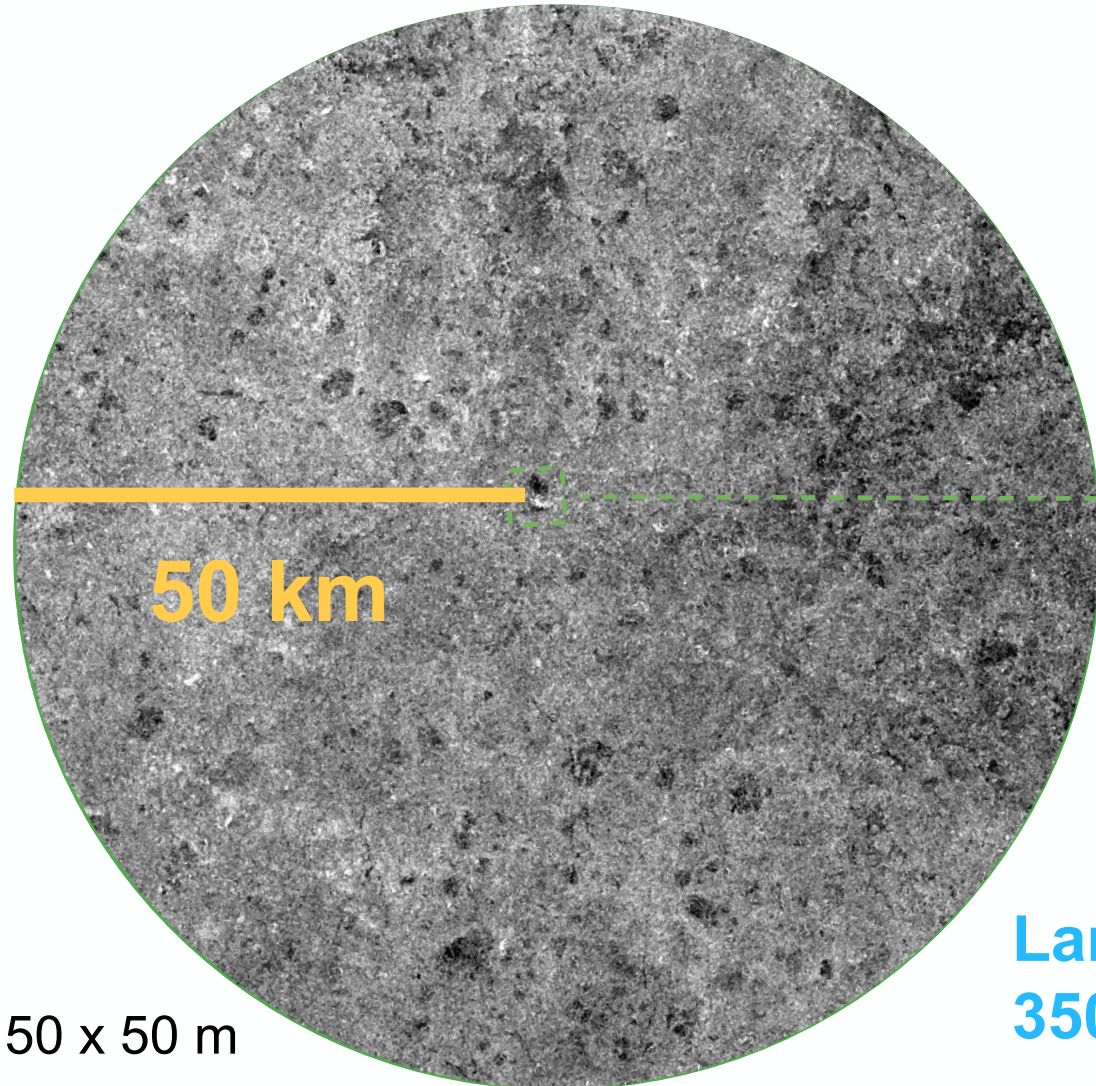
Dmitrii Murashkin, Sascha Willmes, Nils Hutter, Linda Thielke, Stefan Hendricks, Lars Kaleschke, Xiangshan Tian-Kunze, Gunnar Spreen, Christian Haas

