

Towards a Dynamic View of Antarctica

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Digital
Twin
Antarctica



DESTINATION EARTH

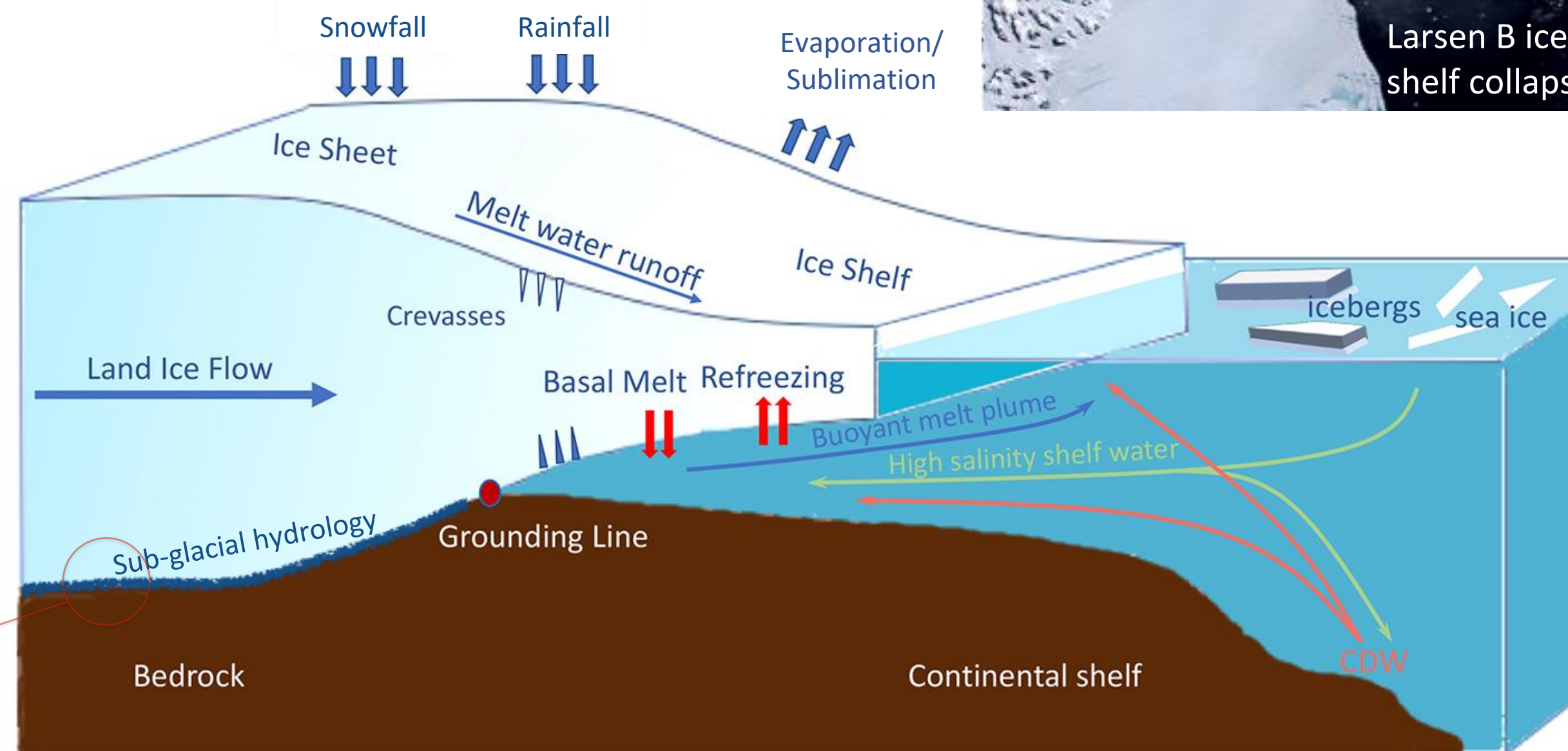
A DIGITAL REPLICA OF OUR PLANET

Destination Earth (DestinE) aims to develop a highly accurate digital model of Earth to monitor the effects of natural and human activity on our planet, anticipate extreme events and adapt policies to climate-related challenges.

