Age-depth distribution in western DML, Antarctica

from 30 years of AWI radar surveys

Steven Franke, Daniel Steinhage, Veit Helm, Alexandra M. Zuhr, Julien A. Bodart, Olaf Eisen, and Paul D. Bons

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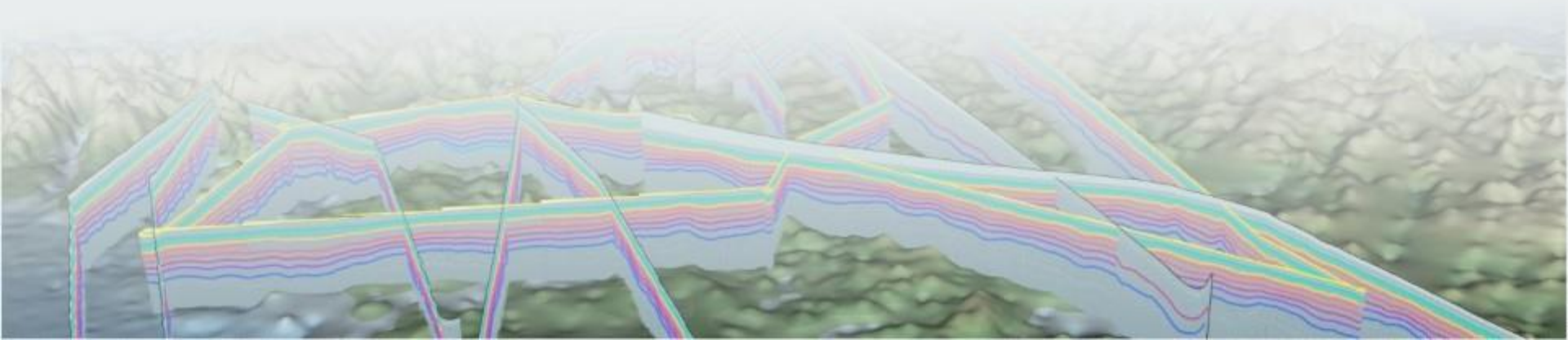
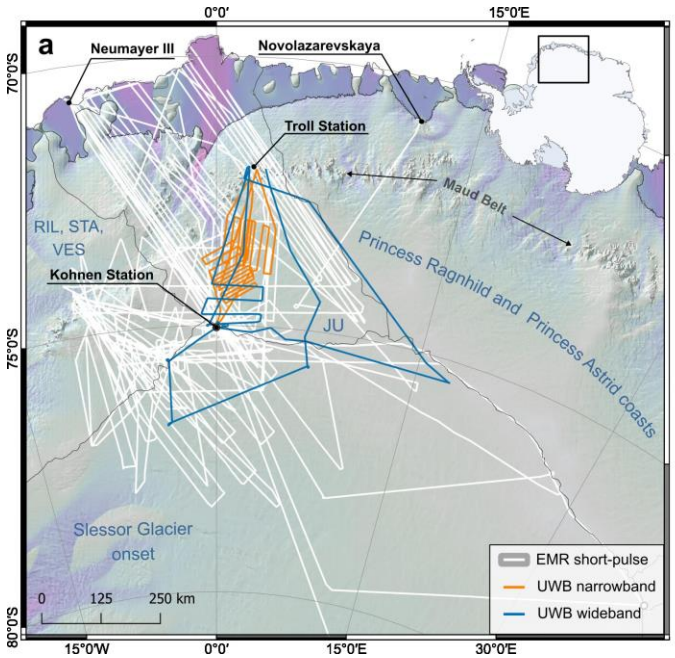
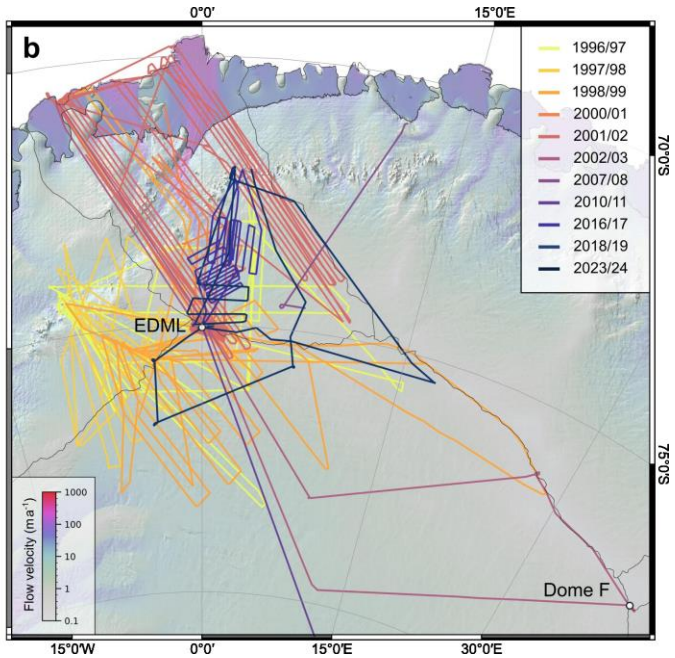


