

# Fold and strain analysis of the large NE Greenland Ice Stream

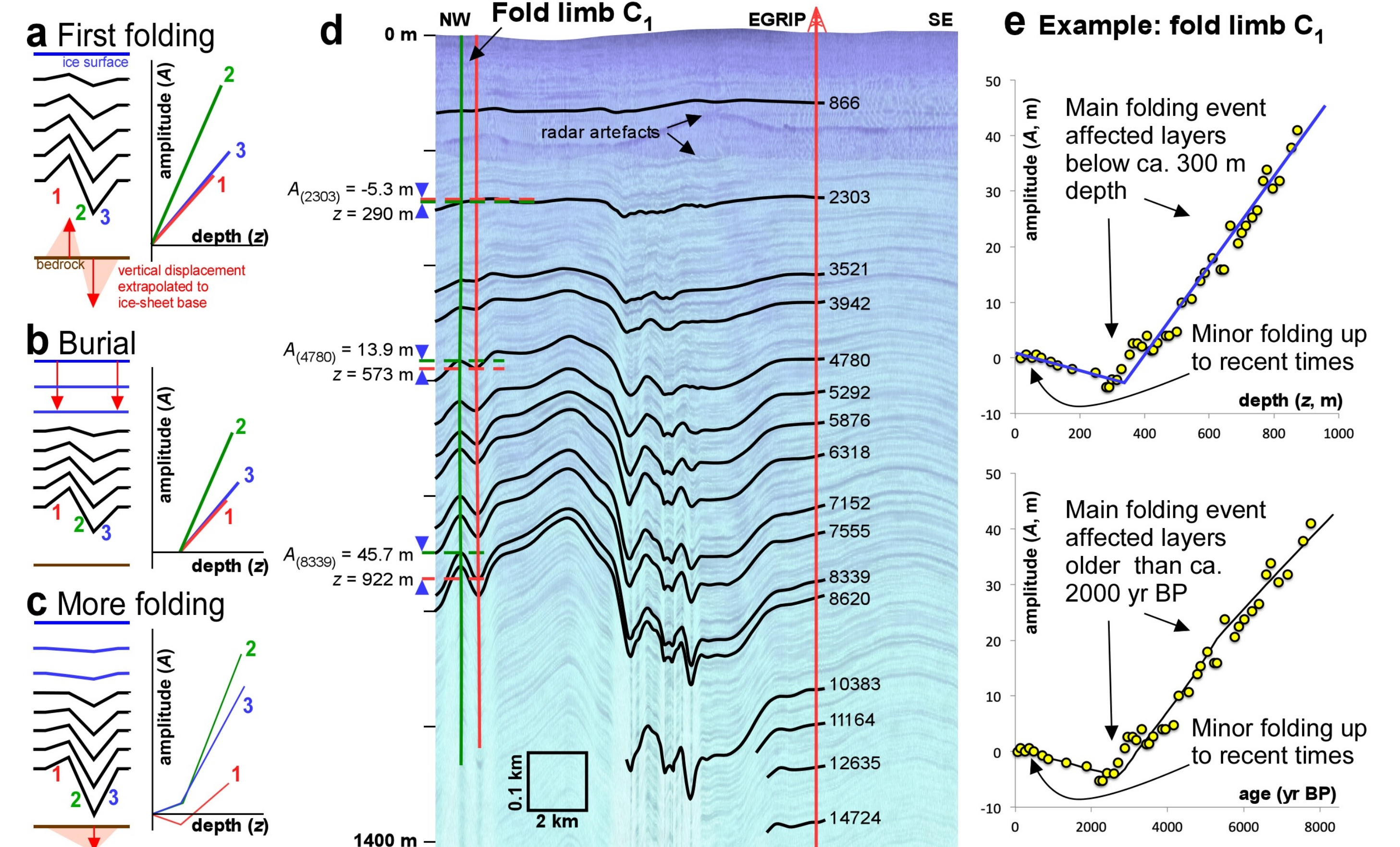
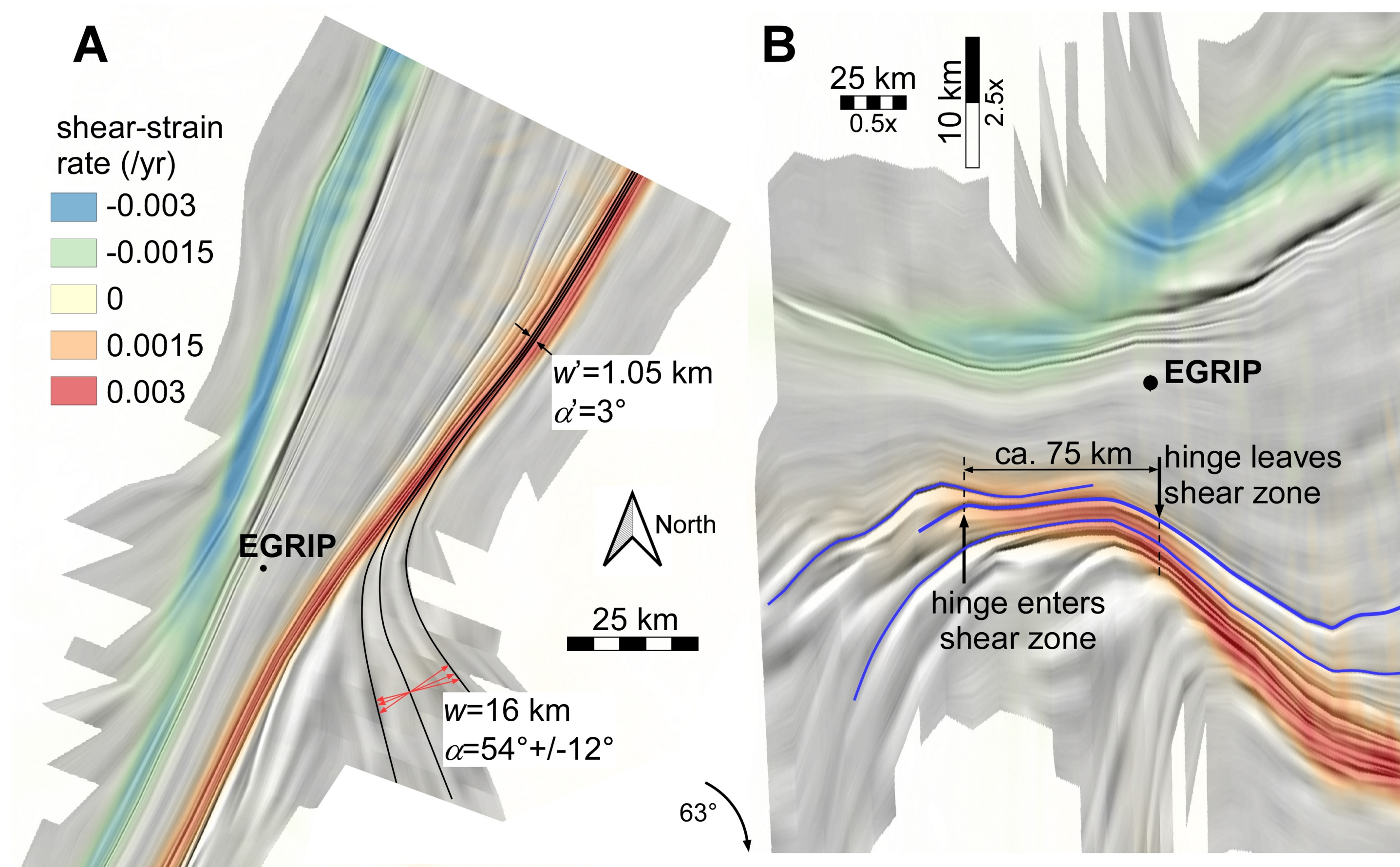
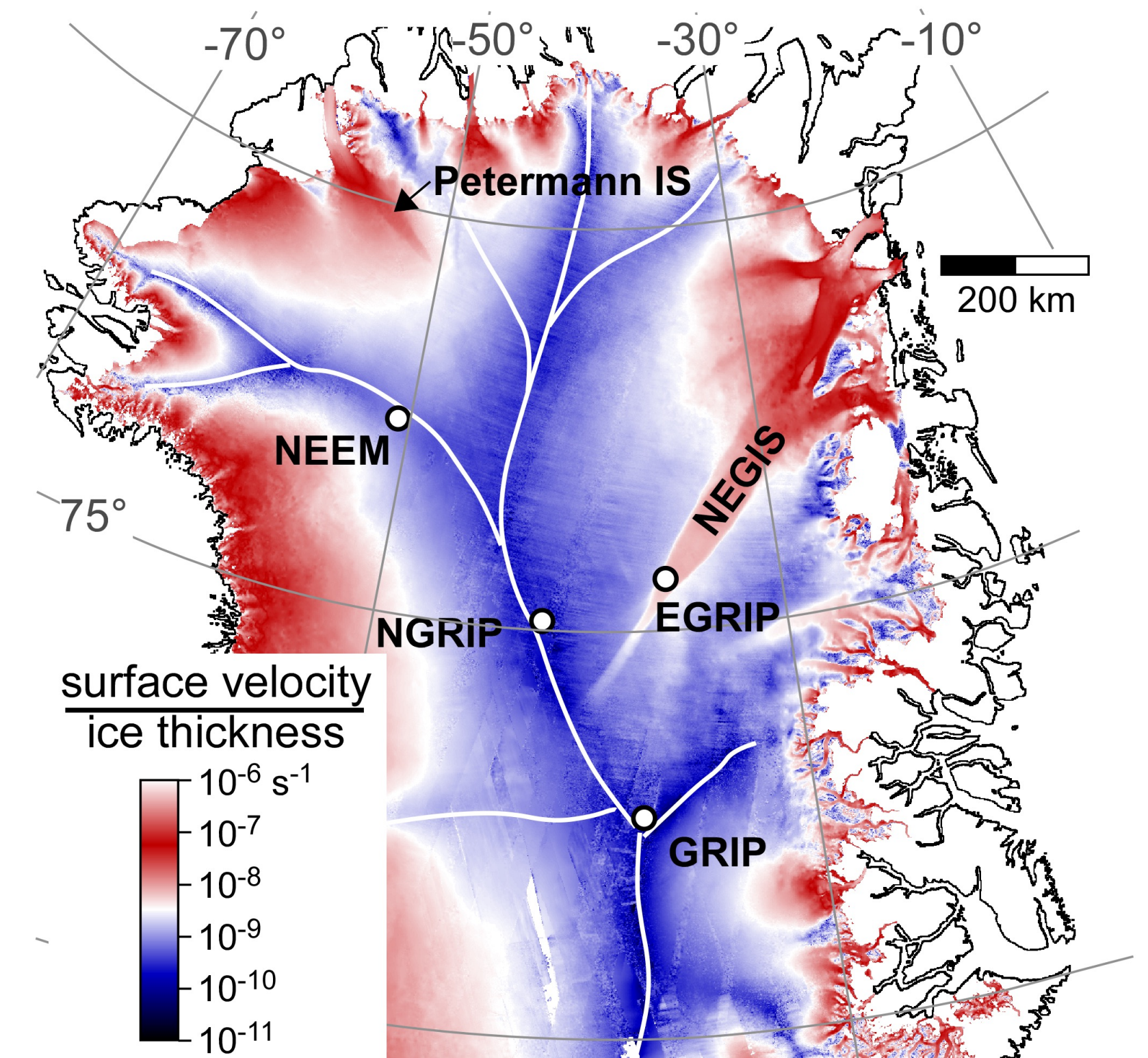
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The >500 km long and tens of kilometres wide North-East Greenland Ice Stream (NEGIS) is the largest ice stream in the Greenland Ice Sheet (GIS). Satellite data show that flow inside the ice stream is significantly faster than adjacent to it and that NEGIS is bound by shear boundaries that are a few kilometres wide. The ice stream drains a large area of the GIS. As the genesis of NEGIS is unclear, it remains uncertain how it may react to global climate change.