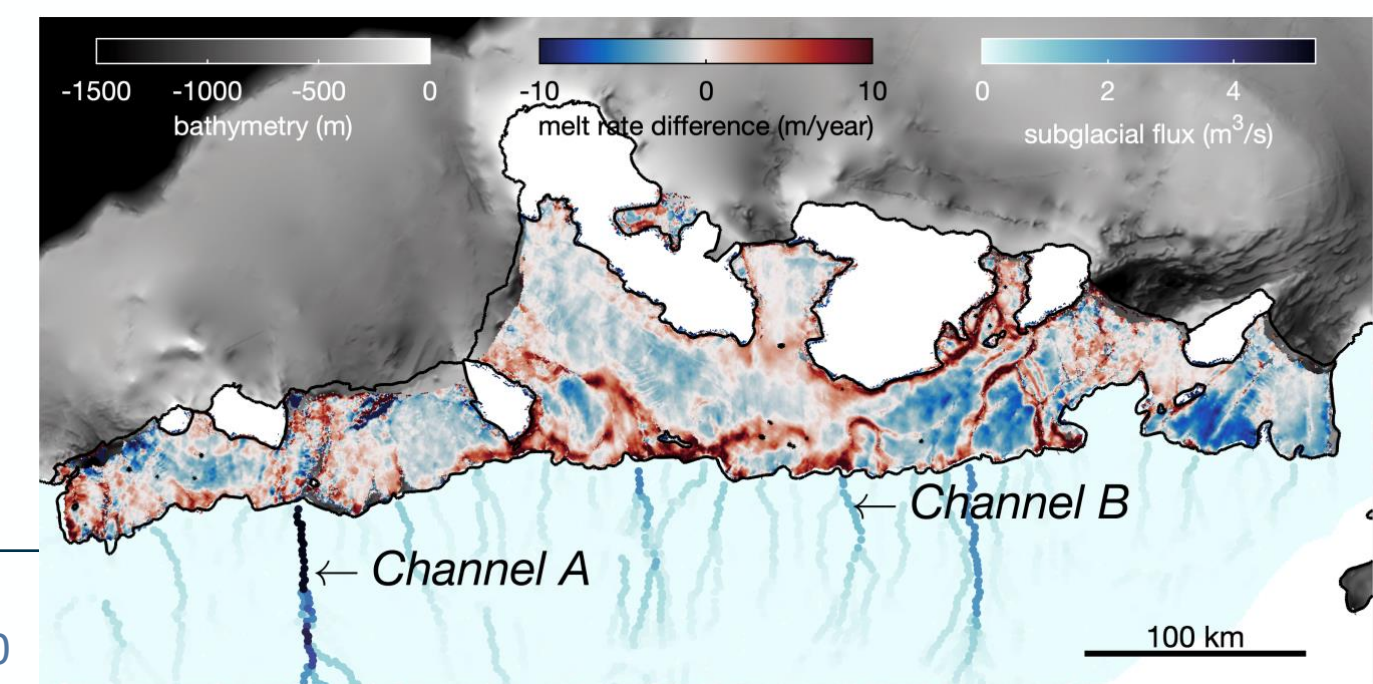
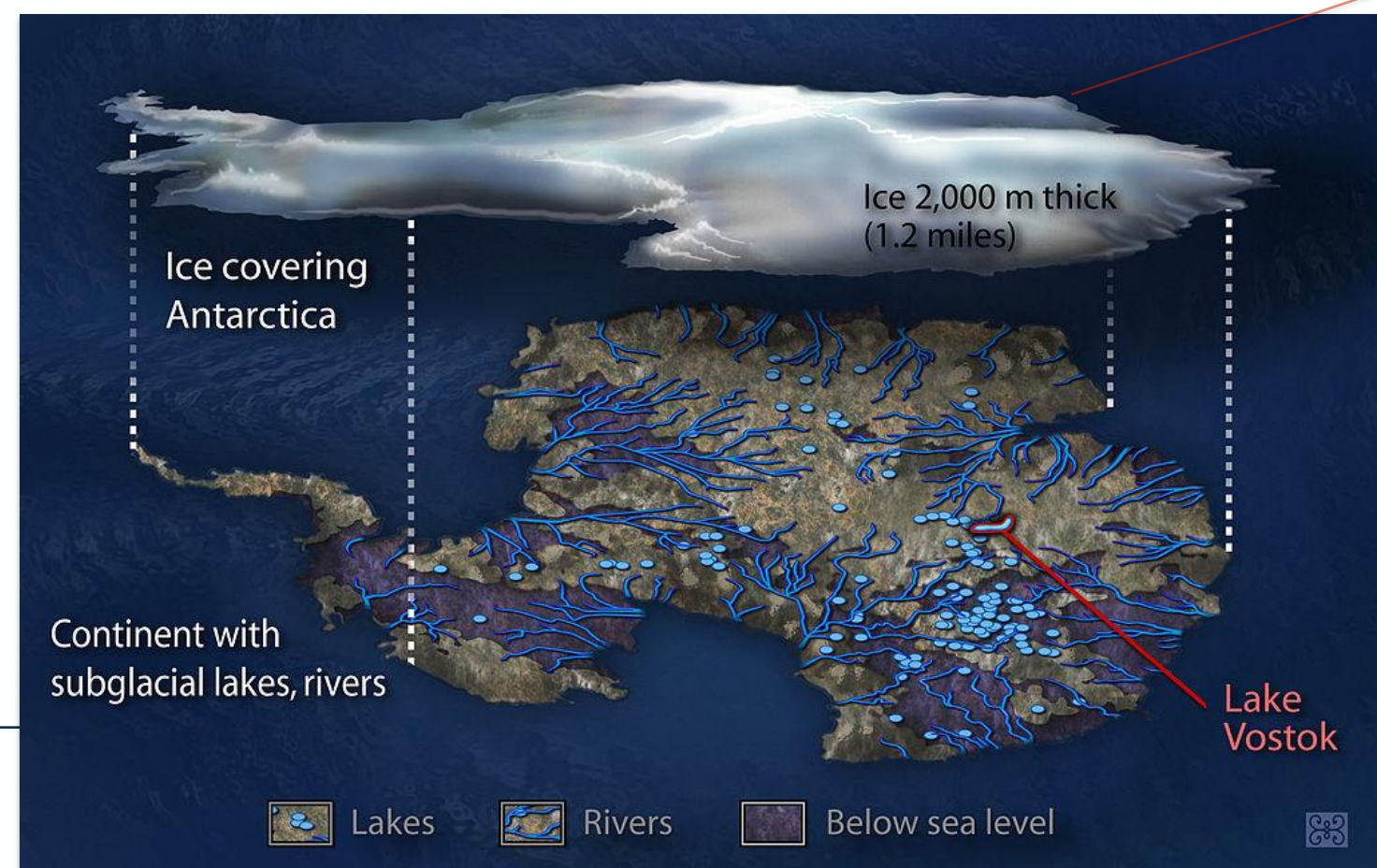
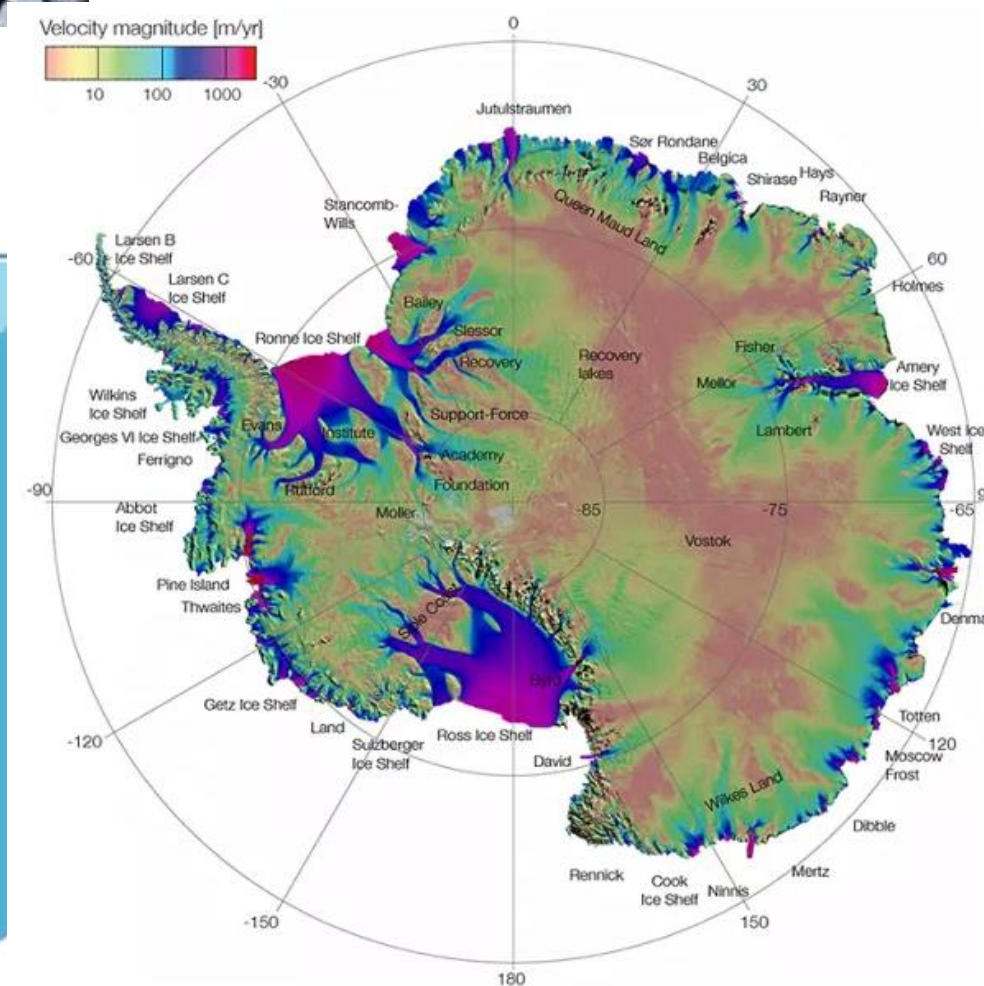




Antarctic hydrology



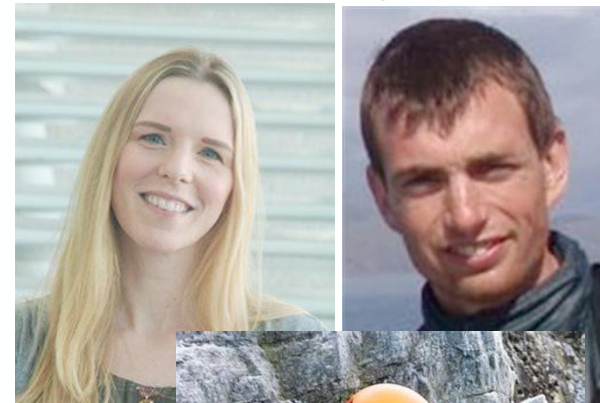
Modified from Nowicki and Seroussi, 2018