Overview

Radar system	Developper	Frequency	Transmit signal	Range resolution	Seasons
EMR	TU HH [a]	150 MHz	60 ns burst	~5 m	1996/97, 1997/98, 1998/99 2000/01, 2001/02, 2002/03 2007/08, 2010/11, 2016/17
AWI MCoRDS 5	CReSIS [b]	180 – 210 MHz (narrowband)	1, 3 & 10 μs chirp	4.3 m	2018/19
AWI MCoRDS 5	CReSIS [b]	150 – 520 MHz (wideband)	1, 3 & 10 μs chirp	0.35 m	2023/24

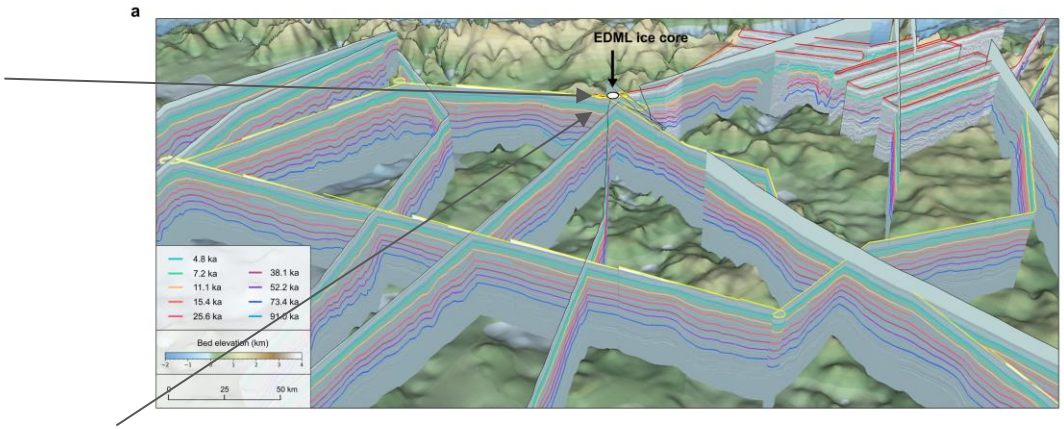
[a] Technical University Hamburg-Haburg
[b] Center for Remote Sensing and Integrated Systems