# How do we detect leads?

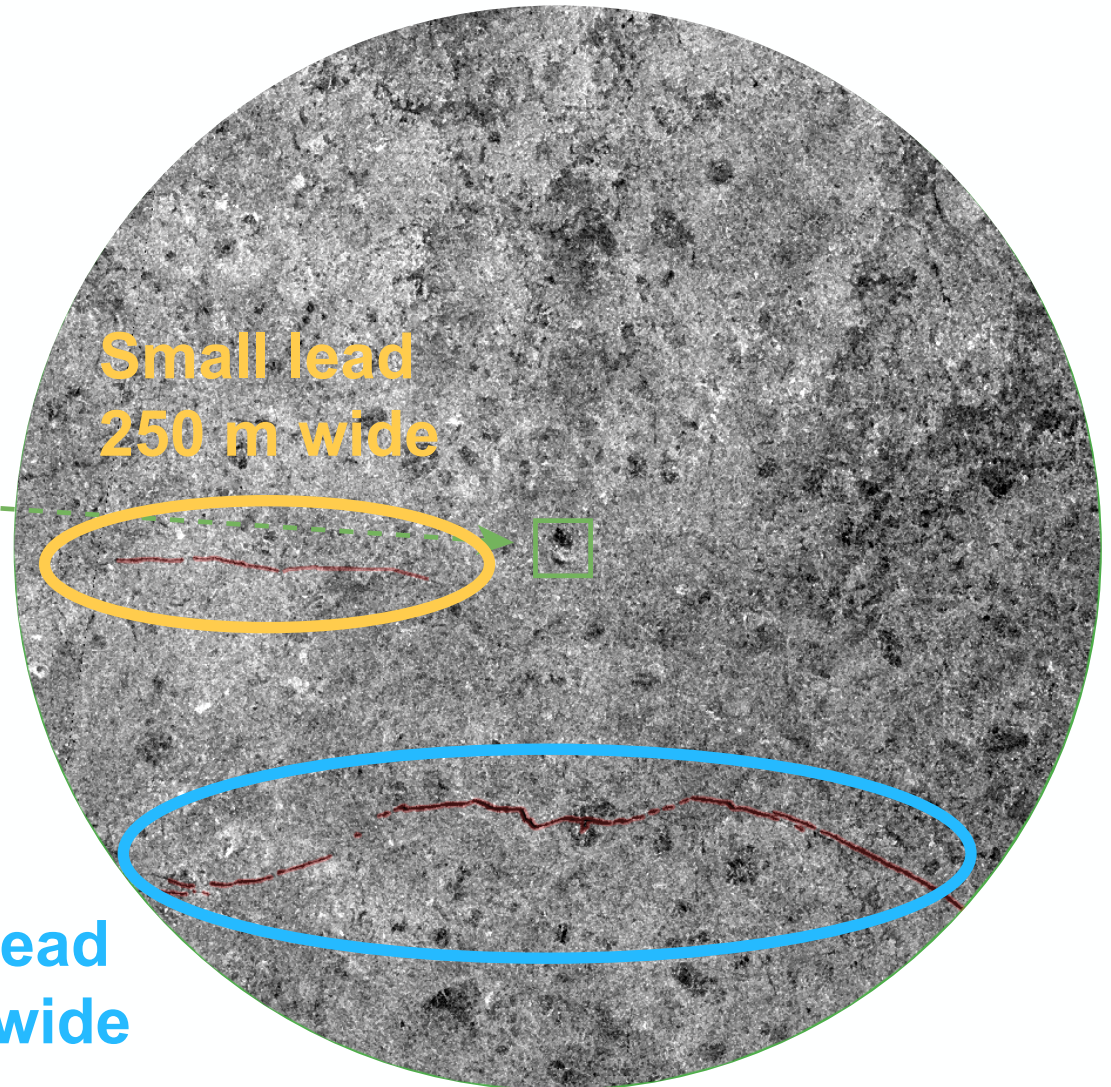


# Calculating lead fractions from divergence

Sentinel-1 on Nov 1, 2019



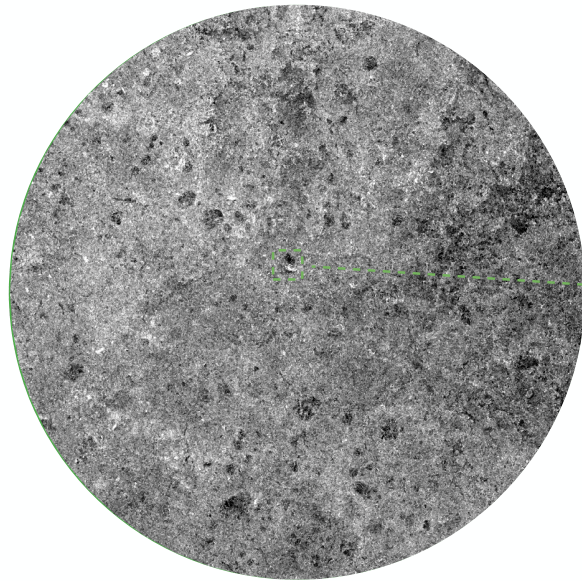
Sentinel-1 on Nov 2, 2019



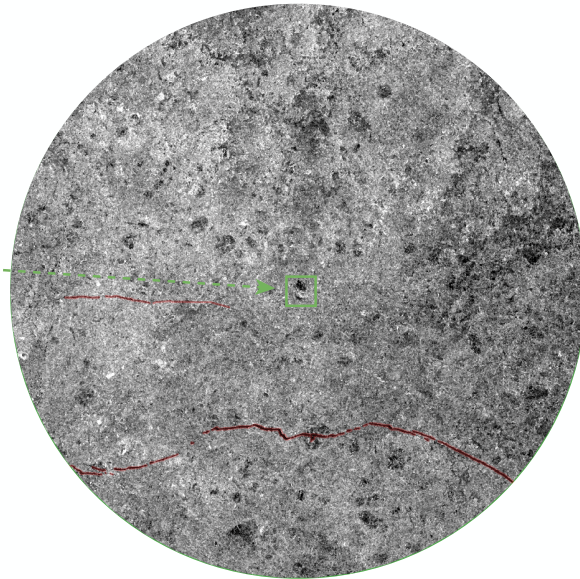
pixel: 50 x 50 m

# Calculating lead fractions from divergence

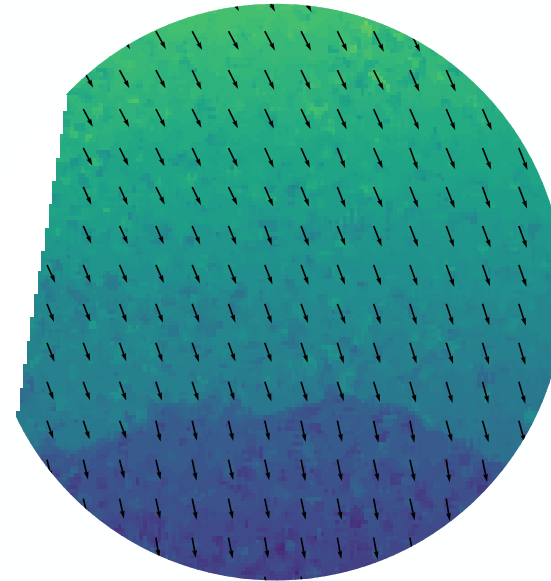
a SAR on Nov 1, 2019



b SAR on Nov 2, 2019



c Velocity

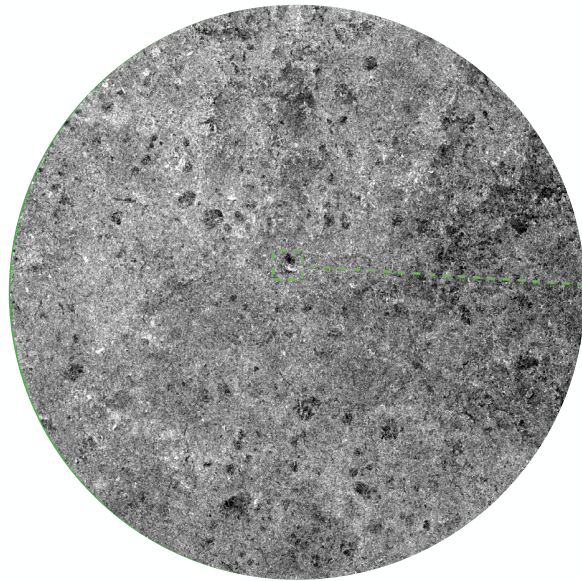


zonal velocity (km d<sup>-1</sup>)