Wei et al., 2020

The People

Lancaster University



Shepherd Space Ltd



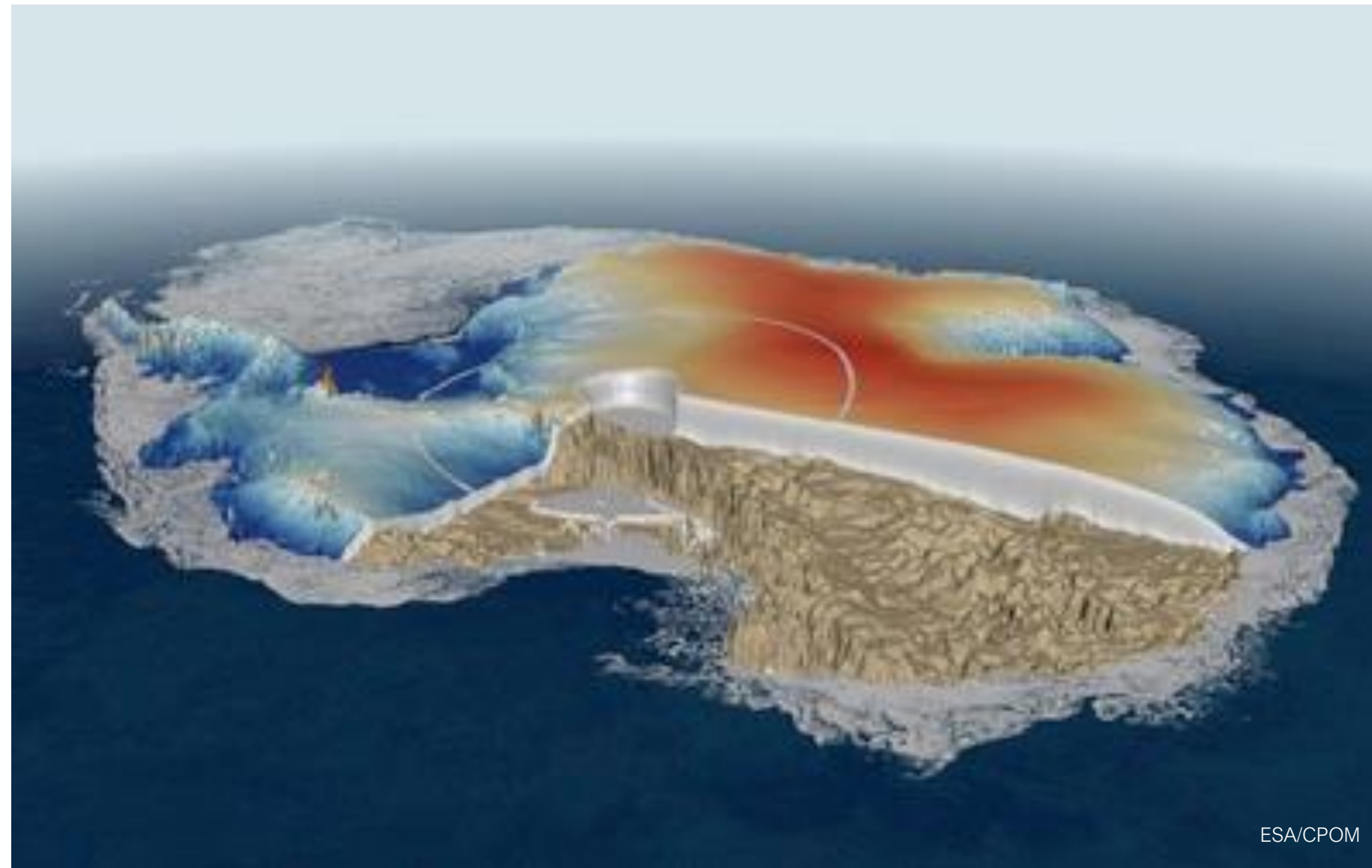
enveo



ifac Institute for Applied Physics "Hella Carrara" of the Italian National Research Council



