Arktalas Hoavva Study: Main Achievements

Arktalas Hoavva Study: Main Goals

Arktalas Project Main Goal:

Use satellite measurements in synergy with in-situ data and modelling tools to characterize and quantify the processes driving changes in the Artic sea ice and Arctic Ocean.

In particular target interlinked Arctic Scientific Challenges

ASC-1: Arctic Amplification and its impact
ASC-2: Impact of more persistent and larger area of open water on sea ice dynamics
ASC-3: Impact of extreme event storms in sea-ice formation
ASC-4: Understand and predict the Arctic ocean spin-up

Arktalas Hoavva Study: Main Achievements – 8 Scientific Papers

Paper 1: Response of Total and Eddy Kinetic Energy to the recent spin up of the Beaufort Gyre *(Relevant to ASC-4). Published in Journal of Oceanography in 2019 by Heather Regan et al.*

Paper 2: Observational evidences of eddy-sea ice interactions in the pack-ice and in the MIZ *(Relevant to ASC-2)*. *Published in Geophysical Research Letter in 2020 by A. Cassianides et al.*

Paper 3: Wind-wave attenuation under sea ice in the Arctic: a review of remote sensing capabilities (*Relevant to ASC-2). Submitted to Journal of Geophys. Res.-Ocean by Fabrice Collard et al 2022.*

Paper 4: Modelling the Arctic wave-affected marginal ice zone, comparison with ICESat-2 observations *(Relevant to ASC-2). Submitted to Philosophical Transactions A by Guillaume Boutin et al 2022.*

Arktalas Hoavva Study: Main Achievements – 8 Scientific Papers

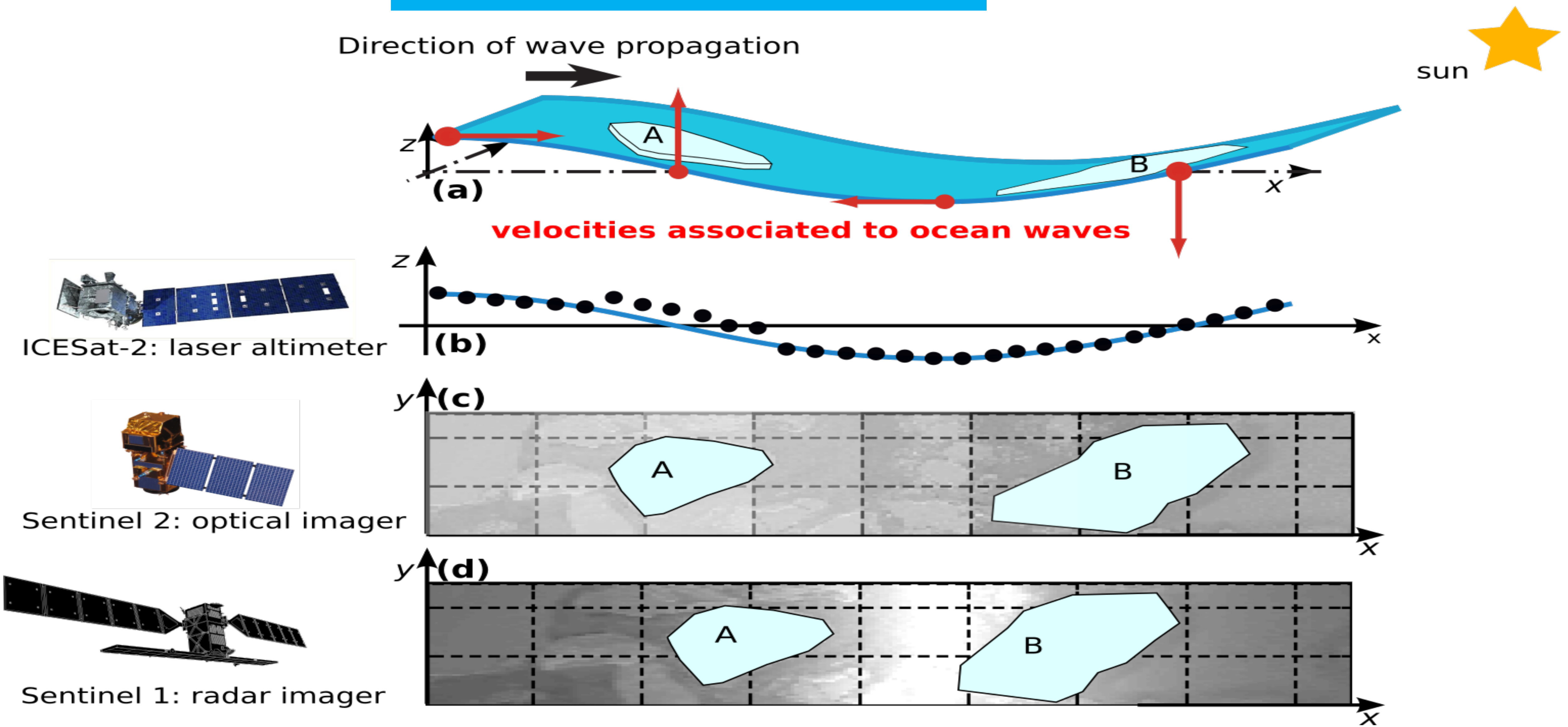
Paper 5: Driving mechanisms of an extreme winter sea-ice breakup event in the Beaufort Sea *(Relevance to ASC-3)*. *Submitted to Geophys. Res. Letter by Jonathan W. Rheinlænder et al., 2022.*