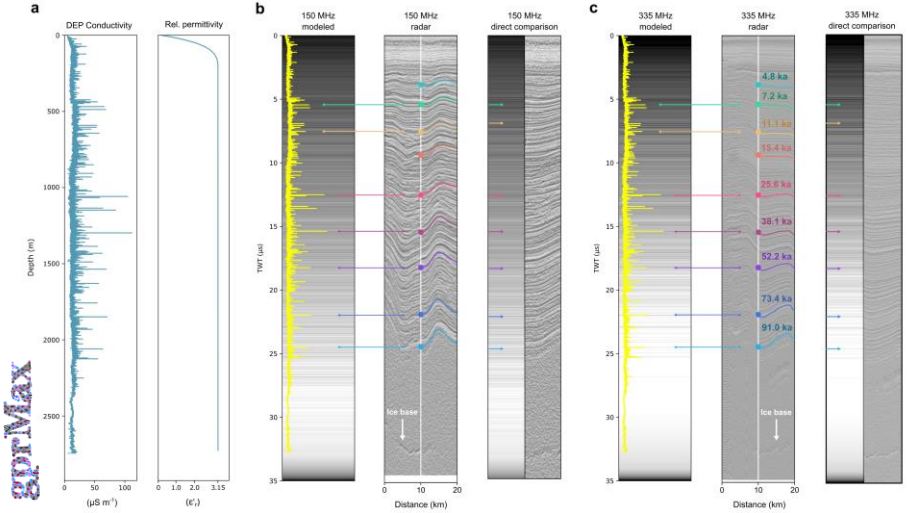


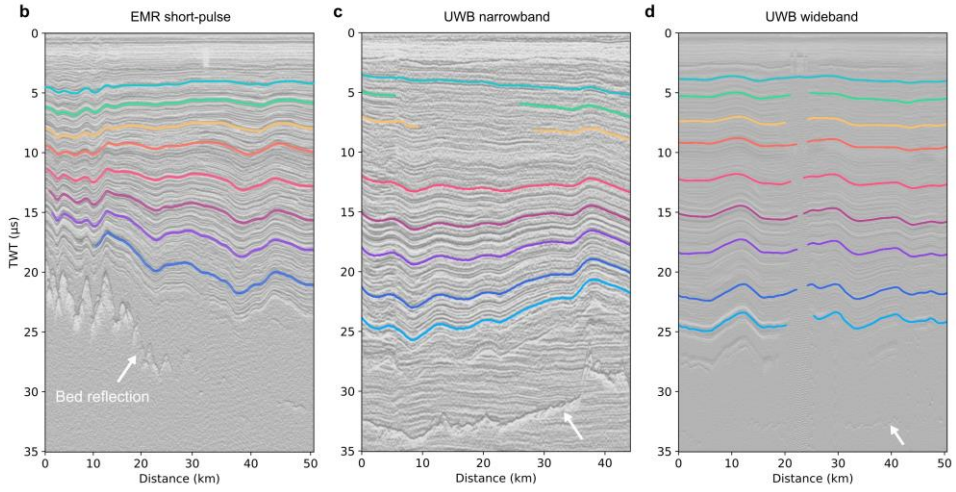


Tracing and dating IRHs

Mean TWT at EDML	Mean depth at EDML	Depth of conductivity peak	TWT-to-depth-based age	Conductivity peak-based age
3 989 ns	349 m		***4.8 ± 0.62 ka***	
5 503 ns	477 m	473.00 m	7.3 ± 0.76 ka	***7.2 ± 0.04 ka***
7 704 ns	662 m	650.25 m	11.2 ± 0.93 ka	***11.1 ± 0.03 ka***[a]
9 527 ns	816 m		***15.4 ± 1.19 ka***[b]	
12 677 ns	1081 m	1069.72 m	25.9 ± 2.08 ka	***25.6 ± 0.03 ka***[c]
15 661 ns	1332 m	1311.08 m	39.0 ± 2.69 ka	***38.1 ± 0.02 ka***[d]
18 470 ns	1569 m	1551.54 m	53.5 ± 4.22 ka	***52.2 ± 0.07 ka***[e]
22 217 ns	1884 m	1867.55 m	74.7 ± 5.34 ka	***73.4 ± 0.88 ka***[f]
24 723 ns	2095 m	2080.22 m	92.4 ± 7.52 ka	***91.0 ± 1.10 ka***