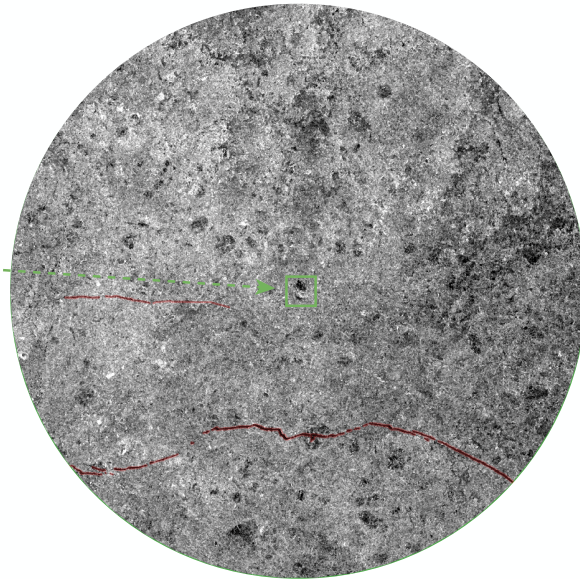
pixel: 700 x 700 m

# Calculating lead fractions from divergence

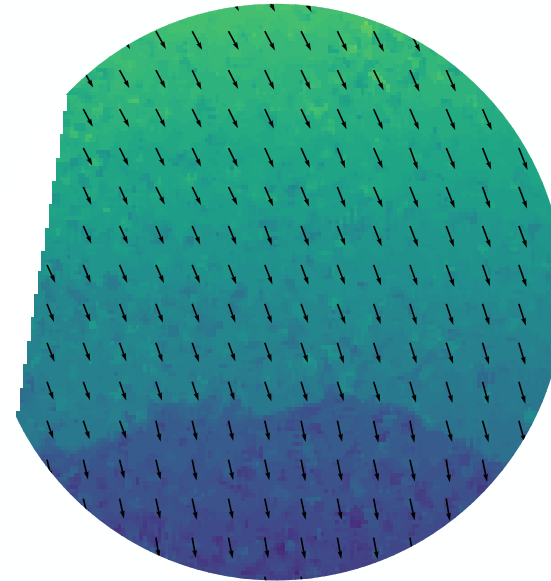
a SAR on Nov 1, 2019



b SAR on Nov 2, 2019



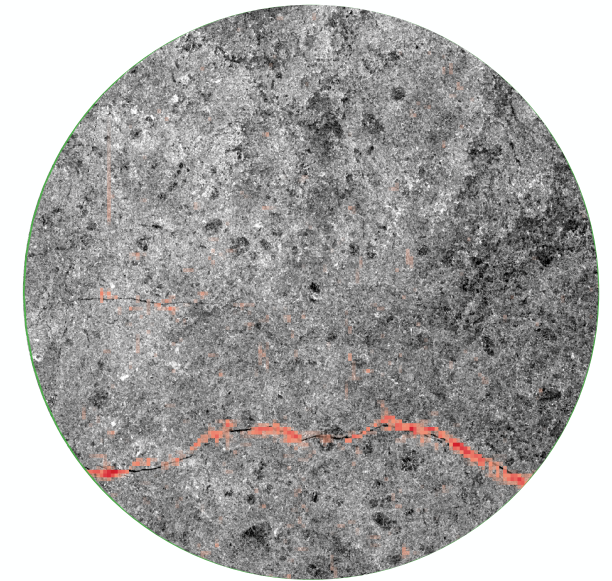
c Velocity



zonal velocity (km d<sup>-1</sup>)

