

# Temporal dynamic of ice-rich riverbank erosion



Helmholtz Alliance:  
Remote Sensing and Earth System Dynamics

Samuel Stettner<sup>1</sup>, Hugues Lantuit<sup>1</sup>, Annett Bartsch<sup>2,3</sup>, Birgit Heim<sup>1</sup>, Guido Grosse<sup>1</sup>, Achim Roth<sup>4</sup>, Barbara Widhalm<sup>2,3</sup>

- <sup>1</sup> Alfred Wegener Institute, Germany, D-14473 Potsdam Telegrafenberg A43
- <sup>2</sup> Central Institute of Meteorology & Geodynamics, Austria, A-1190 Wien, Hohe Warte 38
- <sup>3</sup> Department of Geodesy and Geoinformation, Vienna University of Technology, Austria, A-1040 Vienna Gußhausstr. 25-29
- <sup>4</sup> Department Land Surface, German Aerospace Center, Germany, Oberpfaffenhofen 82234 Weßling



# Test site



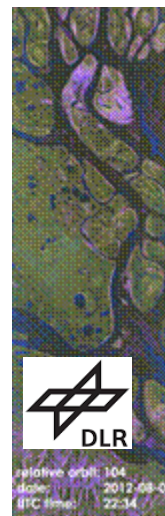
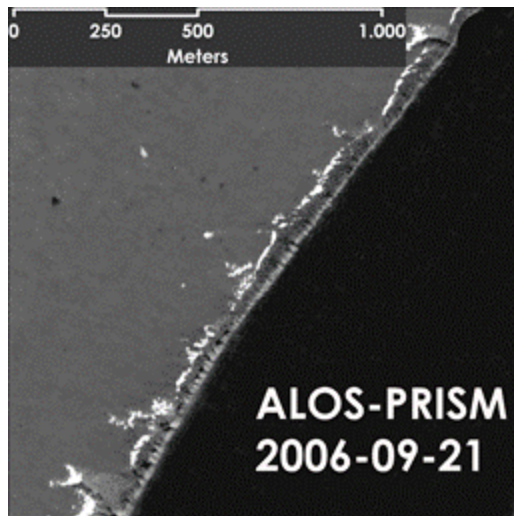
# Data & methods I