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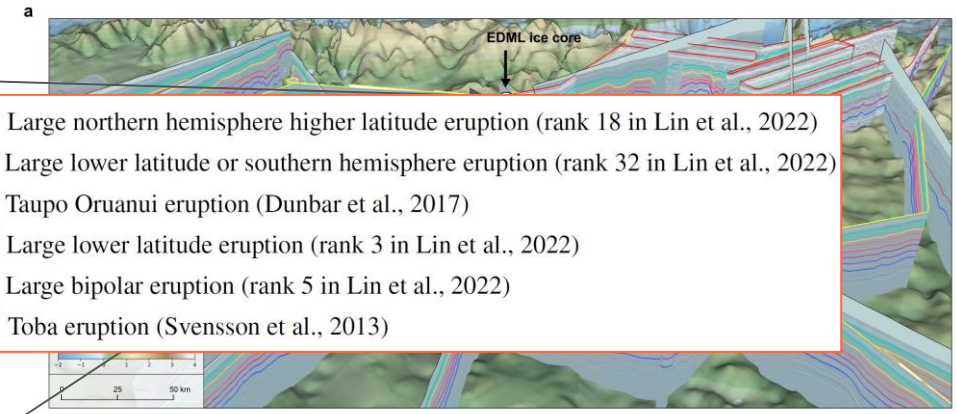
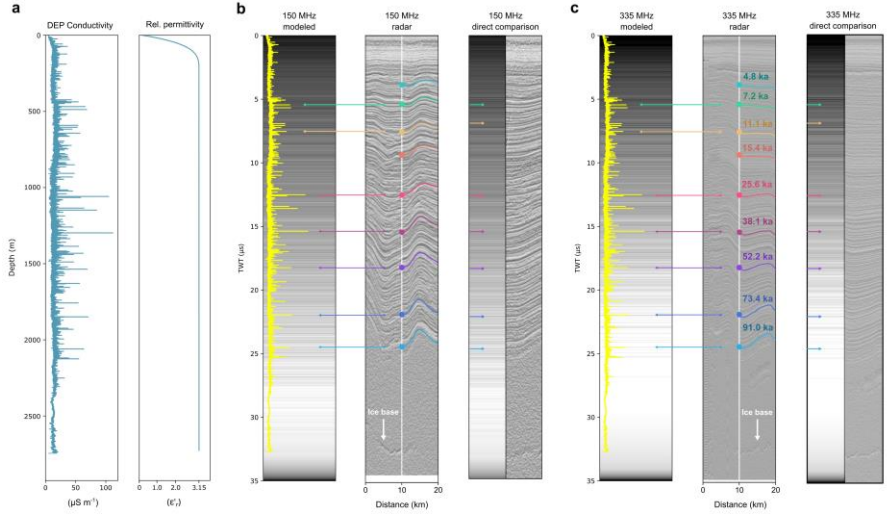
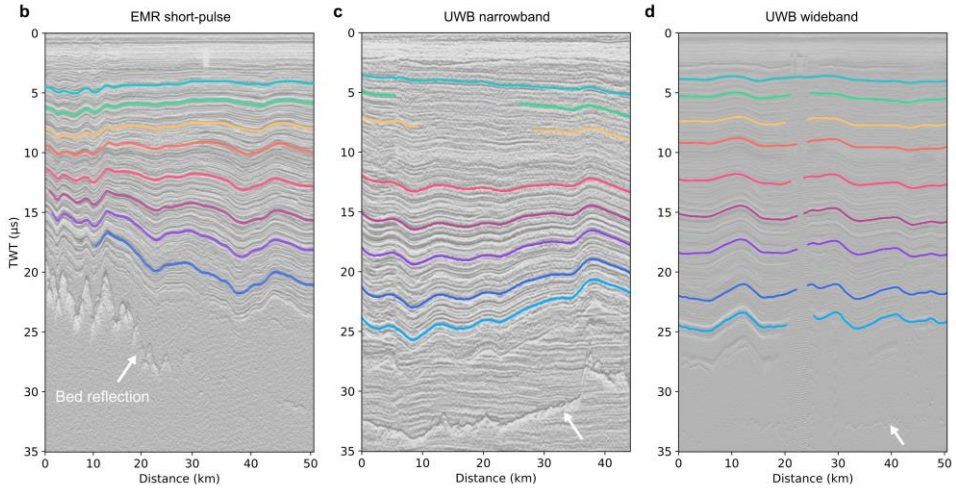


[a] Large northern hemisphere higher latitude eruption (rank 18 in Lin et al., 2022)
[b] Large lower latitude or southern hemisphere eruption (rank 32 in Lin et al., 2022)
[c] Taupo Oruanui eruption (Dunbar et al., 2017)
[d] Large lower latitude eruption (rank 3 in Lin et al., 2022)
[e] Large bipolar eruption (rank 5 in Lin et al., 2022)
[f] Toba eruption (Svensson et al., 2013)





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Muldoon (2018), Beem (2021), Bodart (2021, 2023)

Ashmore (2020), Bodart (2021, 2023)

Beem (2021)

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Wang (2023), Cavitte (2021), Winter (2019),

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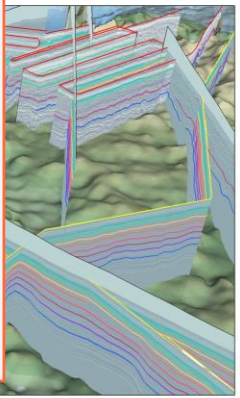