Paper 6: The Arctic amplification and its impact: Attribution through remote-sensing data *(Relevance ASC-1)*. *To be submitted to Journal of Climate by Igor Esau et al., 2022.*

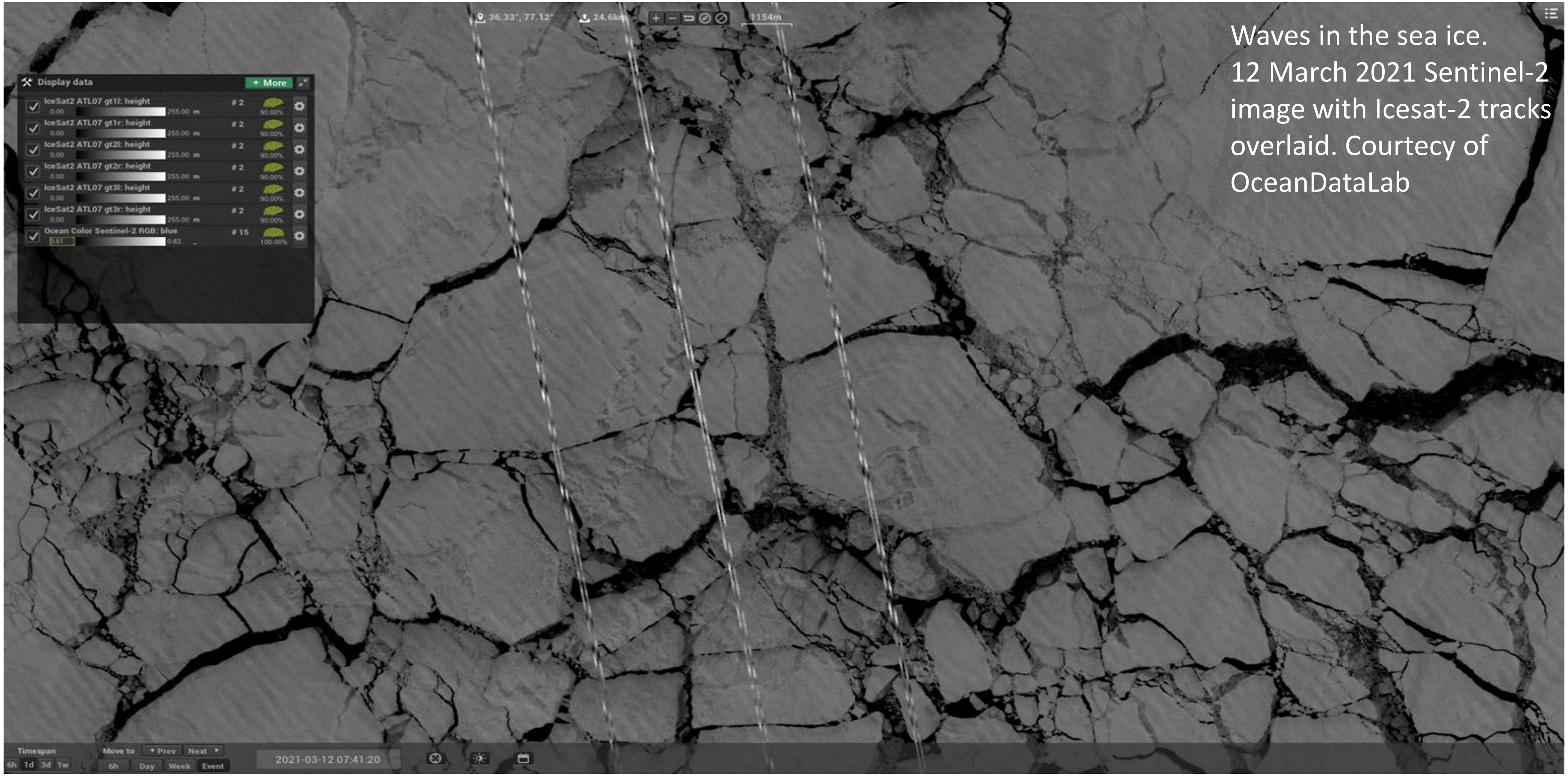
Paper 7: Impact of sea-ice friction on tidal modelling in the Arctic Ocean *(Relevance ASC-1)*. *To be submitted to tbd by Mahtilde Cancet et al., 2022.*

Paper 8: Changes in the Arctic Ocean: Knowledge gaps and Impact of future satellite missions Satellite missions for the Arctic Ocean *(Relevant to all ASCs)*. *To be submitted to Journal of Remote Sensing by Sylvain Lucas et al. 2022.*