■ Optical

| SAR

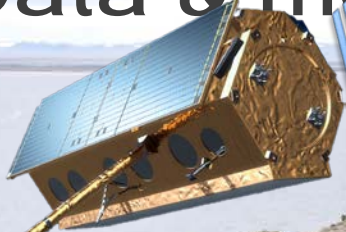
▨ Time-lapse





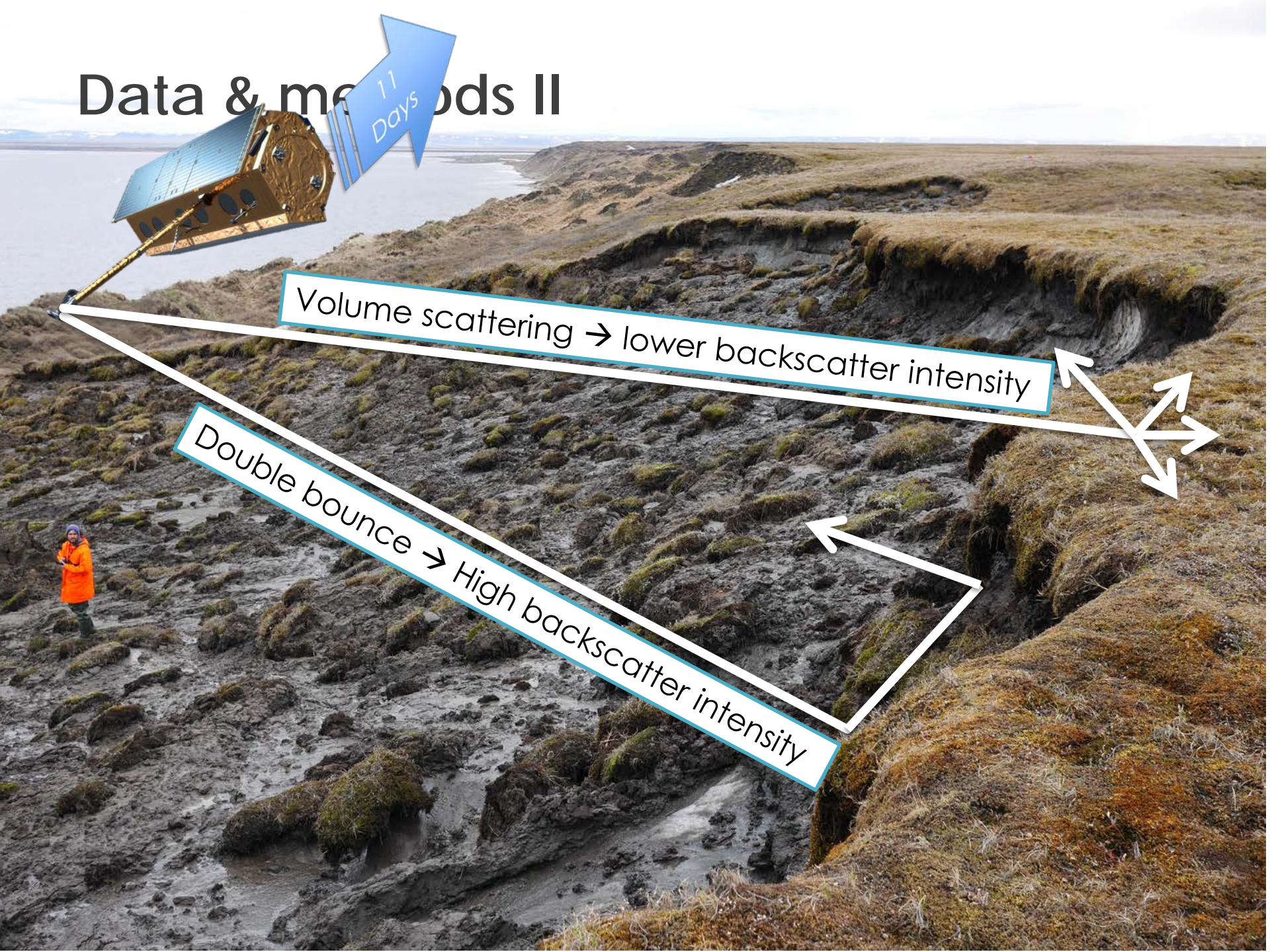
# Data & methods II

11 Days



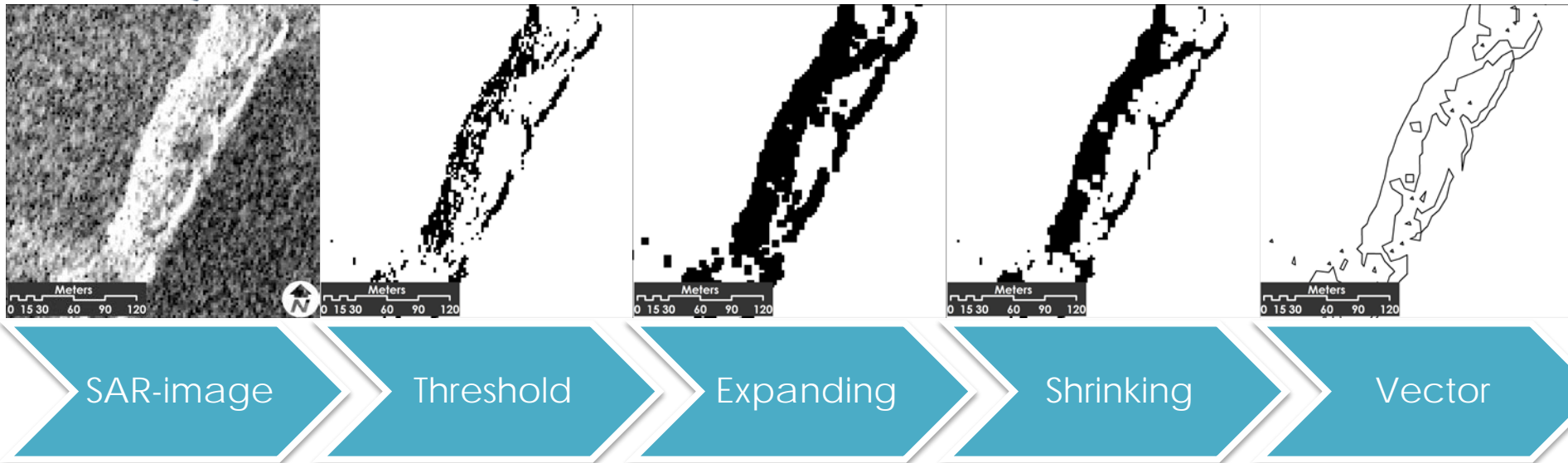
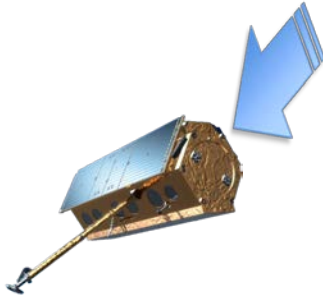
Volume scattering → lower backscatter intensity