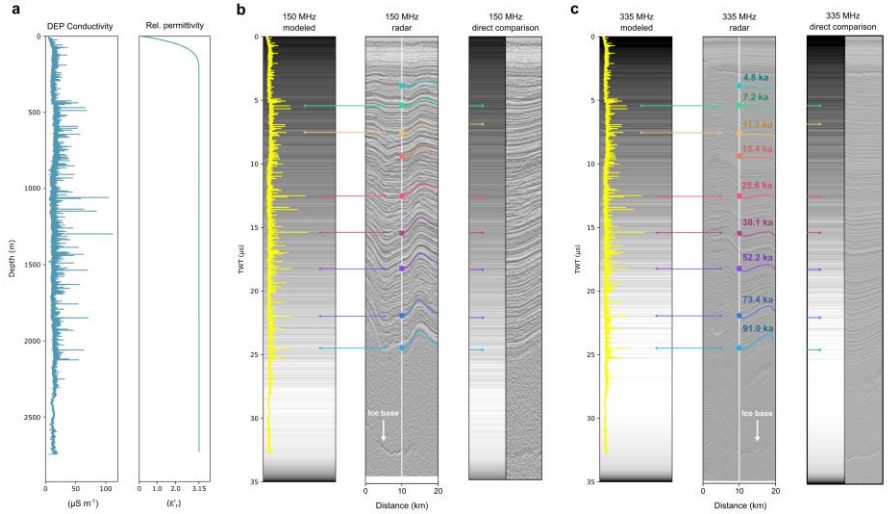

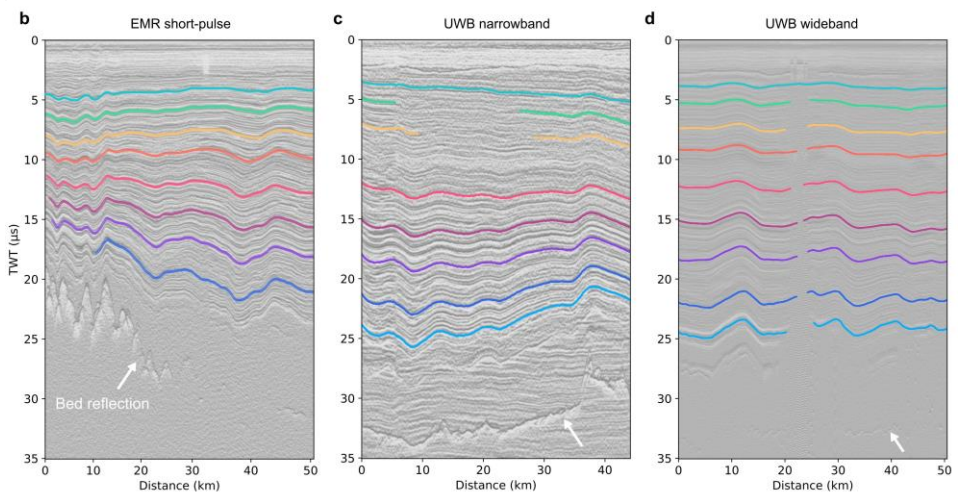

Spatial coverage

Age-depth distribution in western Dronning Maud Land, East Antarctica, from three decades of radar surveys

Steven Franke[1,2], Daniel Steinhage[2], Veit Helm[2], Alexandra M. Zuhr[1], Julien A. Bodart[3], Olaf Eisen[2,4], and Paul Bons[1]

[1]Department of Geosciences, Tübingen University, Tübingen, Germany
[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung , Bremerhaven, Germany
[3]Climate and Environmental Physics, Physics Institute and Oeschger Centre for Climate Change Research, University of Bern, Bern, Switzerland
[4]Department of Geosciences, University of Bremen, Bremen, Germany
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(submitted) The Cryosphere

Age stratigraphy in the East Antarctic Ice Sheet inferred from radio-echo sounding horizons

Anna Winter[1], Daniel Steinhage[1], Timothy T. Creyts[2], Thomas Kleiner[1], and Olaf Eisen[1,3]

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[3]Department of Geosciences, Universität Bremen, Bremen, Germany
Correspondence: Olaf Eisen (olaf.eisen@awi.de)