Paper 3 – Waves in sea ice

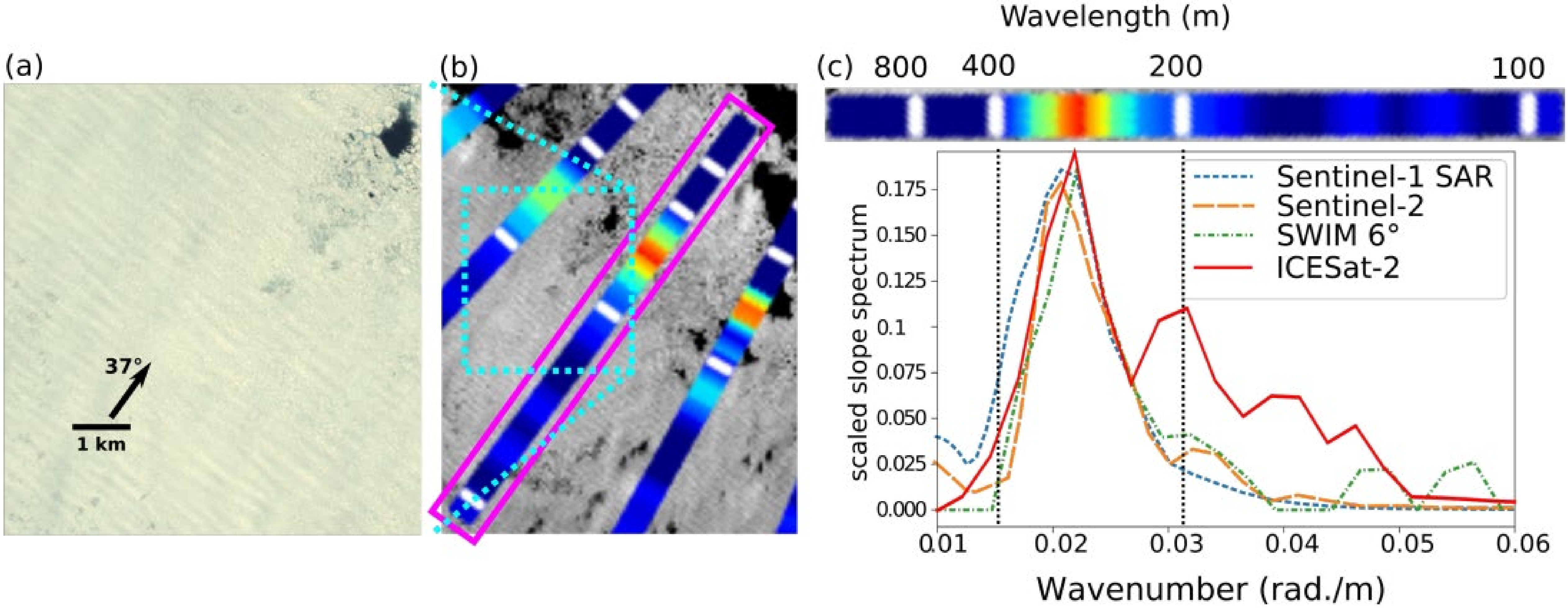


Paper 3 – Waves in sea ice

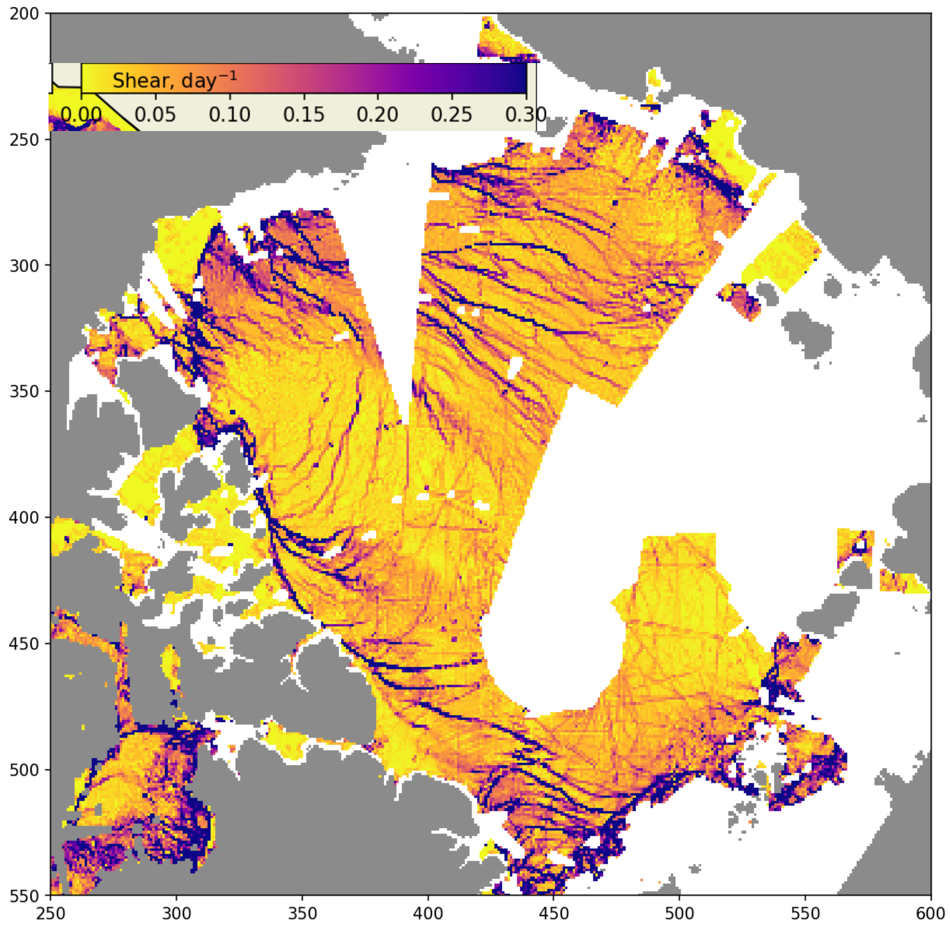


Waves in the sea ice.