pixel: 700 x 700 m

d Divergence

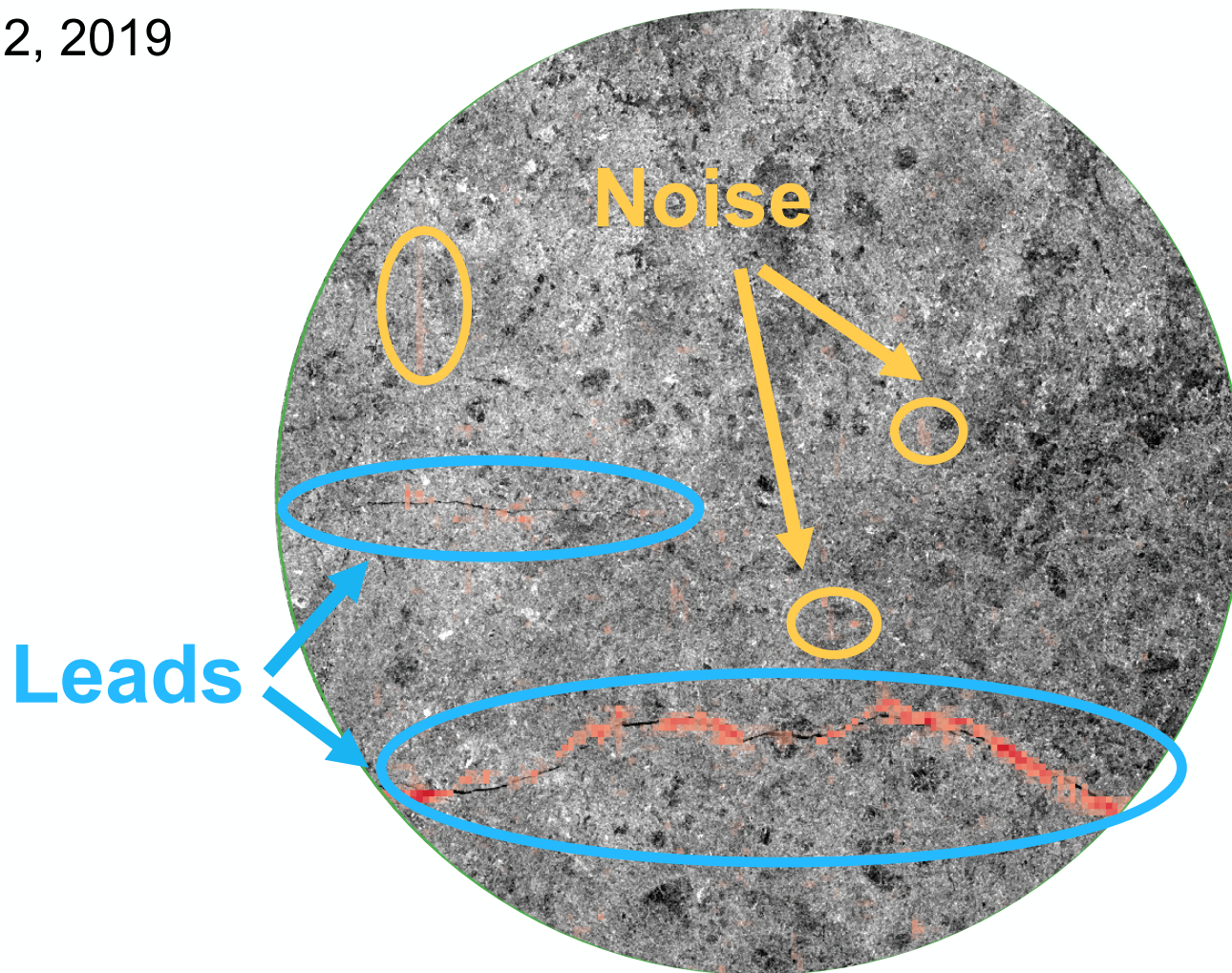


divergence (d<sup>-1</sup>)