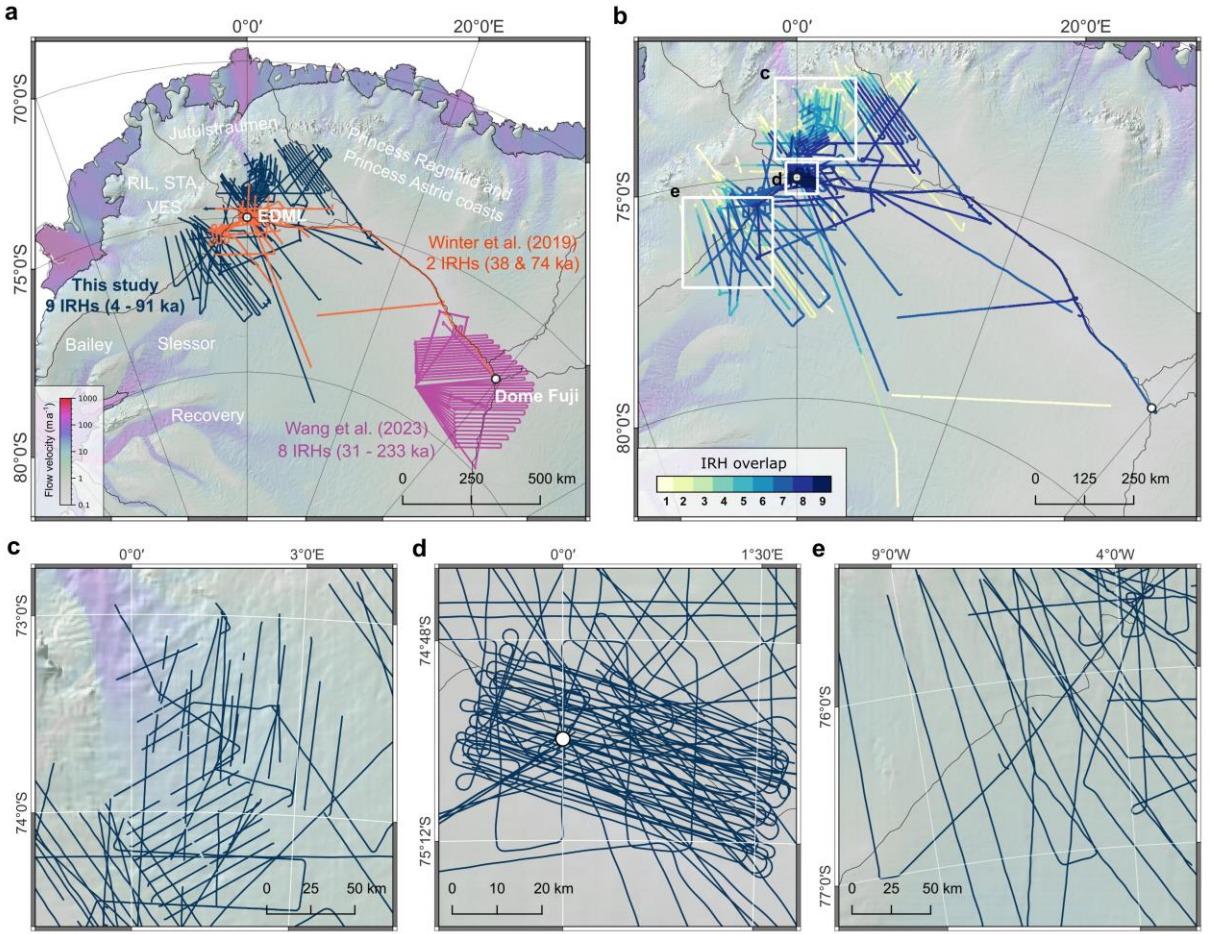
Open Access Earth System Science Data

Mapping age and basal conditions of ice in the Dome Fuji region, Antarctica, by combining radar internal layer stratigraphy and flow modeling