UNIVERSITY OF LEEDS



earthwave

British Antarctic Survey NATURAL ENVIRONMENT RESEARCH COUNCIL



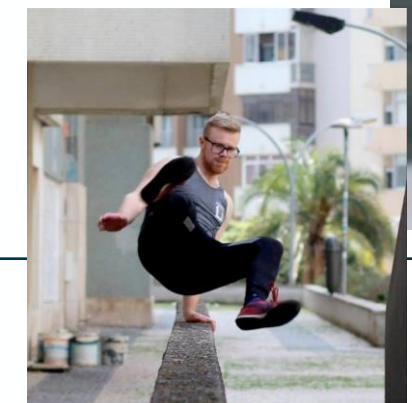
DTU Technical University of Denmark



ETH zürich

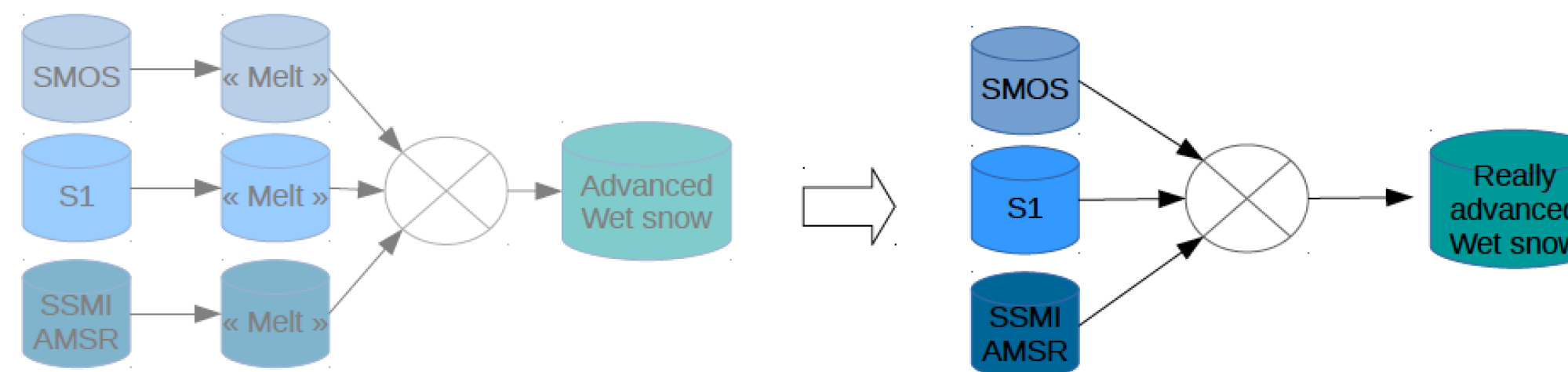
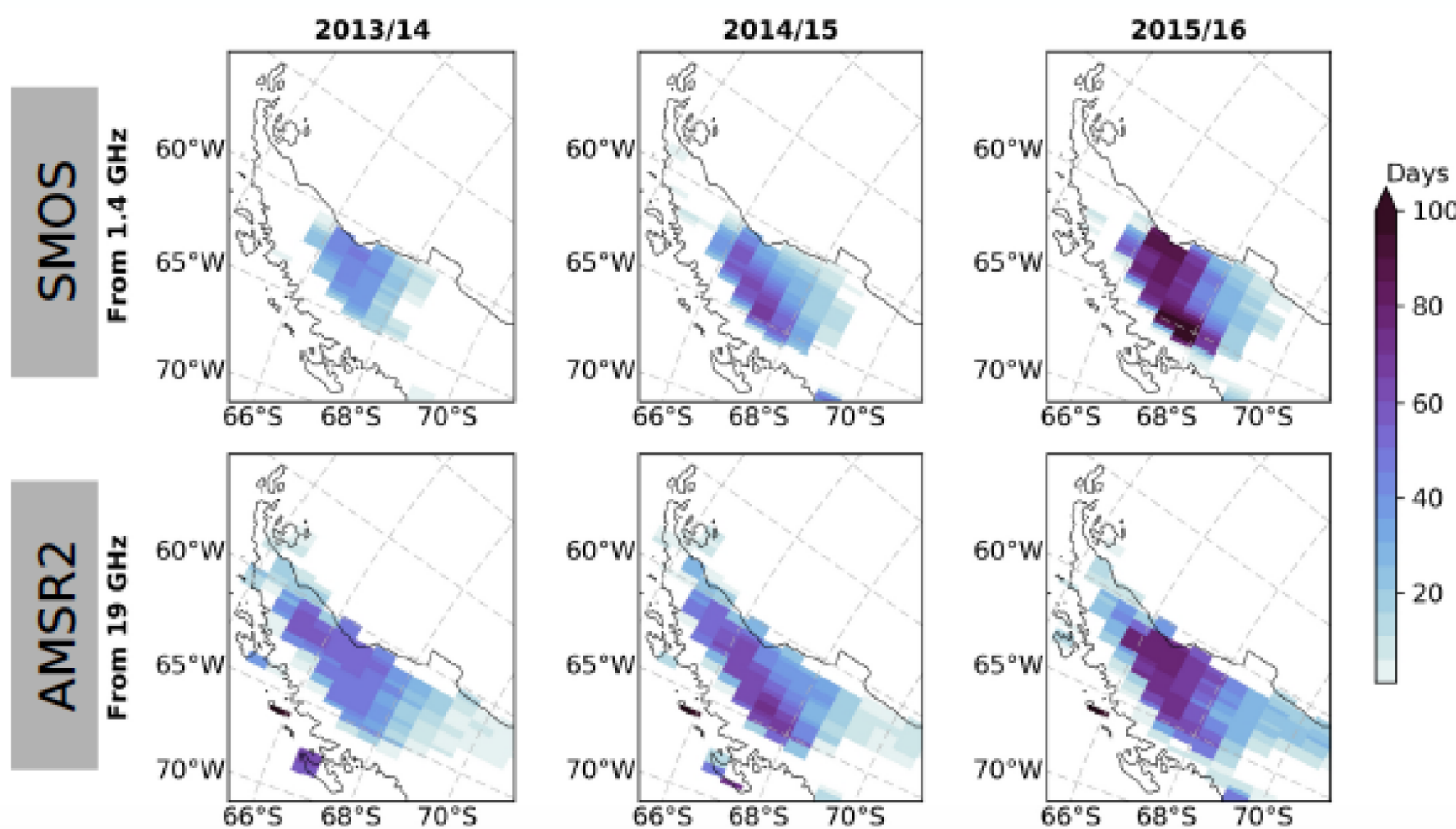
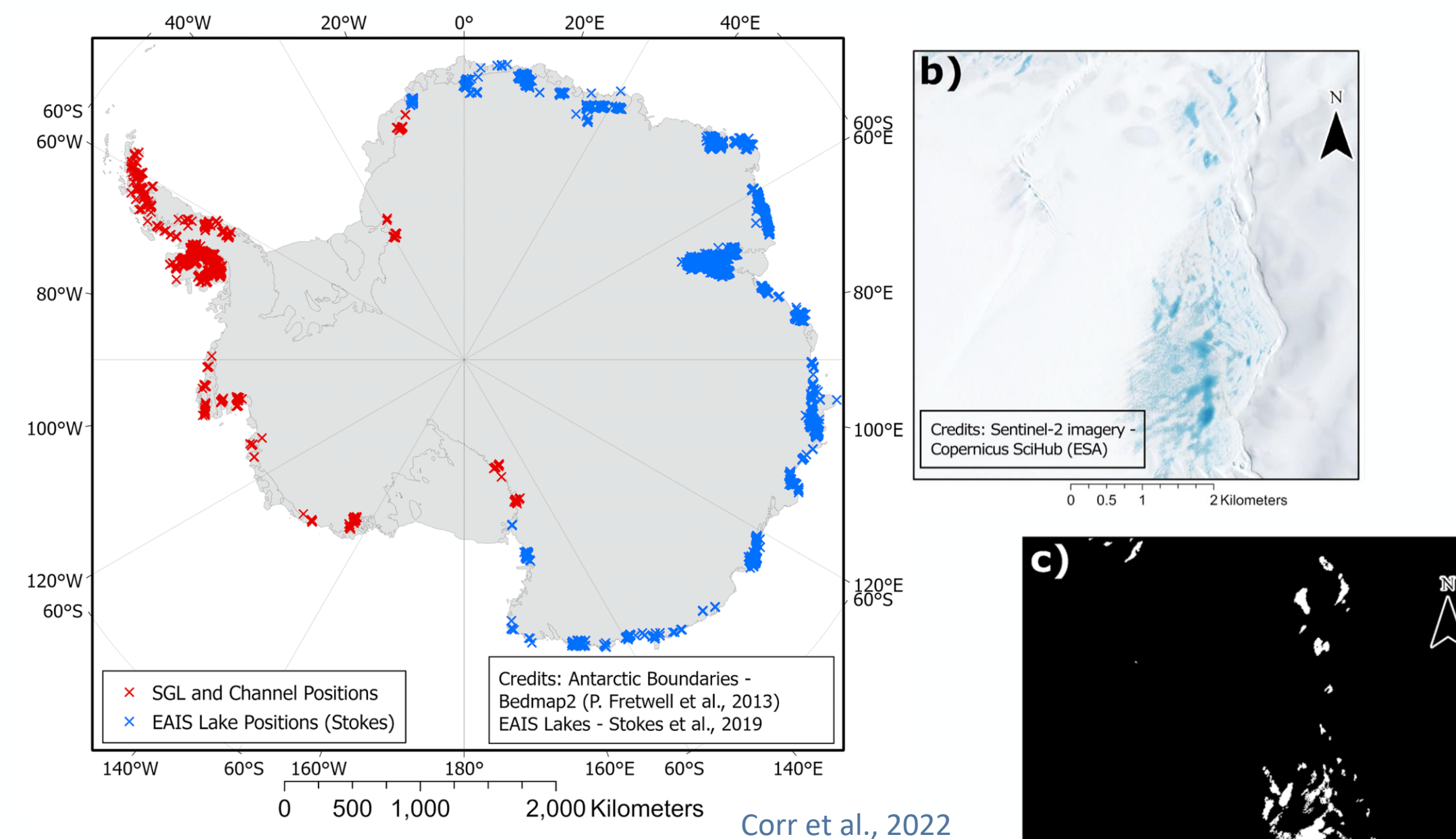
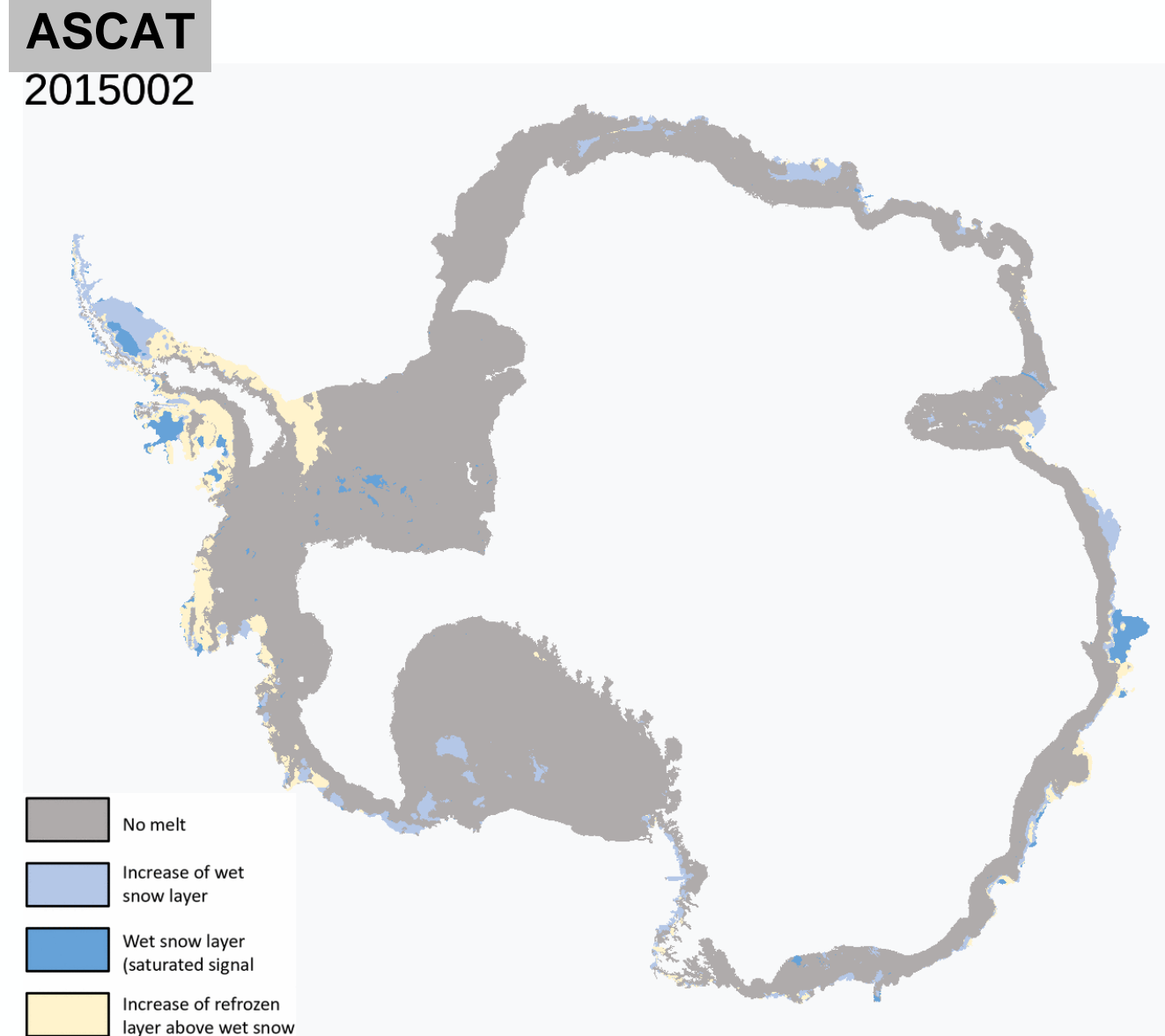
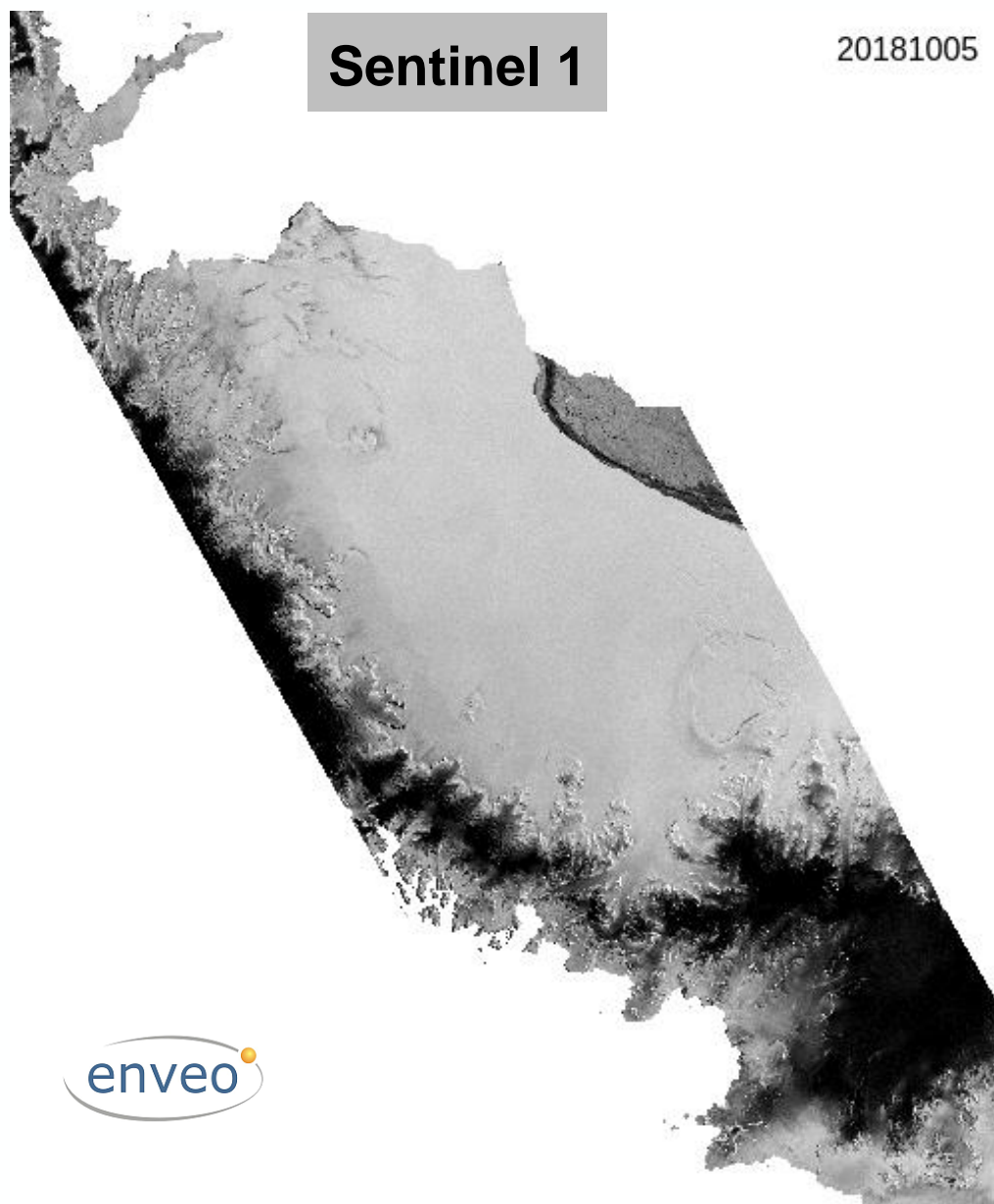