pixel: 700 x 700 m

# Lead fractions indicate location and widths of small leads but contain noise.

SAR on Nov 2, 2019



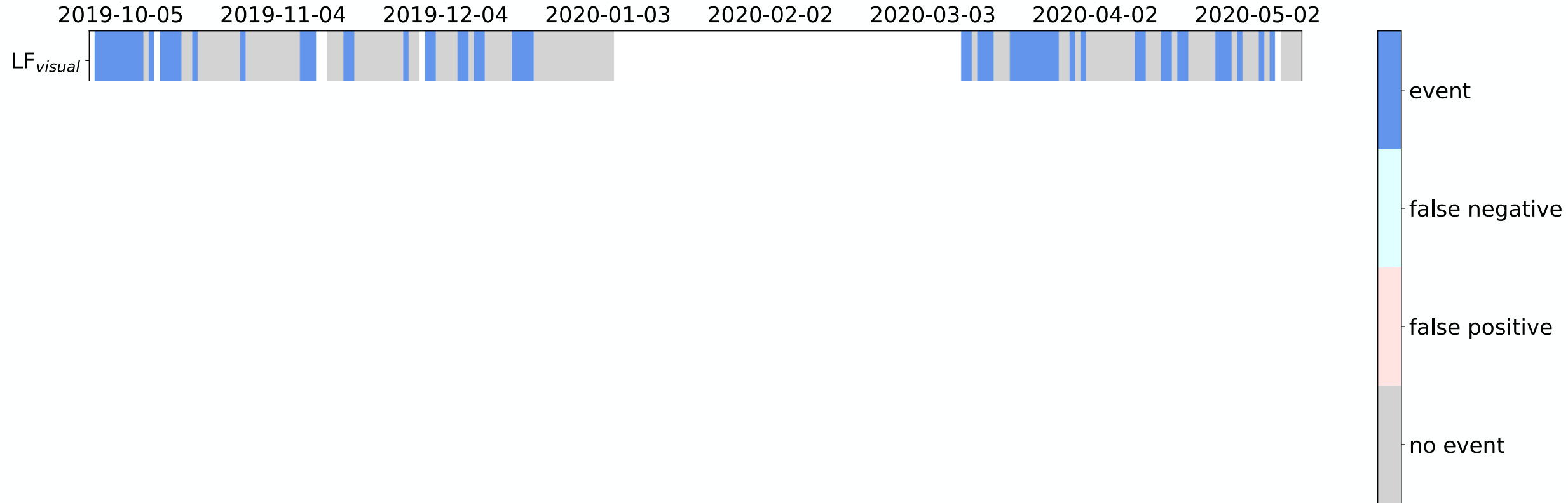
Lead fraction: 2.6 %

*Proof of concept* ✓

*Next:  
time series comparison*

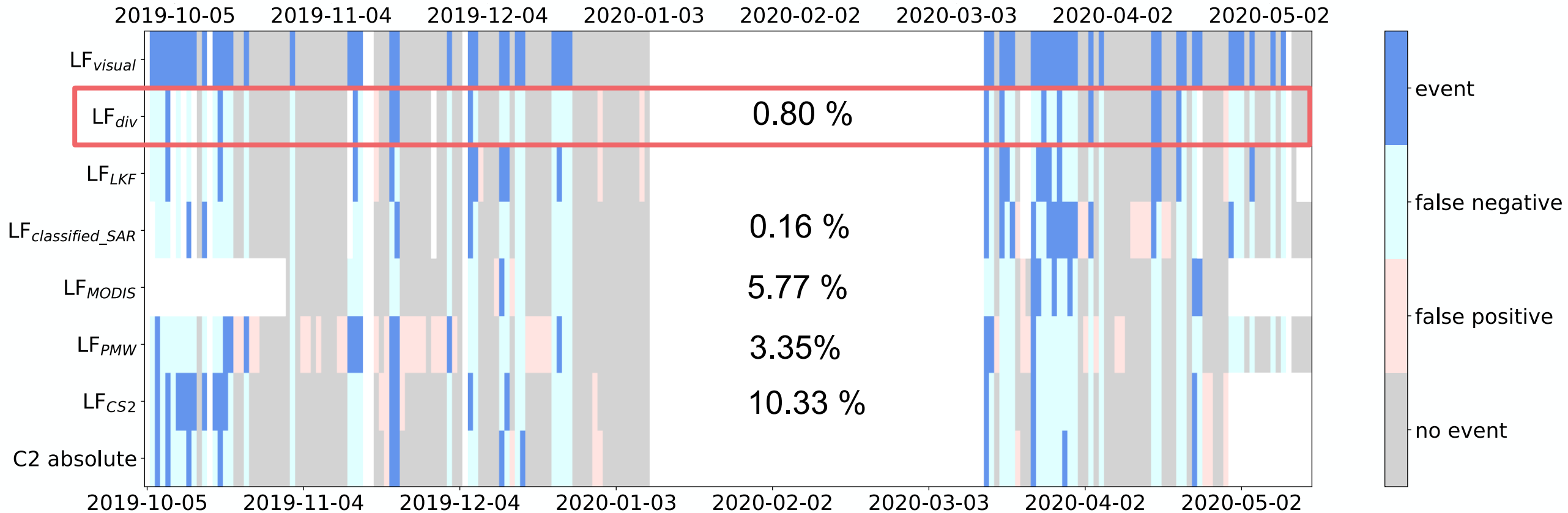
-0.5 -0.4 divergence ( $d^{-1}$ ) 0.1 0.2 0.3