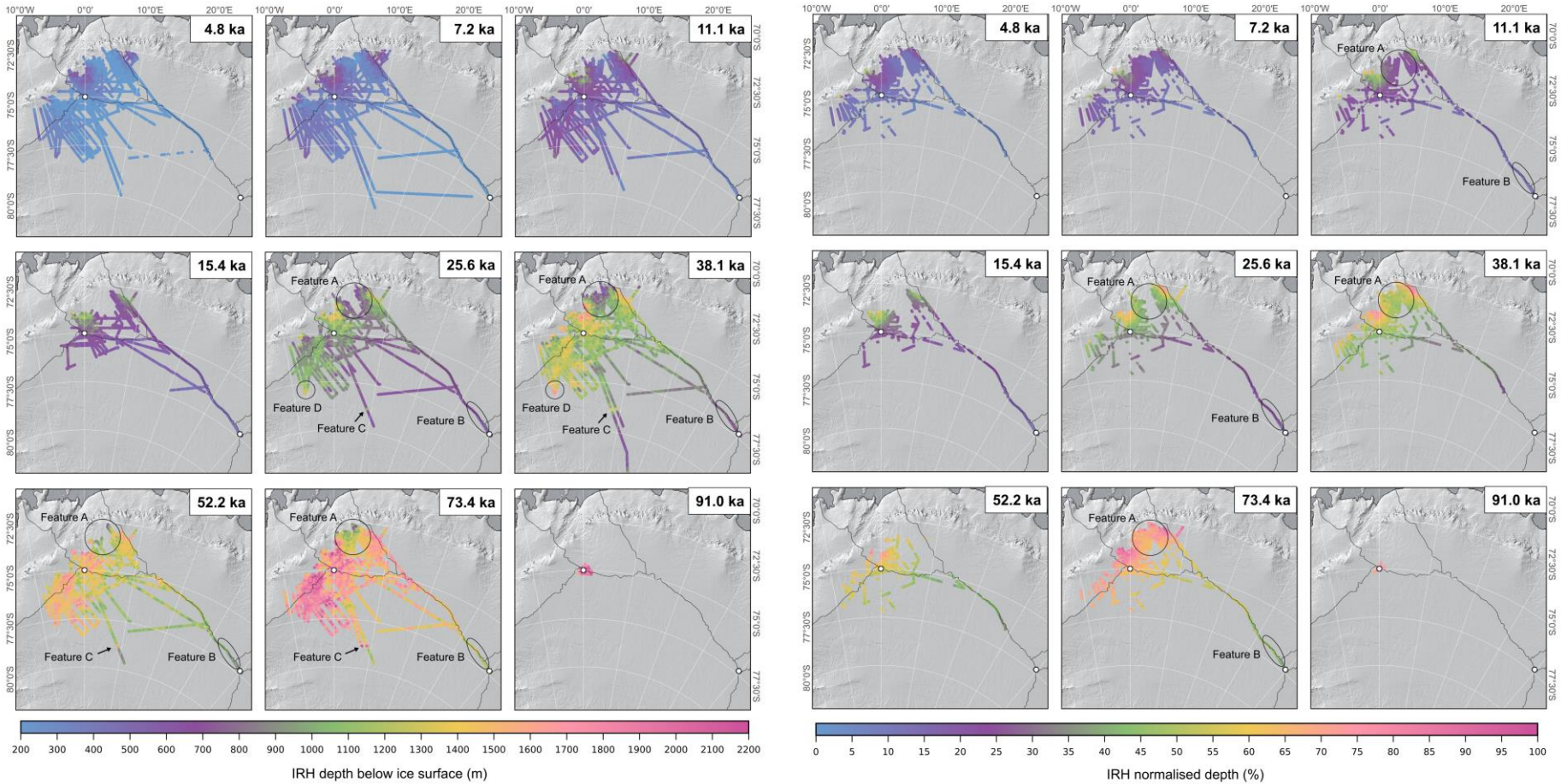
Zhuo Wang[1,2], Ailsa Chung[3], Daniel Steinhage[1], Frédéric Parrenin[3], Johannes Freitag[3], and Olaf Eisen[1,4]

[1]Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar und Meeresforschung, Bremerhaven, Germany
[2]College of Geoexploration Science and Technology, Jilin University, Changchun, China
[3]Univ. Grenoble Alpes, CNRS, INRAE, IRD, Grenoble INP, IGE, 38000 Grenoble, France
[4]Department of Geosciences, Universität Bremen, Bremen, Germany

The Cryosphere



Spatial coverage



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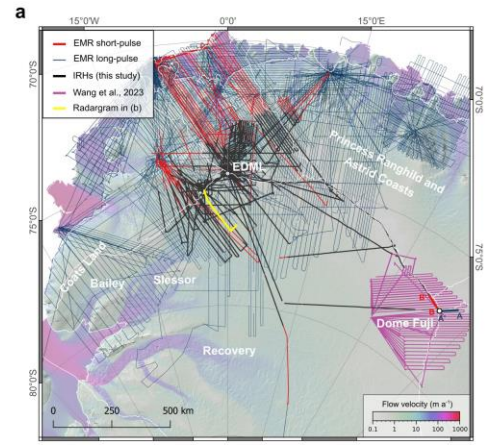