## 2. STRAIN ANALYSIS

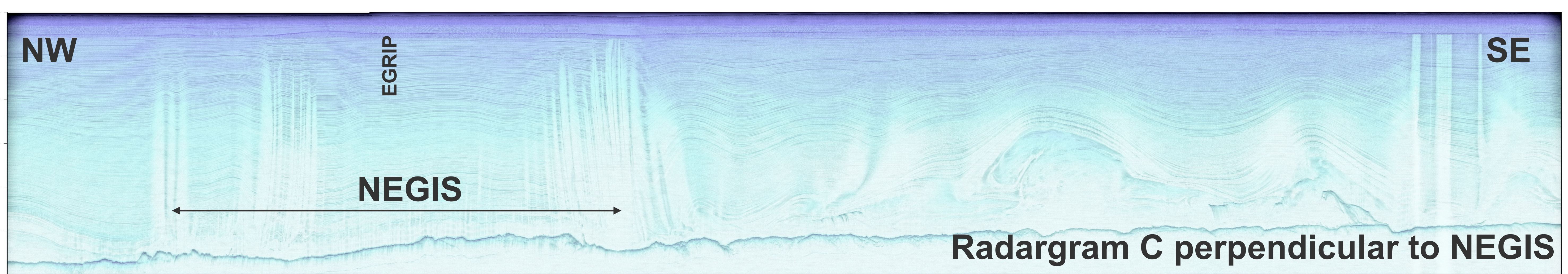
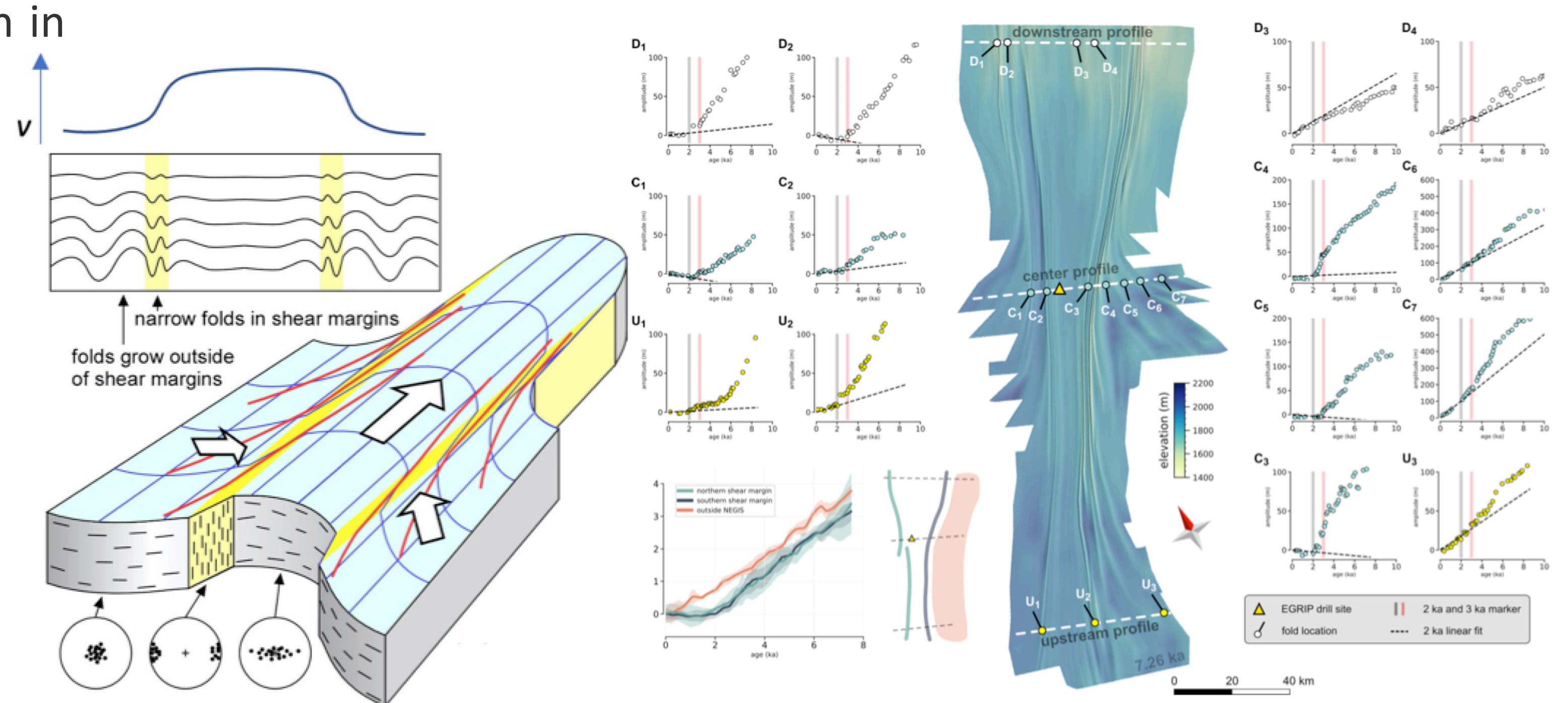
Based on a dense grid of airborne radar surveys (radargrams) we could reveal the 3-dimensional internal geometry of the internal stratigraphy. This shows that NEGIS was first a wide zone with convergent flow that resulted in folds on the 10 km scale and with convergent fold hinges. In a second stage these folds were passively sheared and displaced in the margins of the present-day NEGIS. Classical strain analysis shows that at the level of the EGRIP deep ice-drilling site in upstream NEGIS the displacement by the shear margins is ca 75 km at a finite shear strain in the order of 15-20.

## 4. CONCLUSIONS

Our results contradict the common assumption that NEGIS in its current form has been stable throughout the Holocene, and show that NEGIS-type ice streams can appear suddenly and have a large impact on ice sheet discharge and geometry on relatively short time scales. This is a major concern for realistic sea level projections, as global warming changes the boundary conditions of our ice sheets, which may trigger the sudden appearance of new ice streams in the future in Greenland as well as in Antarctica.

## 3. DATING FOLD GROWTH

With a novel method for dating folding events in ice stratigraphy, we show that NEGIS as we know it now is surprisingly young, as the shear margins in the survey area were only fully developed by ca. 2 ka BP. We propose that the localisation of shearing leading to plug flow with sharp shear margins is due to the strong anisotropy of the ice and the rotation of the lattice-preferred orientation during shearing.



Contents of this poster are part of the manuscript that is in revision: **Folded ice reveals: the North East Greenland Ice Stream was formed only 2000 years ago**, by Jansen, D. Steven Franke S., Bauer, C.C., Binder, T., Dahl-Jensen, D., de Riese, T., Eichler, J., Eisen, O., Llorens, M.-G., Johanna Kerch, J., Miller, H., Neckel, N., Paden, J., Sachau, T., Stoll, N., Weikusat, I., Wilhelms, F., Zhang, Y. & Bons, P.D.

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