# Time series evaluation with visual references



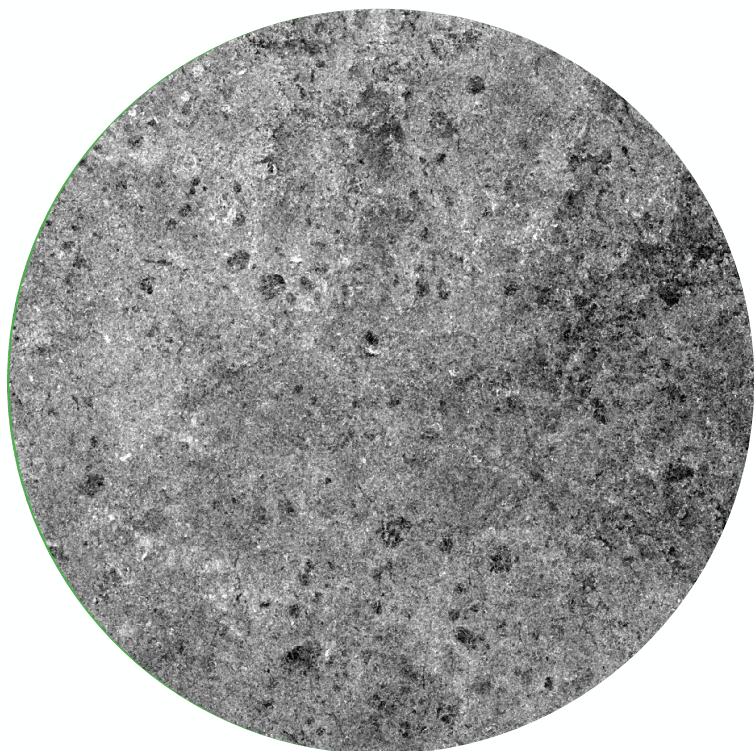


# Time series evaluation with visual references

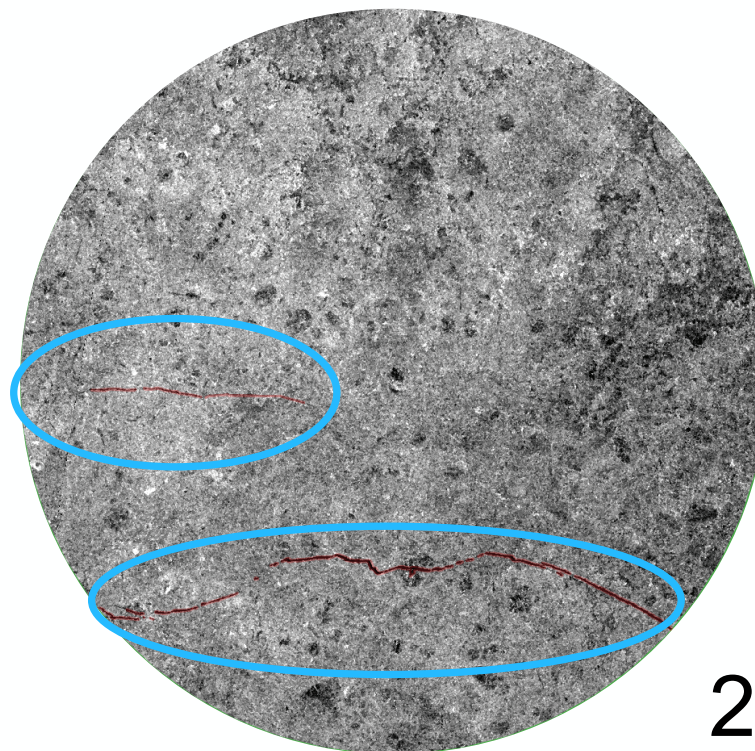


# Lead fractions indicate location and widths of small leads but contains noise.

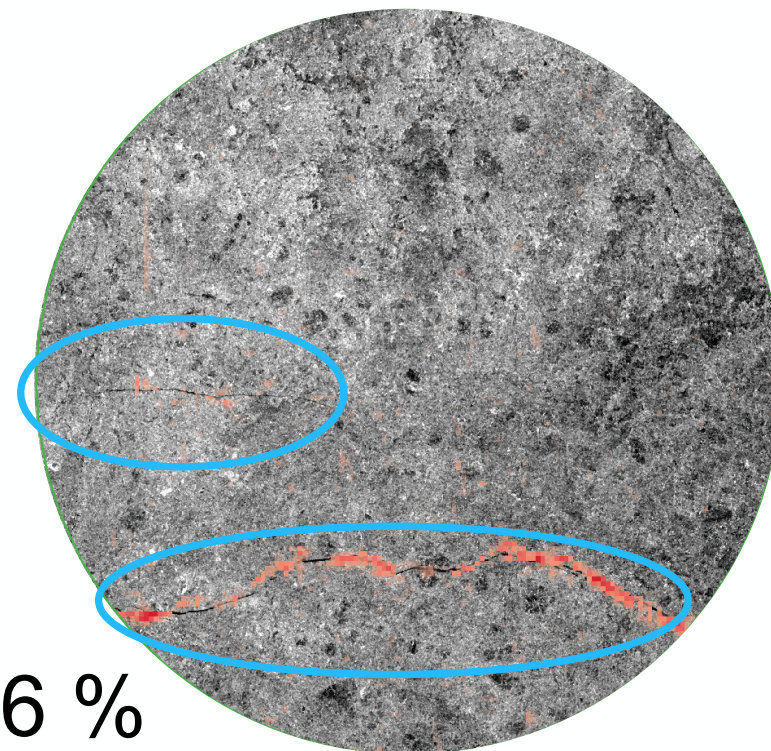
SAR on Nov 1, 2019



SAR on Nov 2, 2019



Divergence



2.6 %



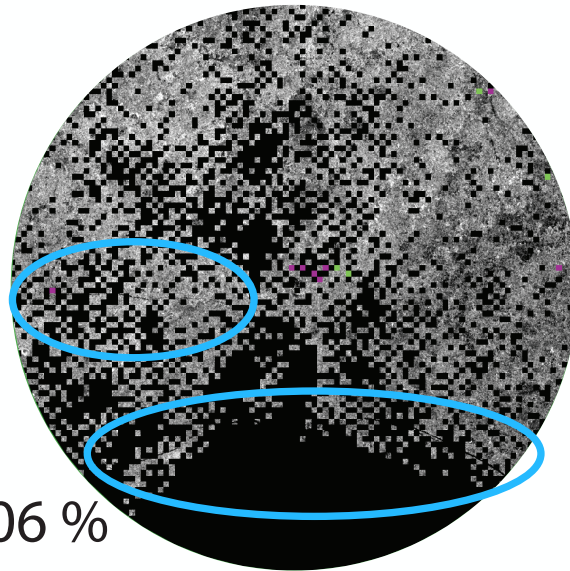
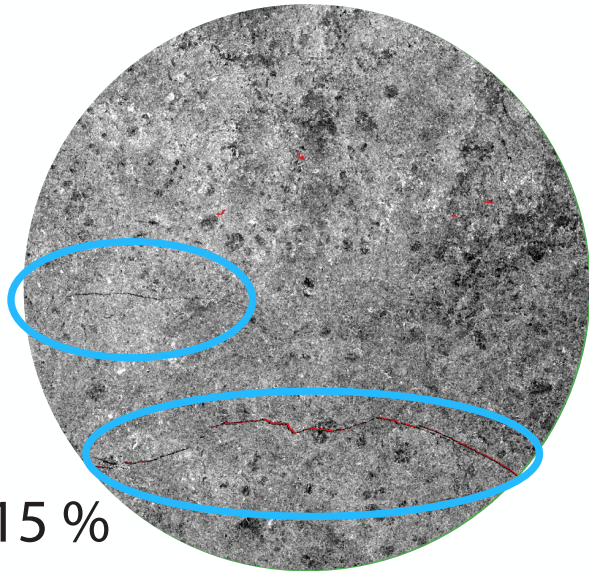
# Comparison to other lead fraction products