Double bounce → High backscatter intensity



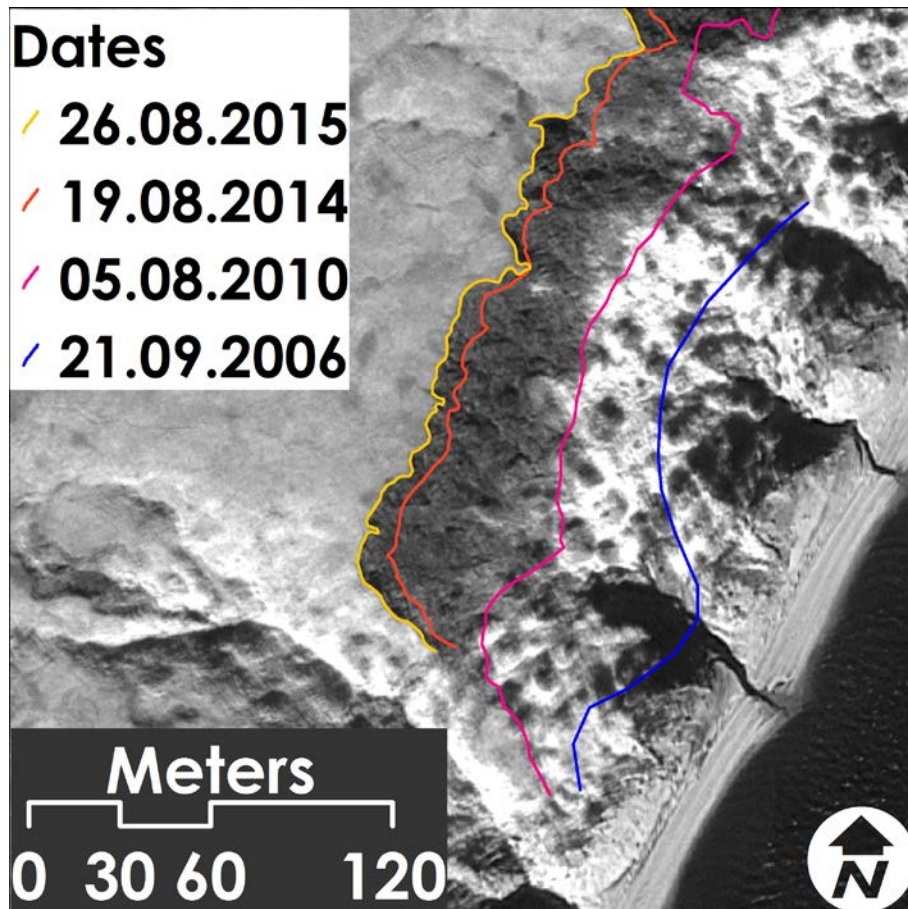


# Data & methods III

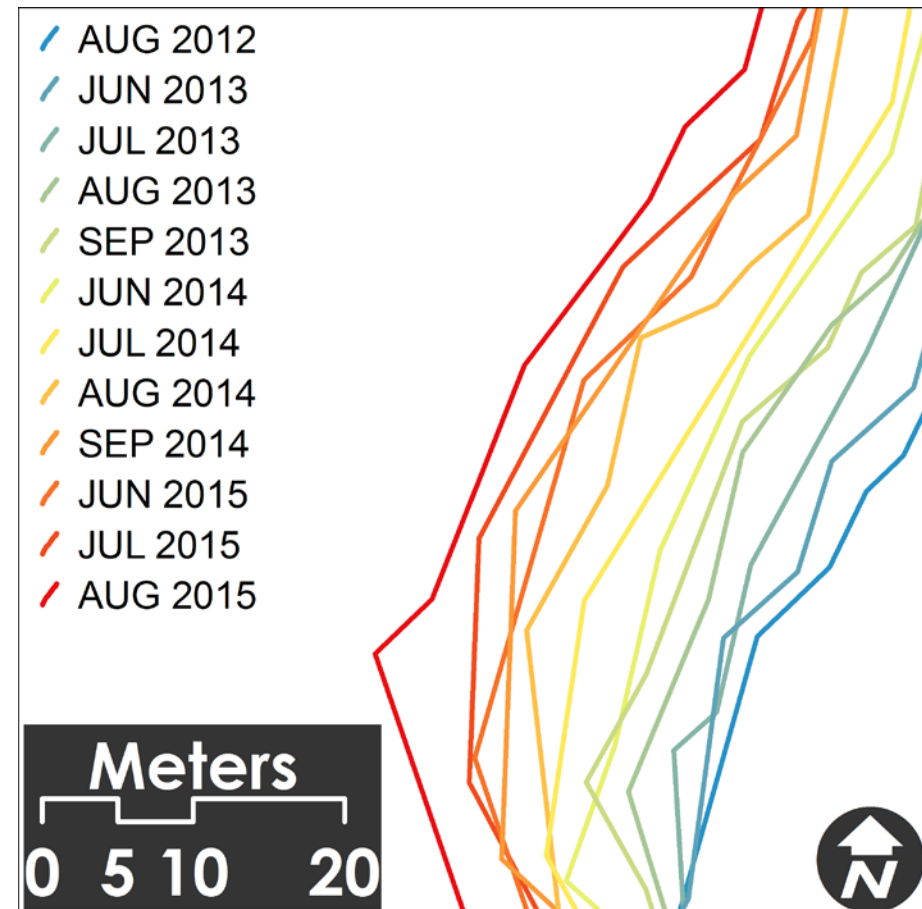


# Cliff top retreat

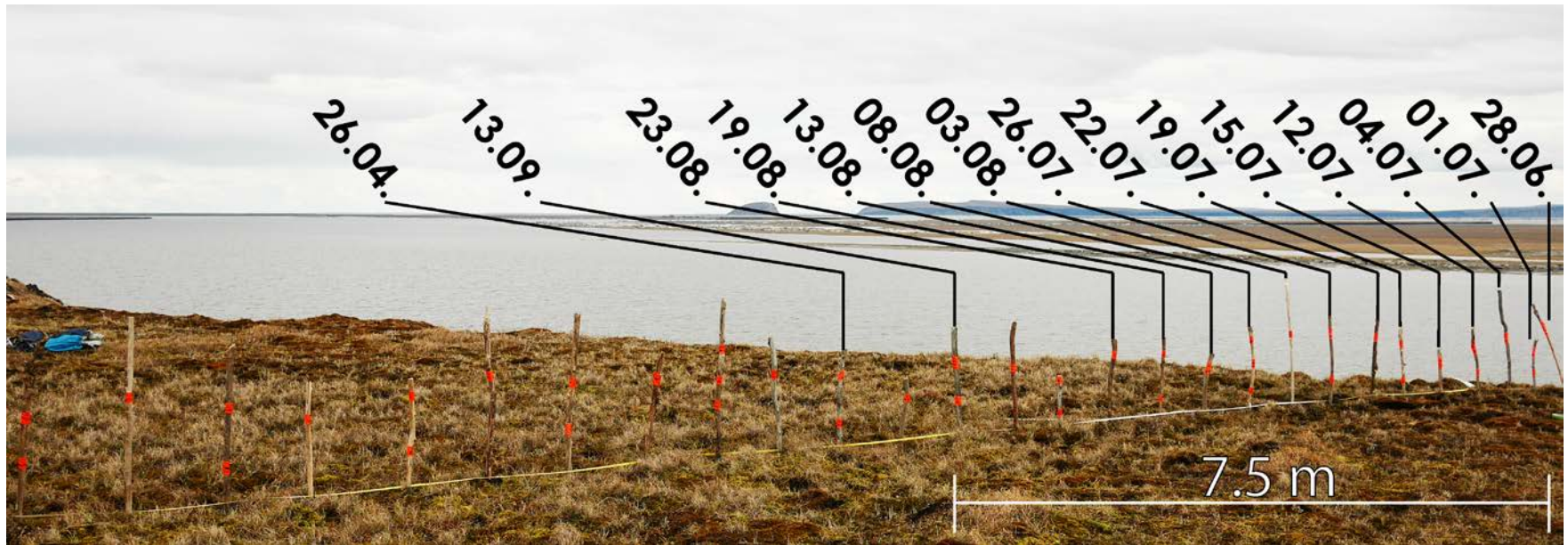
Optical



TerraSAR-X



# Field validation 2015



Wooden markers every 50 cm distance

„loss“ of stakes every 3 to 8 days

July = 3 m; August 2.5 m

# Time-lapse June & July 2015





# Conclusions



TerraSAR-X time-series is:

- ✓ suitable for detecting seasonal dynamics of rapid permafrost degradation
- ✓ bridging the temporal gap between optical long-term archives and field based measurements
- ✓ indicating permanent cliff top erosion within the thawing period





# Thank you for your attention!



Helmholtz Alliance:  
Remote Sensing and Earth System Dynamics



River ice on Lena River after ice  
break up in June 2015, Samoylov