12 March 2021 Sentinel-2 image with Icesat-2 tracks overlaid. Courtecy of OceanDataLab

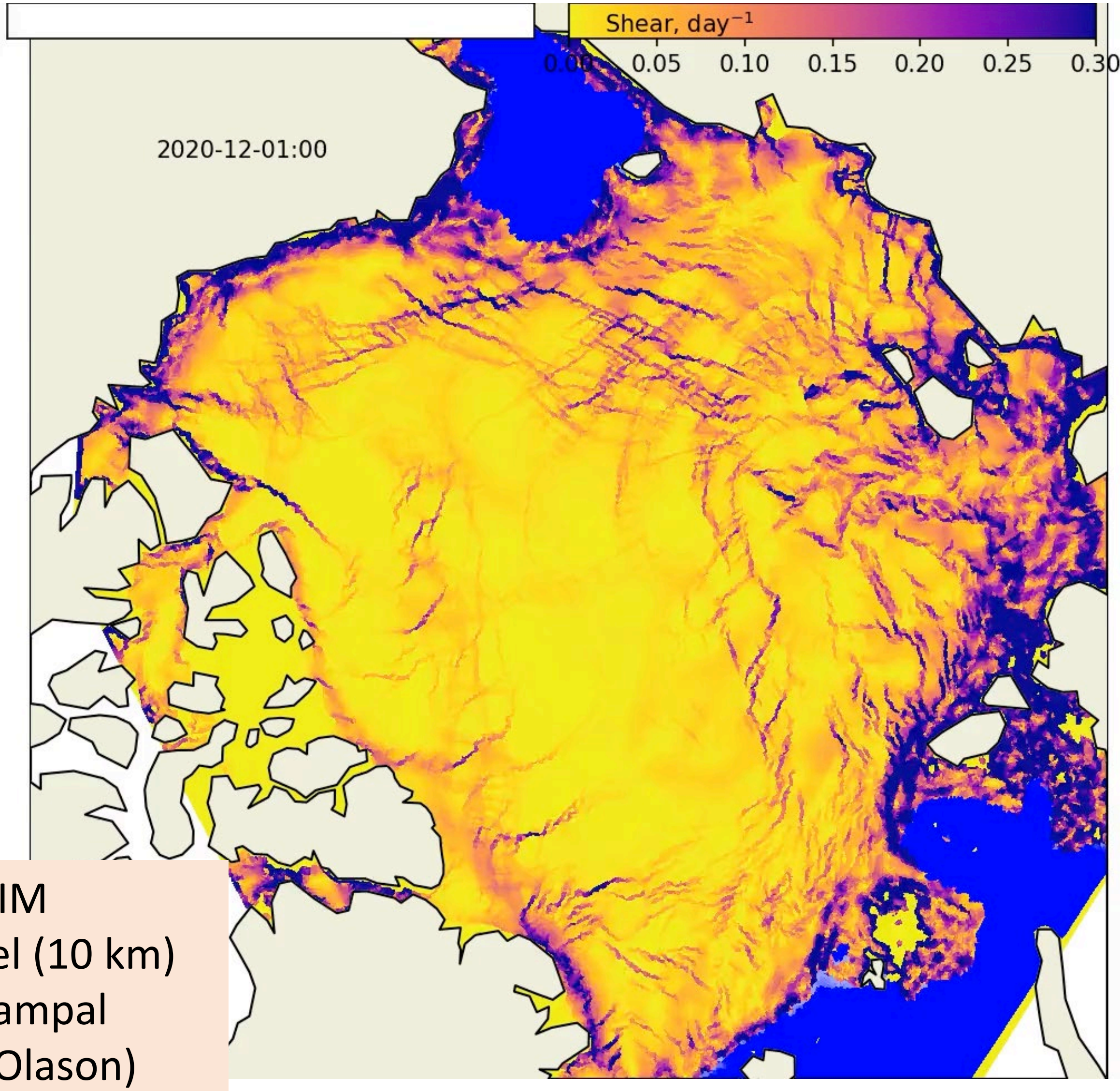
Paper 3 - Wave slope spectra intercomparison