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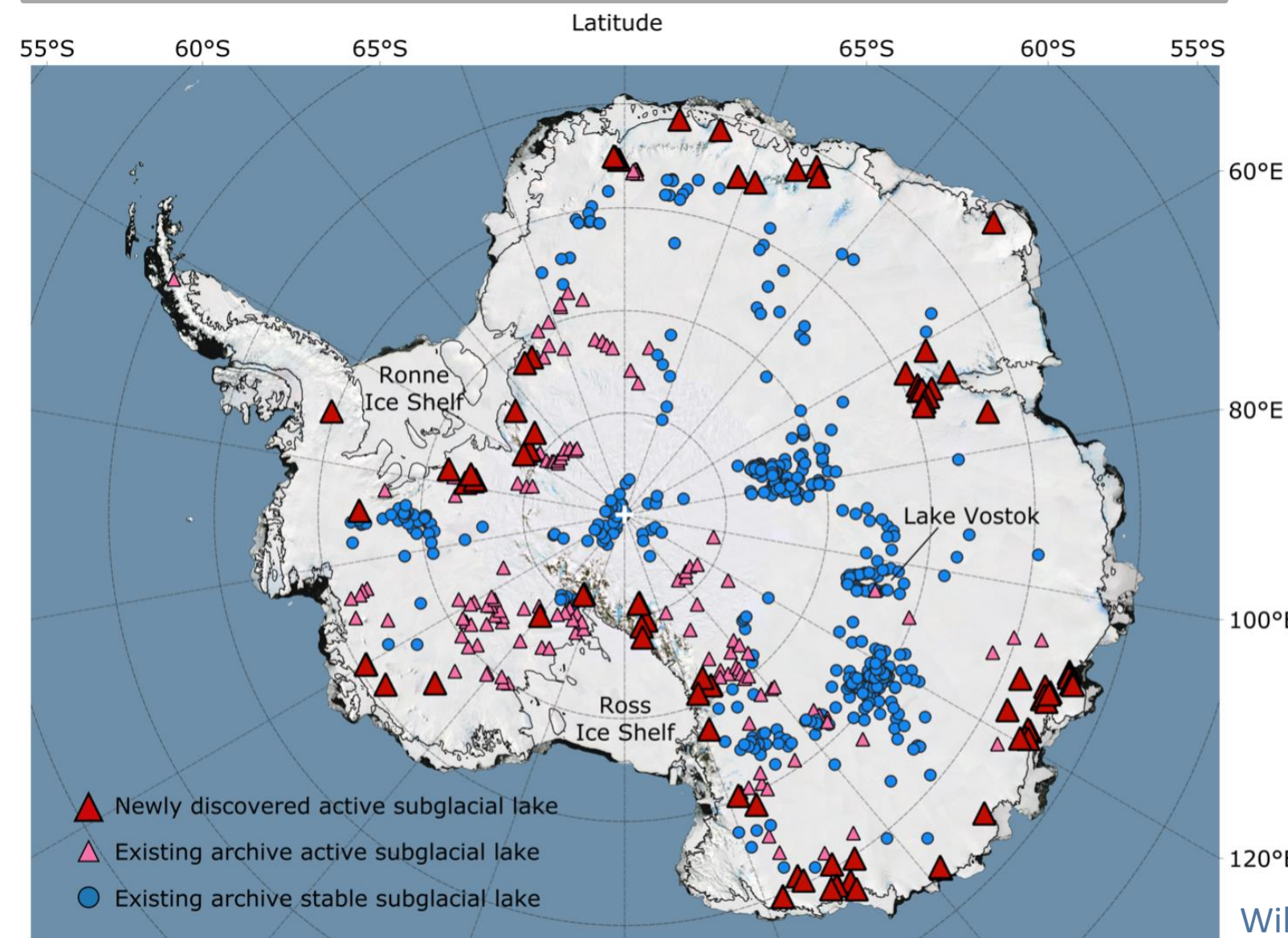
Surface melt