Classified SAR

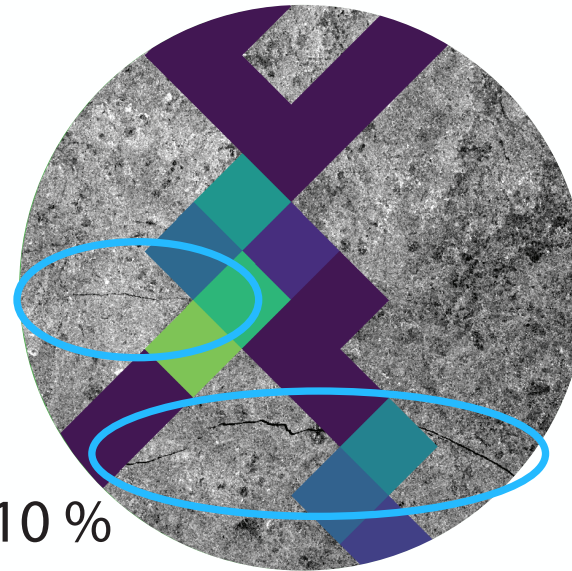
Thermal infrared

Radar altimeter

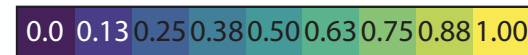
Passive microwaves



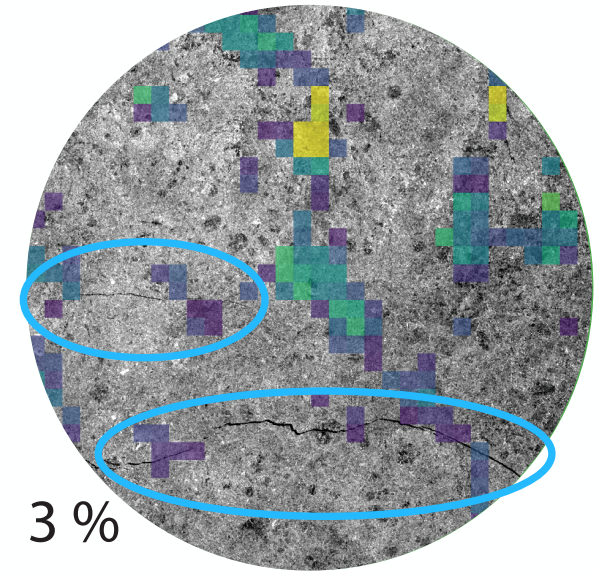
0.06 %



10 %



fraction



3 %



percentage

Leads too small

Clouds

Overestimation  
difficult to interpret

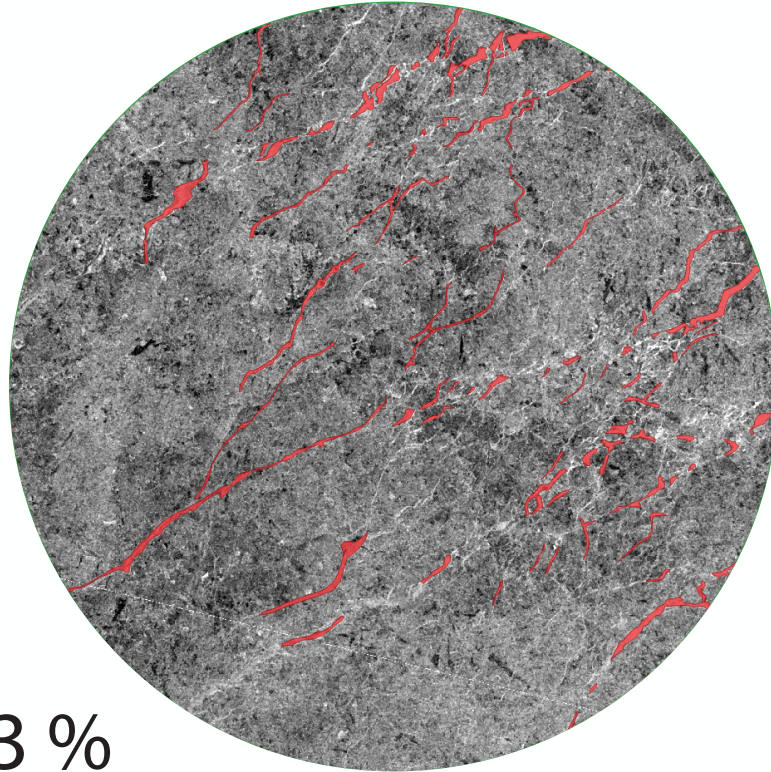
Thin ice?

# Divergence can only resolve opening, not existing leads.

a SAR on Mar 26



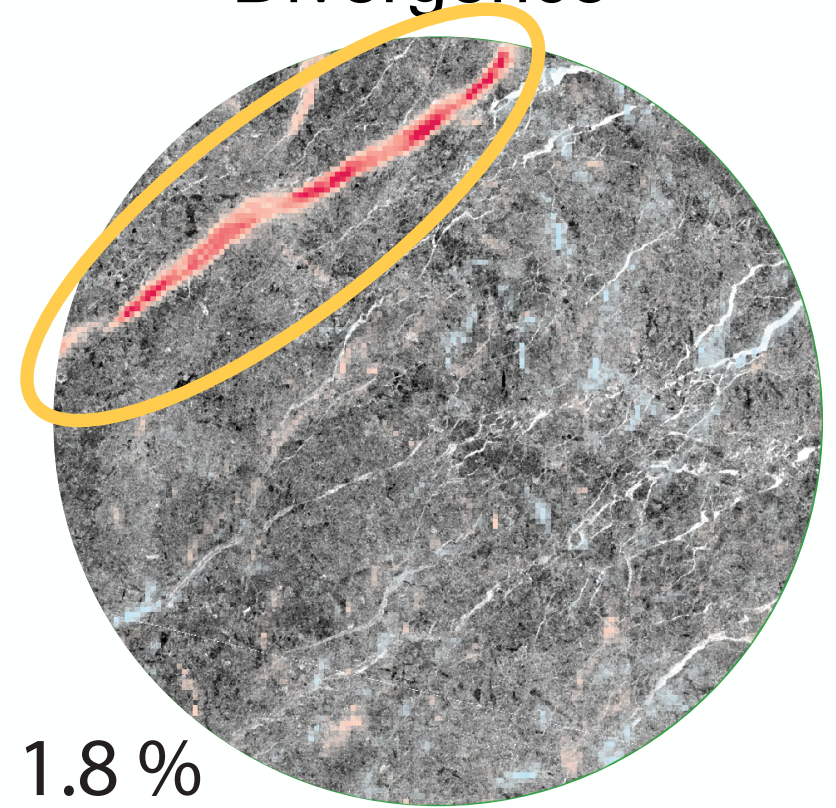
b SAR on Mar 27



3 %



Divergence



1.8 %



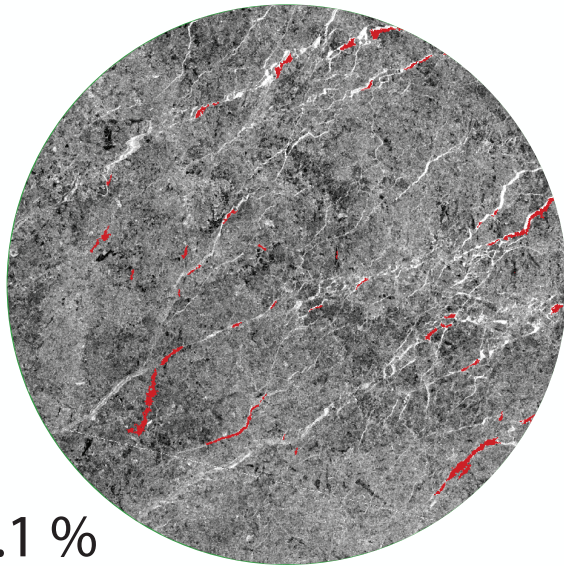
# Comparison to other lead fraction products