Paper 5: Observed and simulated sea ice deformation

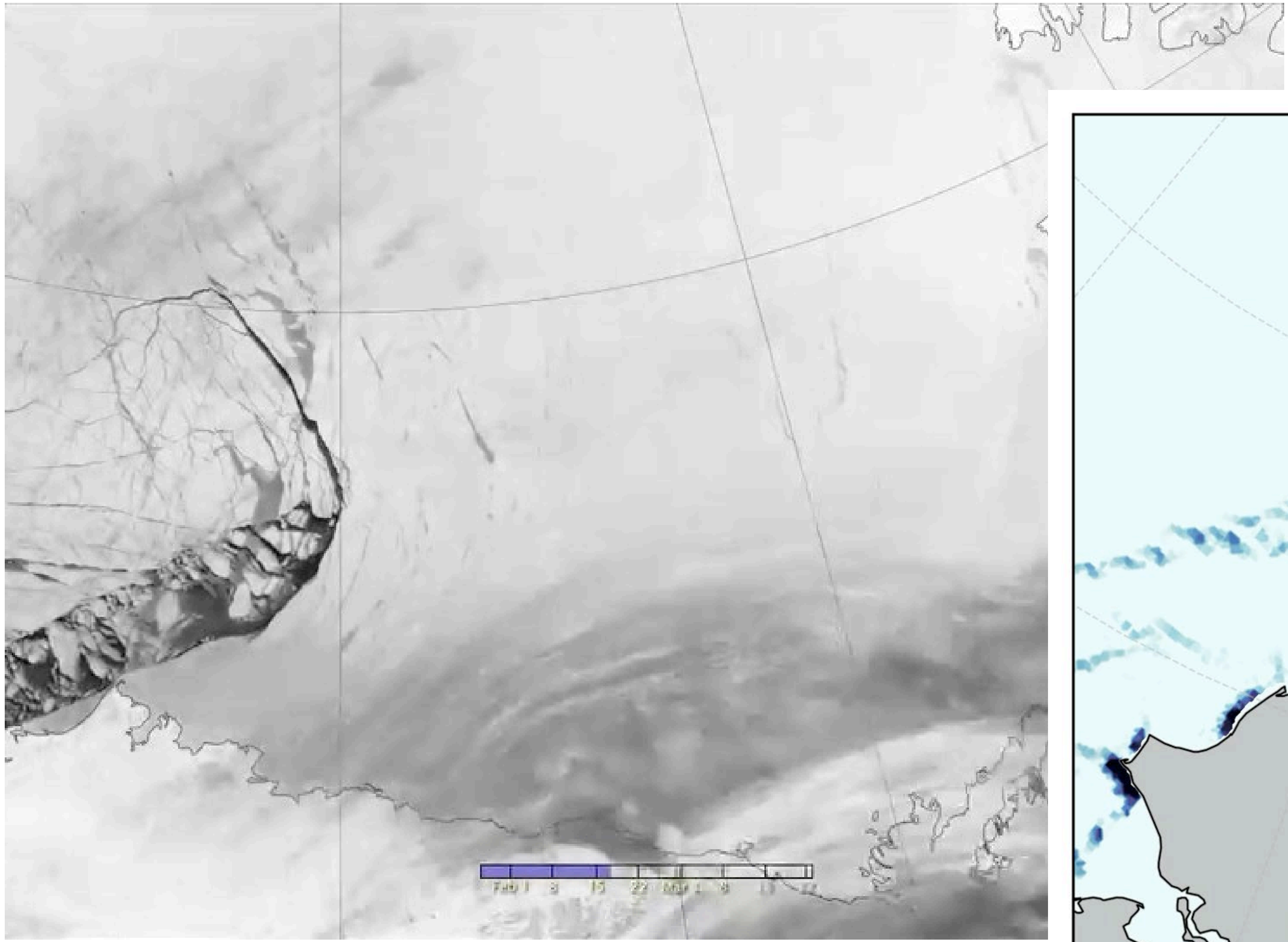


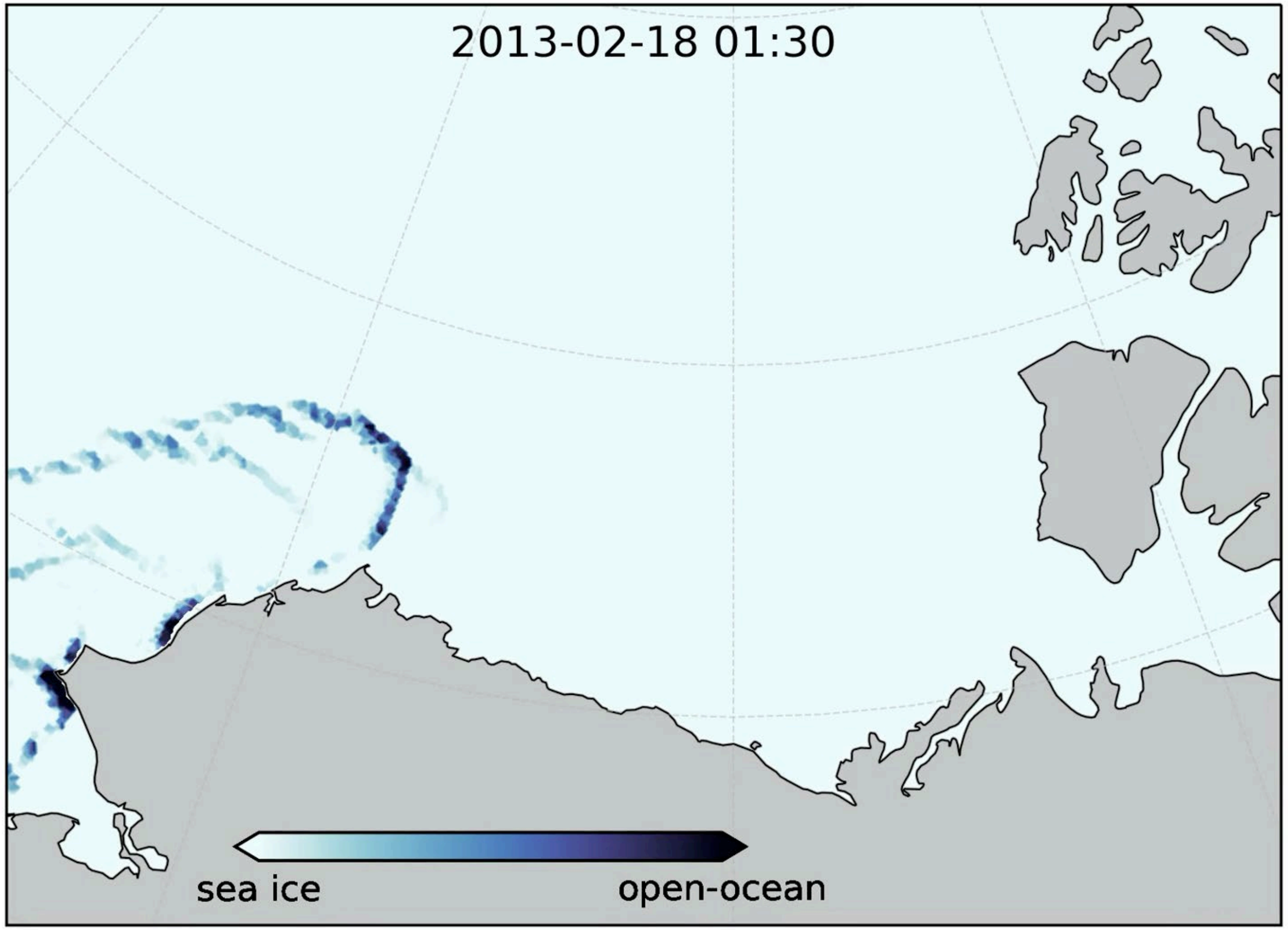
Sentinel-1 SAR based sea ice