Supra-glacial lakes and streams



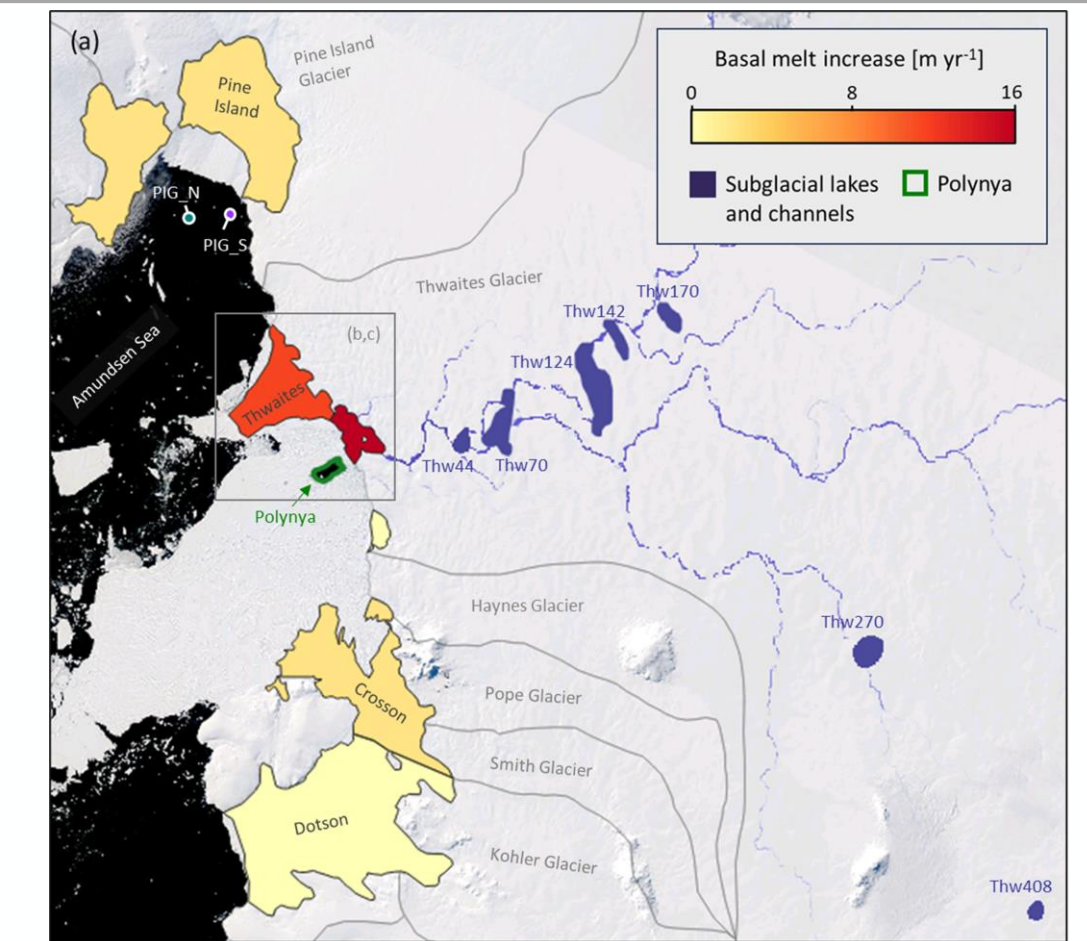
Leduc-Leballeur et al., 2020

Sub-glacial lake inventory

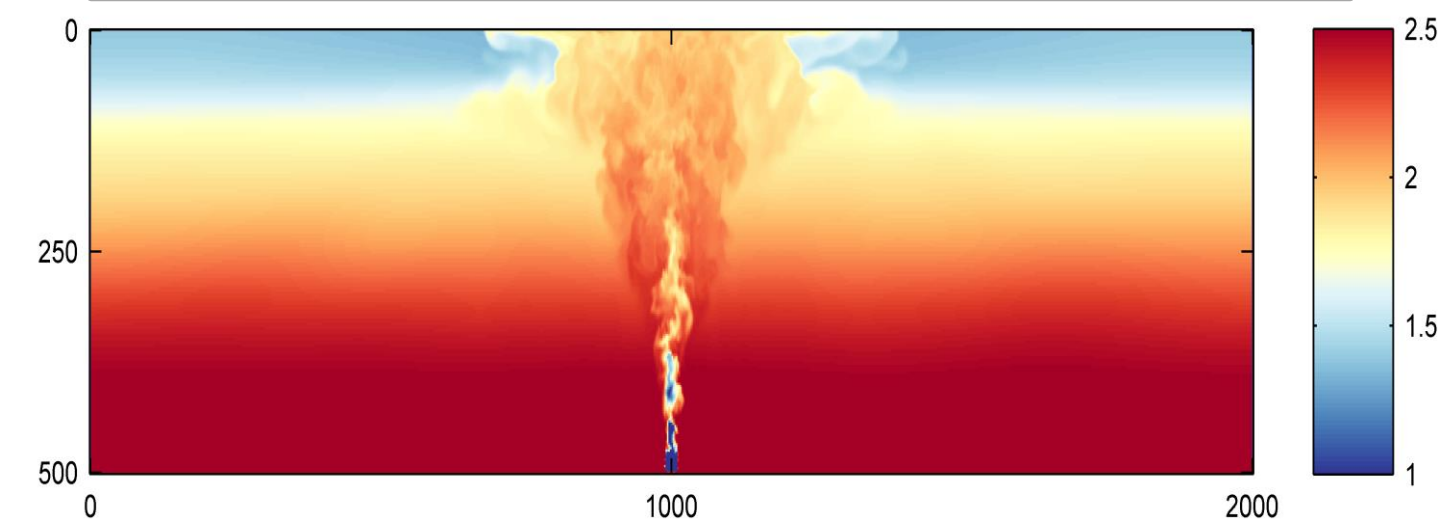


Wilson et al., in prep.