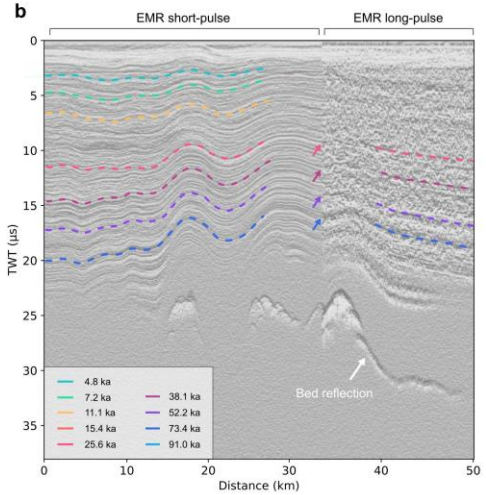

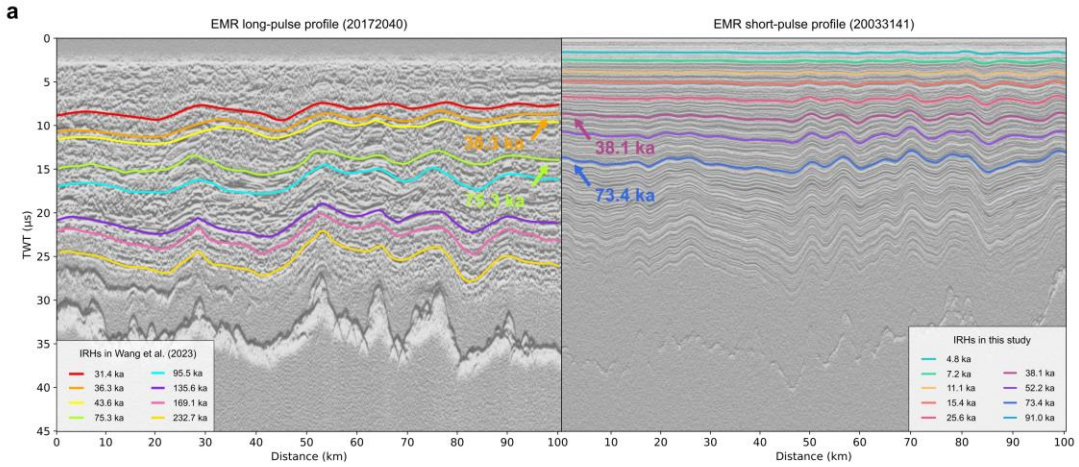

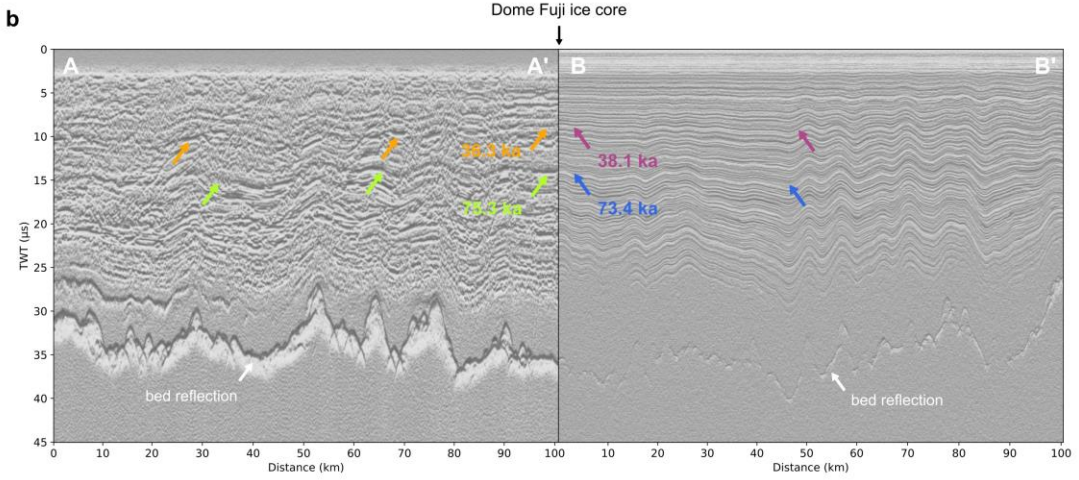

Summary

- Expansion of IRH archive in DML (**Holocene** and Last Glacial Period)
- Many IRHs are caused by conductivity peaks and likely linked to deposits of large bipolar volcanic eruptions
- 7 IRHs are likely the same reflections documented in other studies (West and East Antarctica)
- Potential to expand the IRH archive with EMR long-pulse date for some IRHs