deformation presented as shear intensity on 14 January 2021



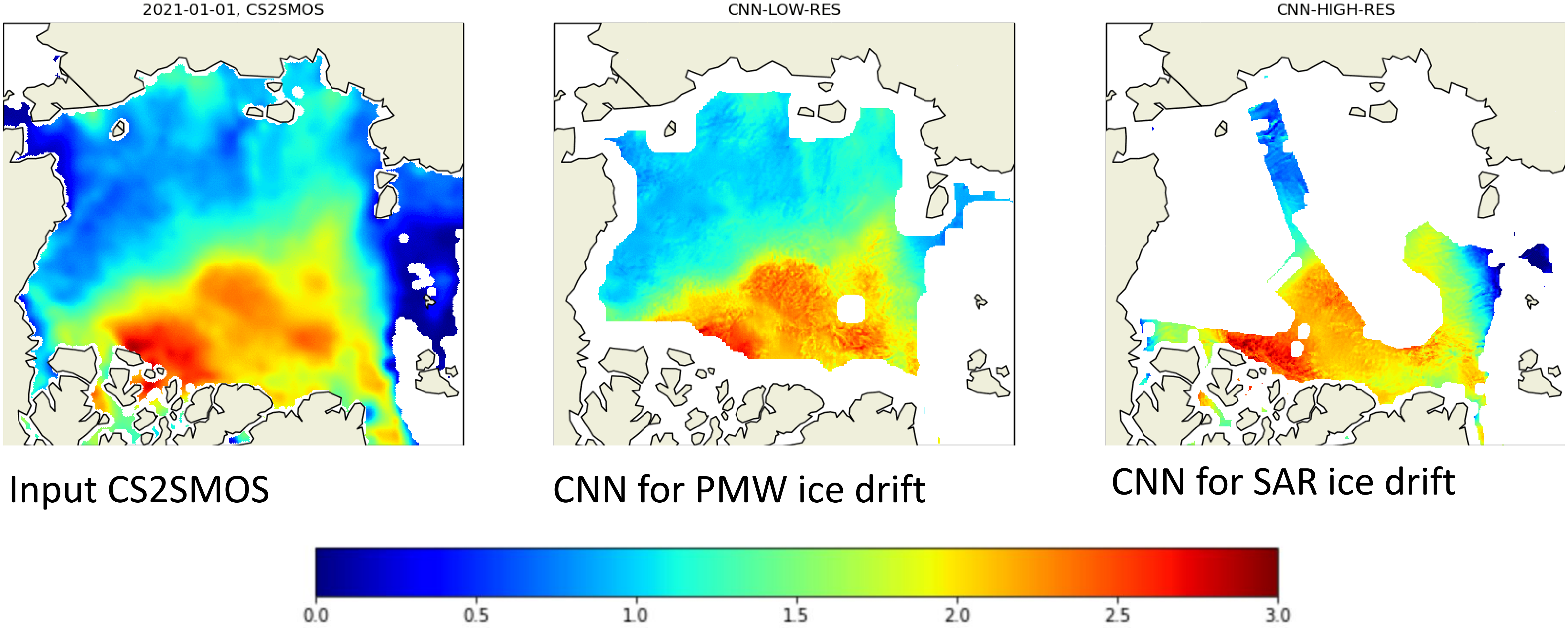
neXtSIM
Sea ice model (10 km)
(Pierre Rampal
And Einar Olason)