Impact on ice-ocean interaction

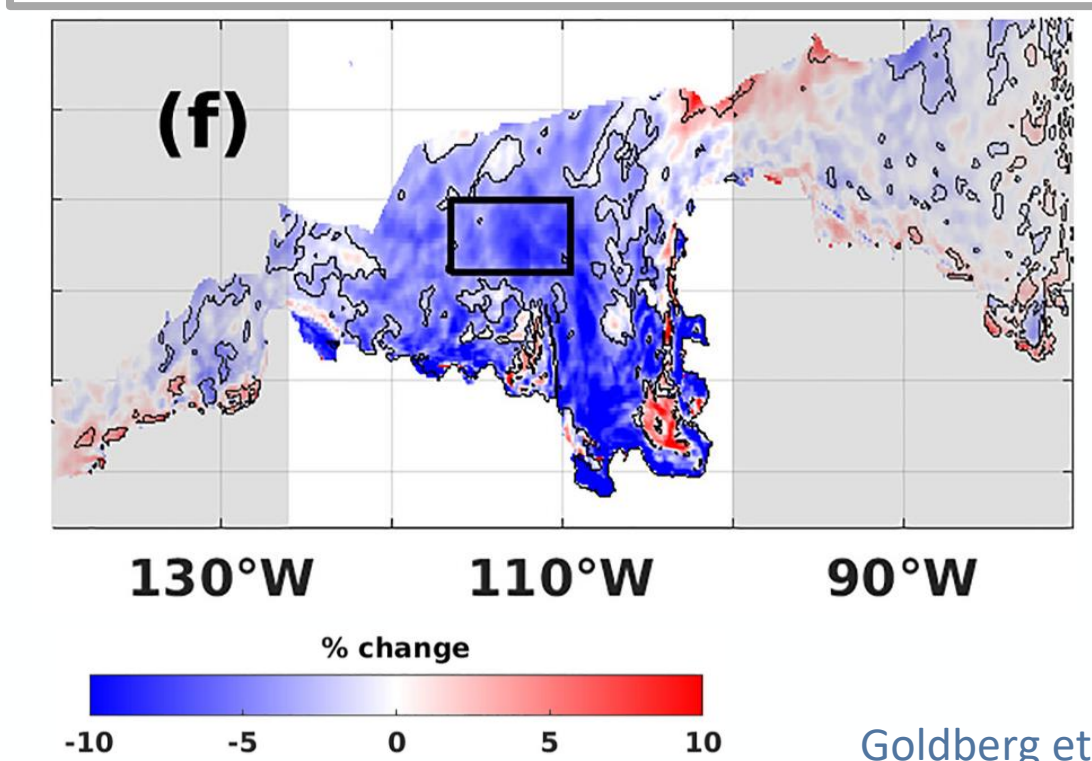


Melt-water plume from subglacial outflow



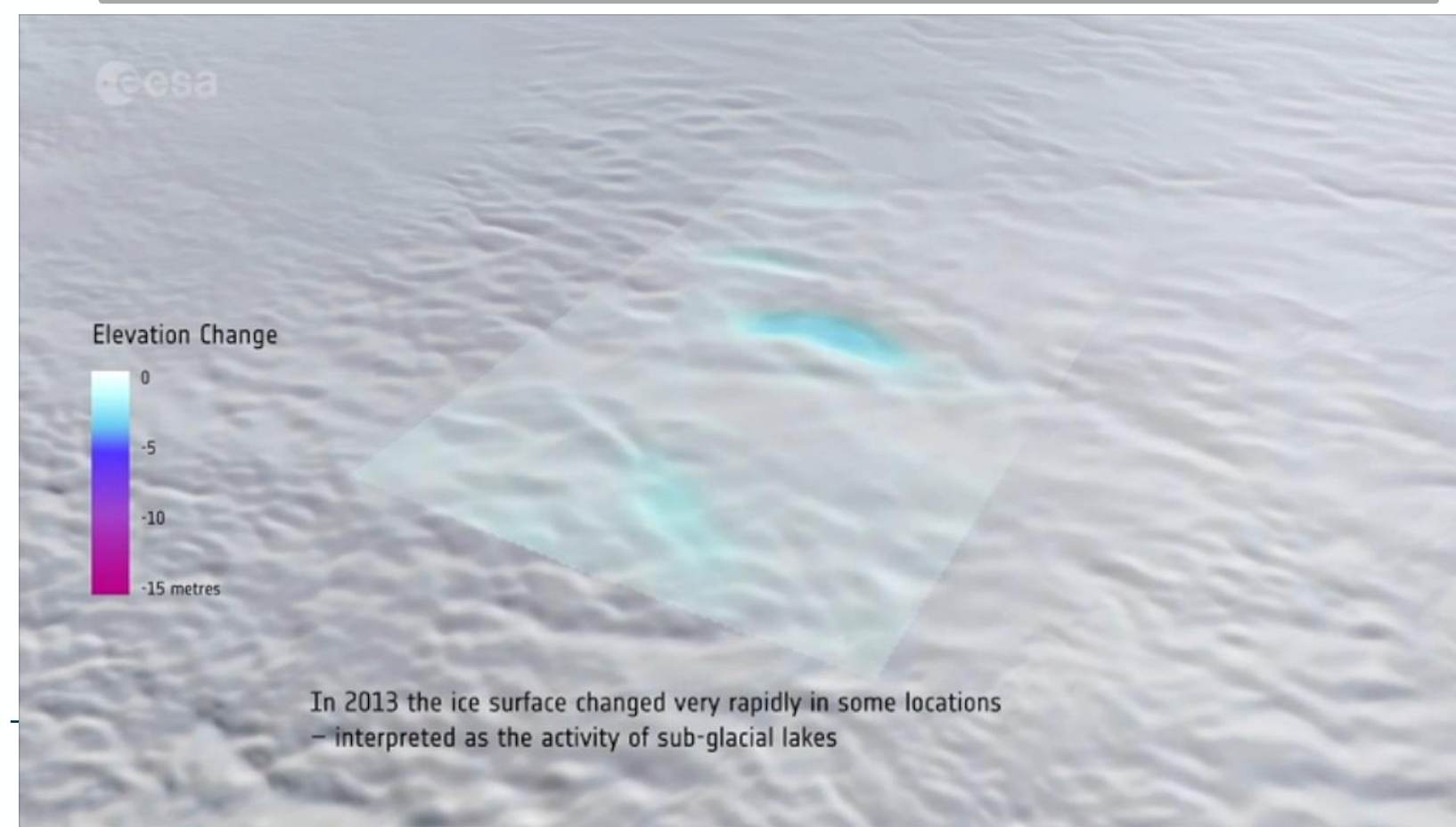
Slater et al., 2015

Impact on sea-ice volume



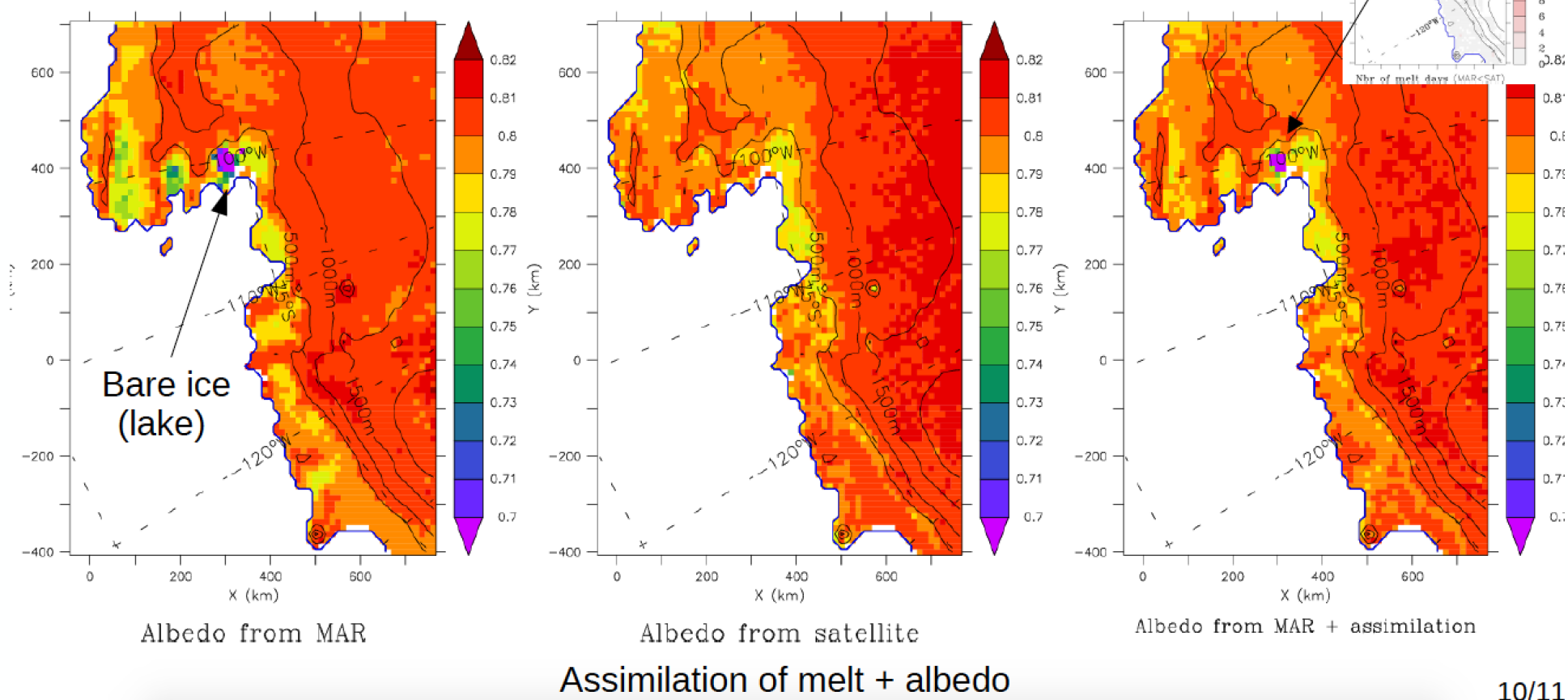
Goldberg et al., 2024

Lake discharge under Thwaites glacier



Malczyk et al., 2020

Assimilation - EO-derived Melt and Albedo into the regional climate model MAR



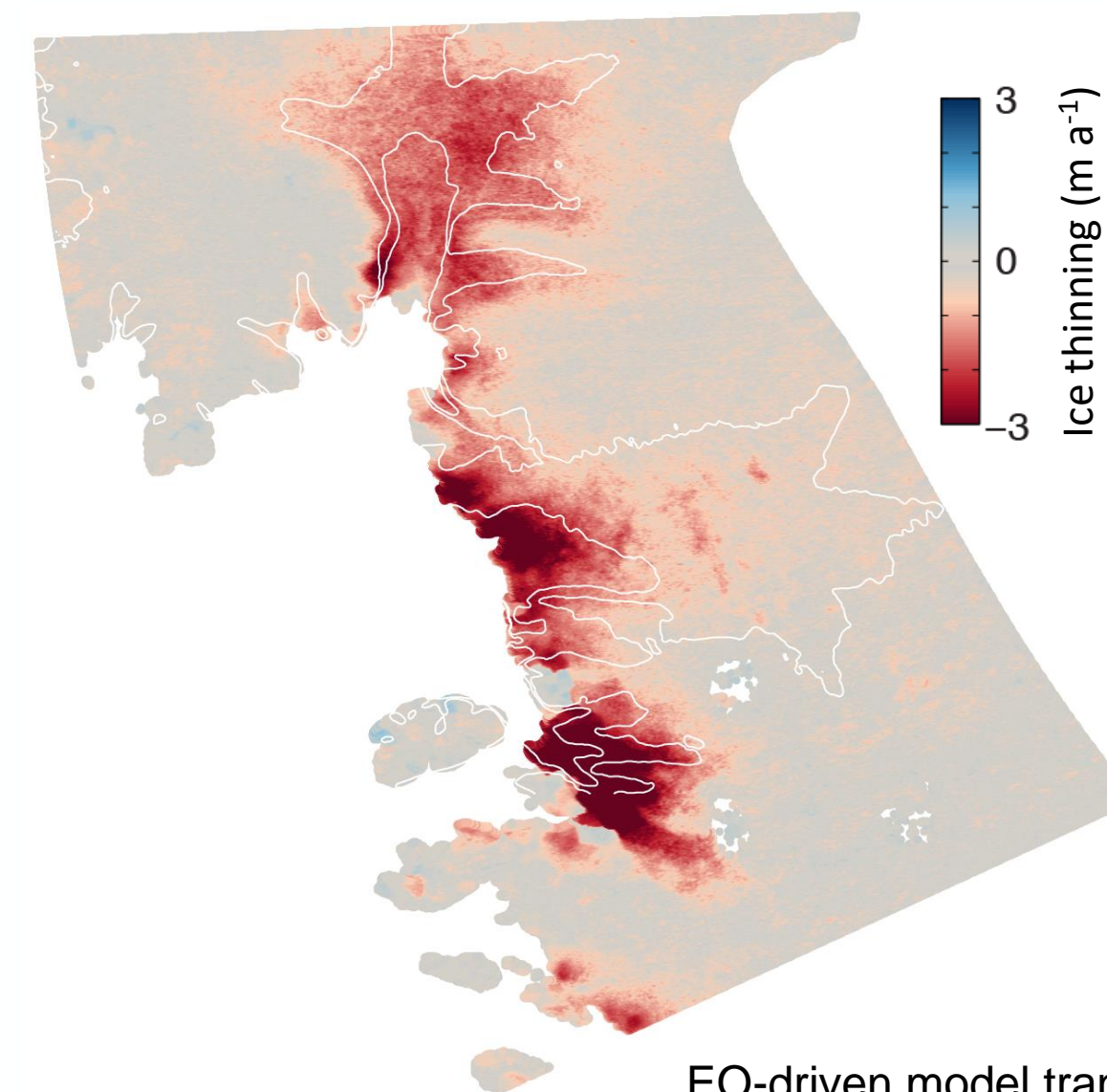
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Kittel et al., 2022