Classified SAR

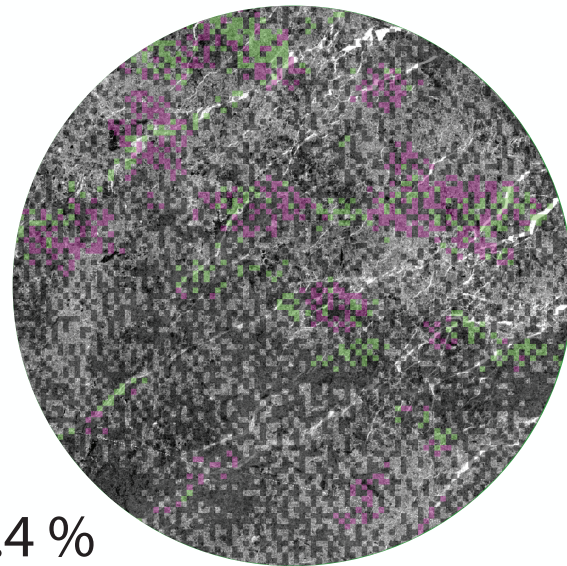
Thermal infrared

Radar altimeter

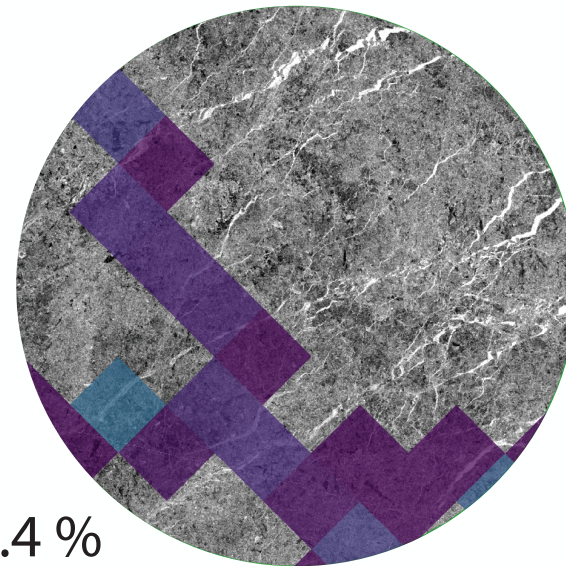
Passive microwaves



1.1 %



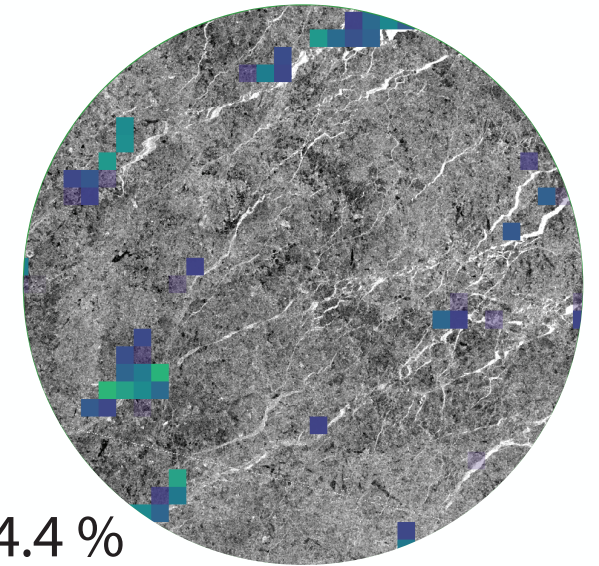
7.4 %



8.4 %



fraction



4.4 %



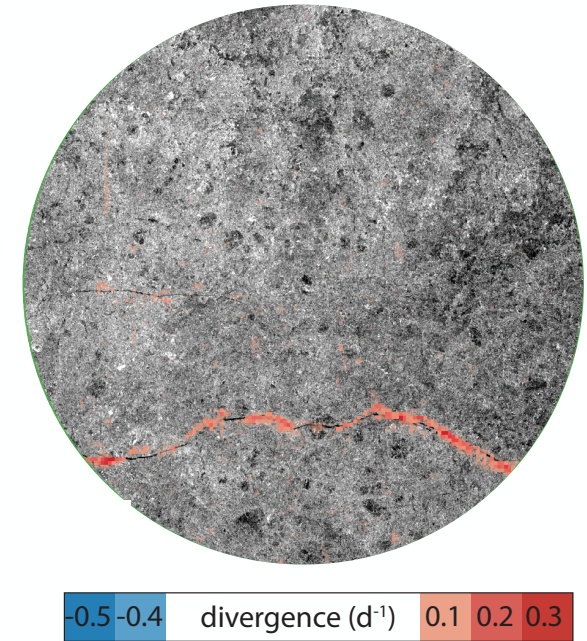
percentage

# Summary

**On a 50 km scale lead fractions from divergence are valuable additions to the existing products.**

- + indicate **location and widths** of small leads.
- contain noise and they can only resolve “newly” formed leads.

**There are large differences in the lead fraction products due to the different retrieval methods – Choose with care!**



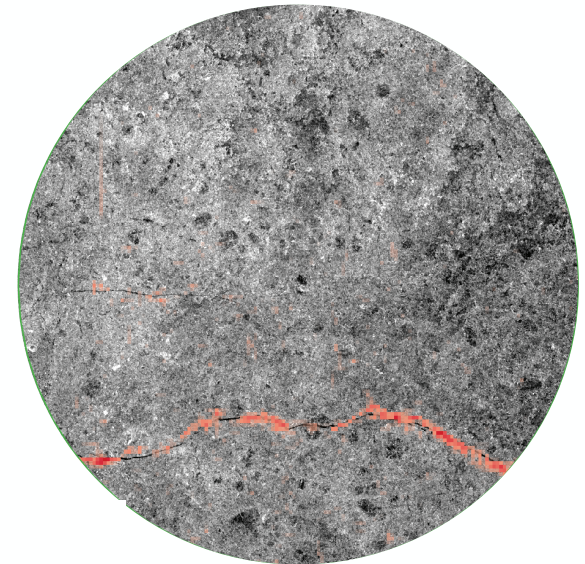
# Outlook

**On a 50 km scale lead fractions from divergence are valuable additions to the existing products.**

+ indicate **location and widths** of small leads.

- contain noise and they can only resolve “newly” formed leads.

**There are large differences in the lead fraction products due to the different retrieval methods – Choose with care!**



## Outlook:

Track origin and widths of the leads for a complete deformation history