Paper 5: Observed and simulated lead formation

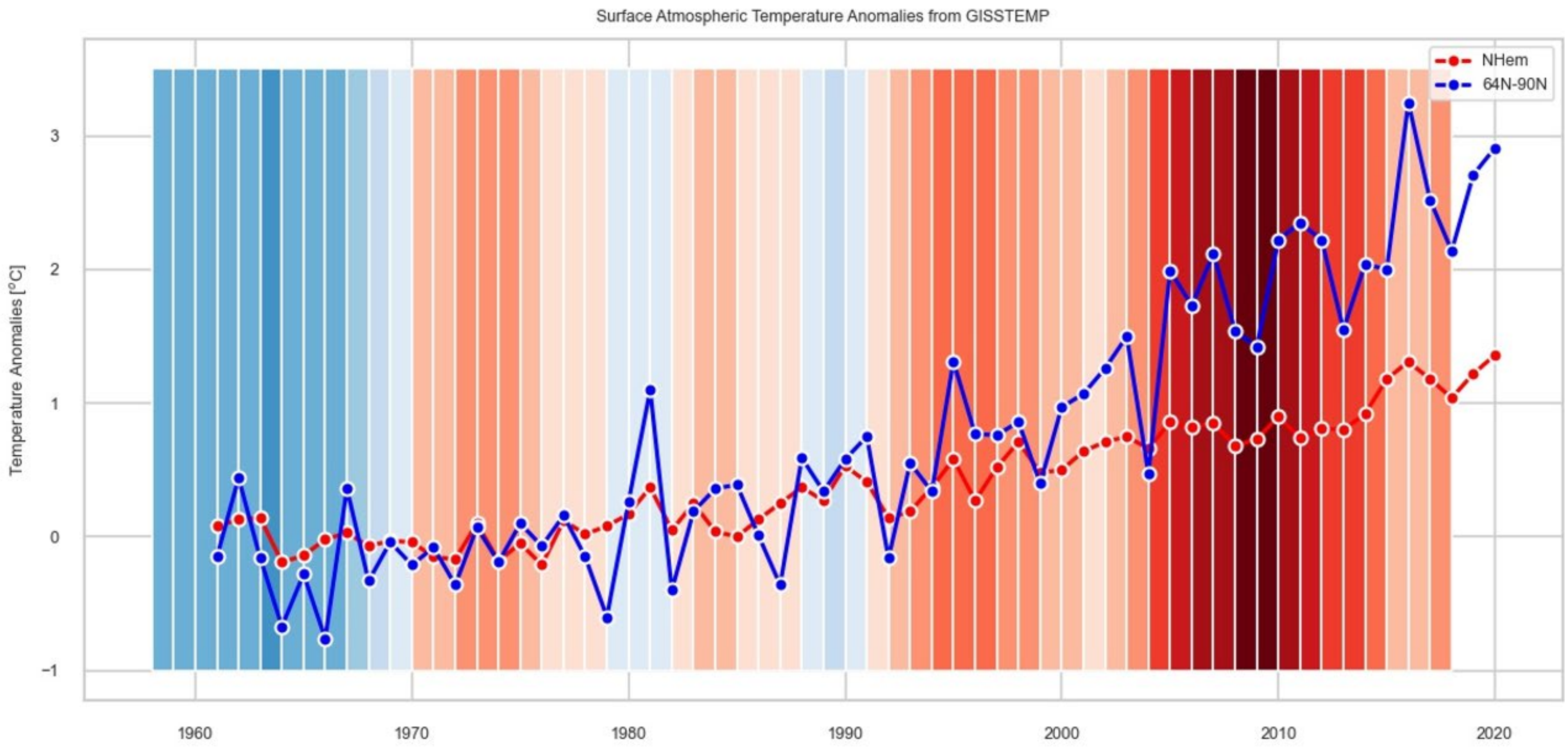


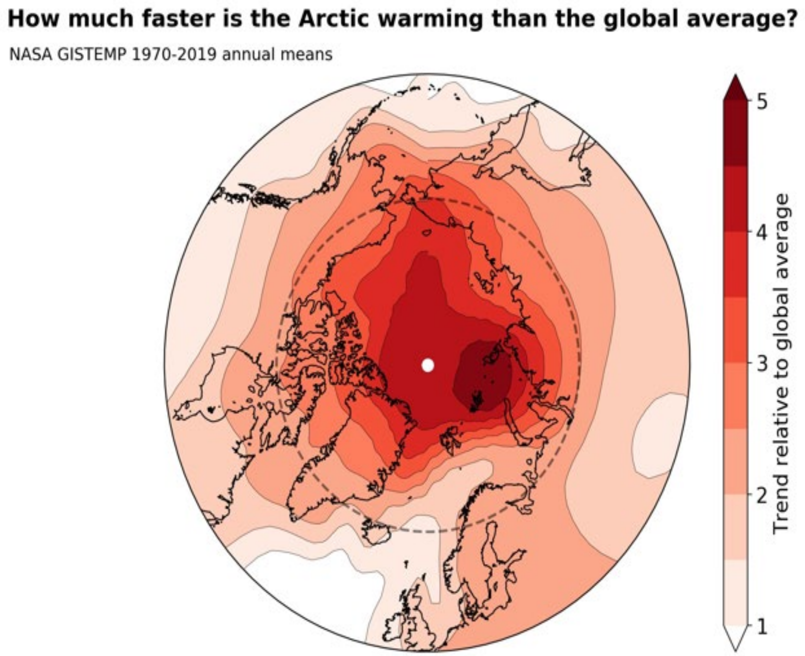


CNN applied to real satellite data (courtesy Einar Olason, Anton KorosvNERSC)



Paper 6 – Arctic Amplification





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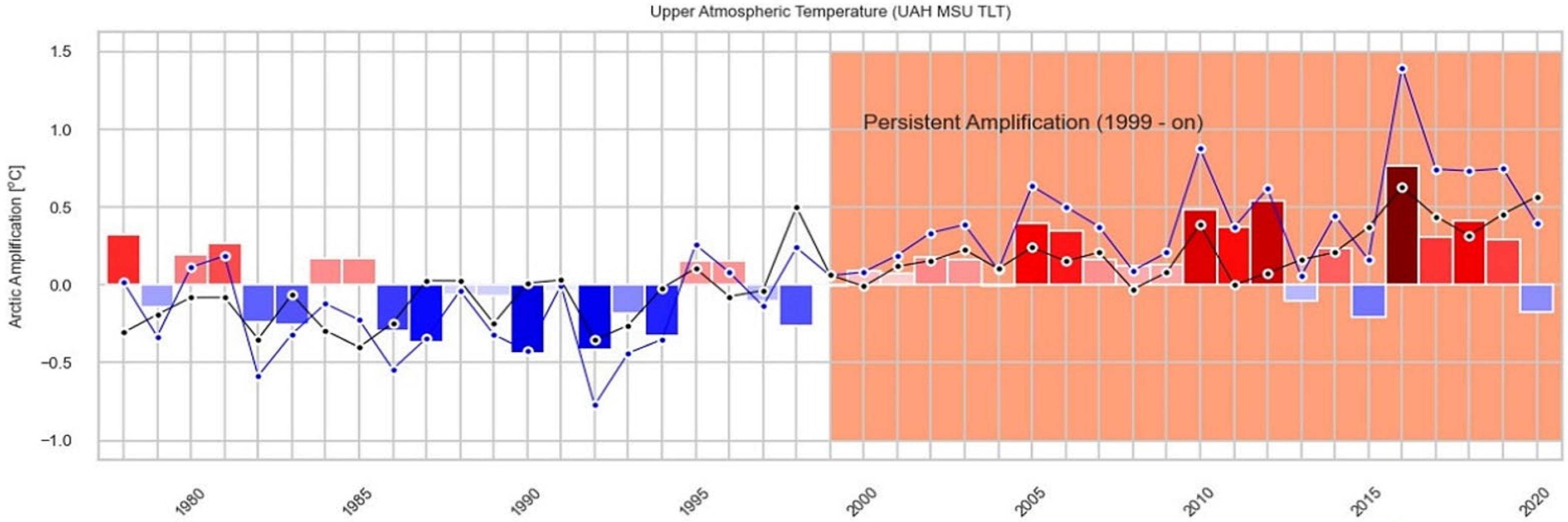

Shrubification of tundra

Emergence of global warming

Period of hidden Amplification

Period of apparent Amplification

Period of saturated Amplification

Sea ice transition (strong reduction of multiyear ice)

Arktalas Hoavva Study: Summary

By systematic use of satellite sensor synergy with modelling tools we have:

- *Discovered novel abilities to detect & characterize behaviour of waves in sea ice;*
- *Quantify wave slope spectra in sea ice;*

- *Established systematic approach for quantifying satellite-based sea ice deformation to intercompare and validate against novel sea ice model.*
- *Provide estimates of shear, strain and vorticity*

- *Evidenced slightly new explanation for the important role of the ABL for the Arctic Amplification*