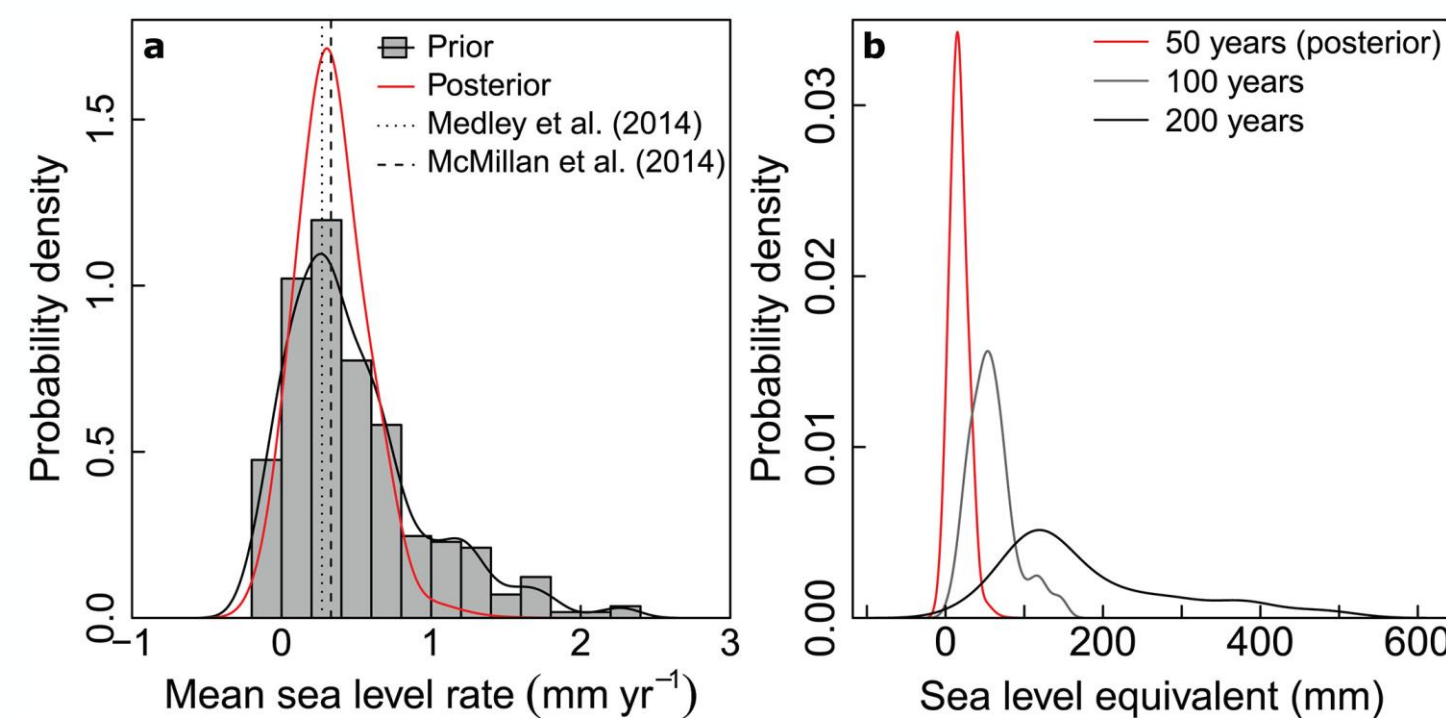
Interest of assimilation

- Evaluating uncertainties over current climate knowing that a model underestimating current melt by 40% should underestimate future melt increase by 40% at least (Fettweis et al., 2020).
- Focusing on another area (eg: Peninsula) more difficult to simulate (high resolution is needed) and where there is more melt.

EO-model synergy in projection of ice sheet sea level projections

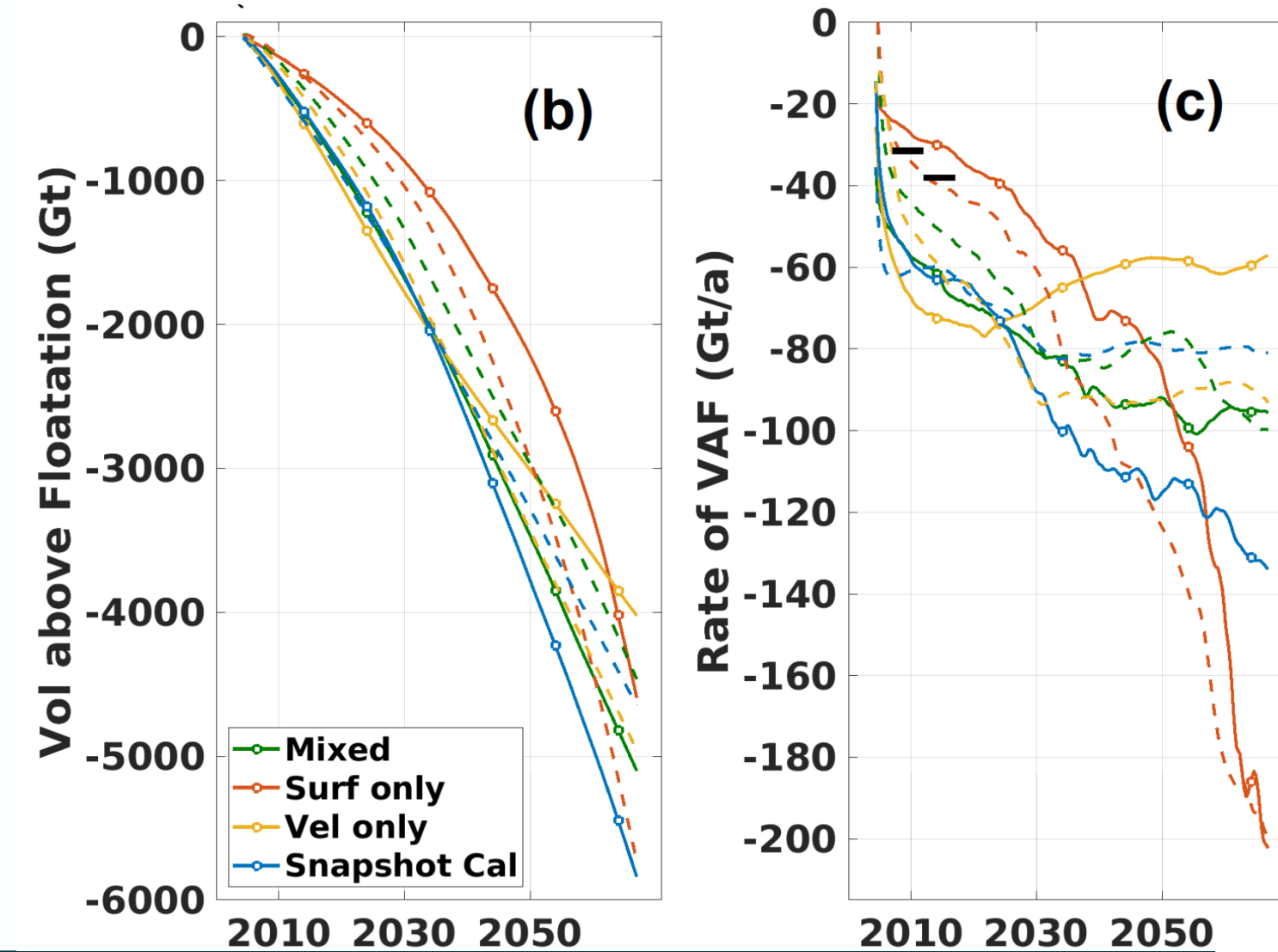


EO-driven model "rating"



Nias et al., 2019

EO-driven model transient initialization



Goldberg et al., in prep.



Digital Twin Earth - Antarctica

