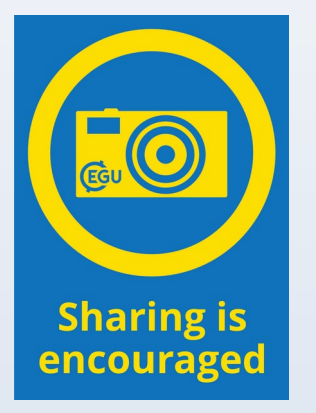


# Water/Falls: Coupling stochastic calving and subglacial hydrology at Sermeq Kujalleq (Store Glacier)

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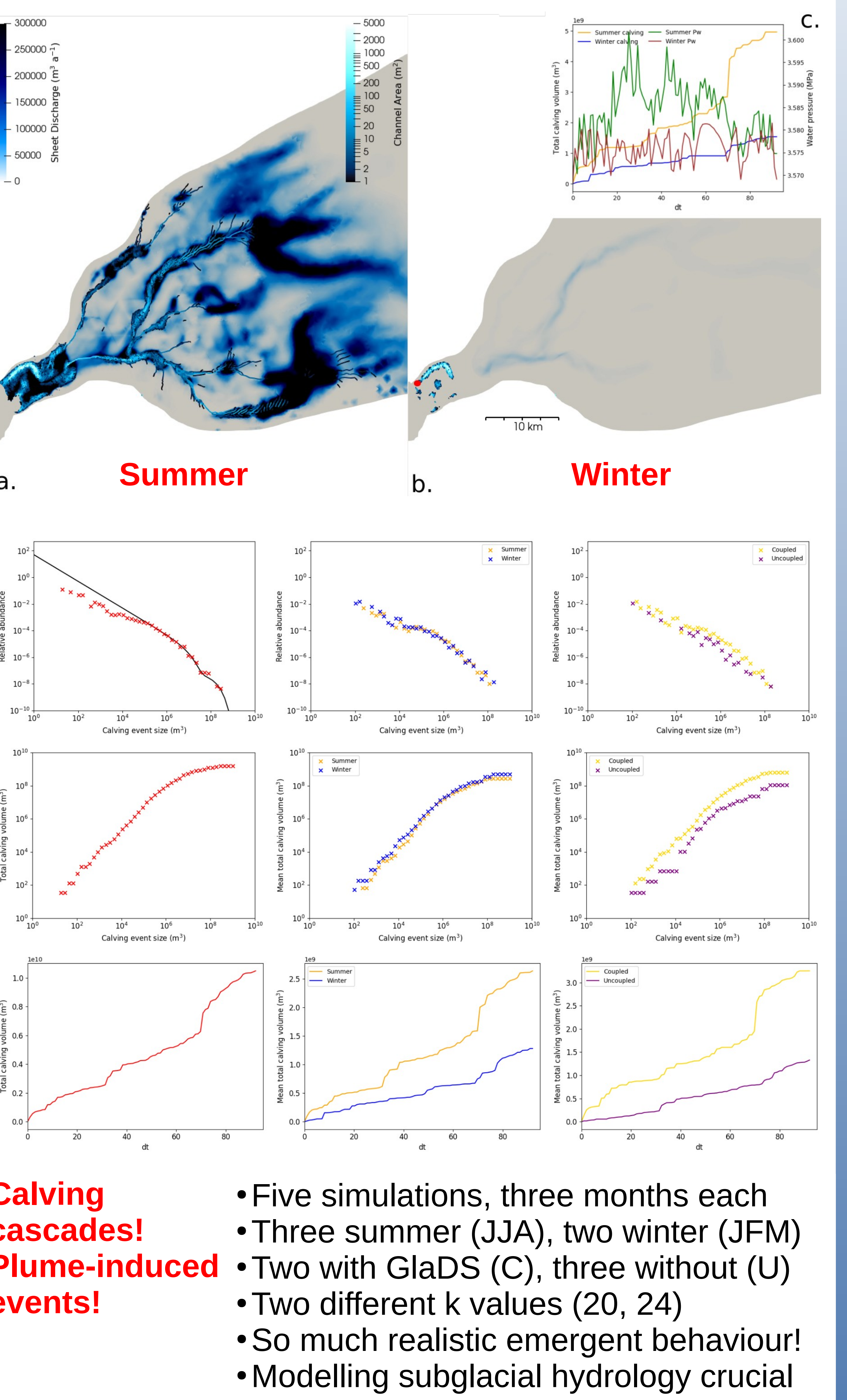
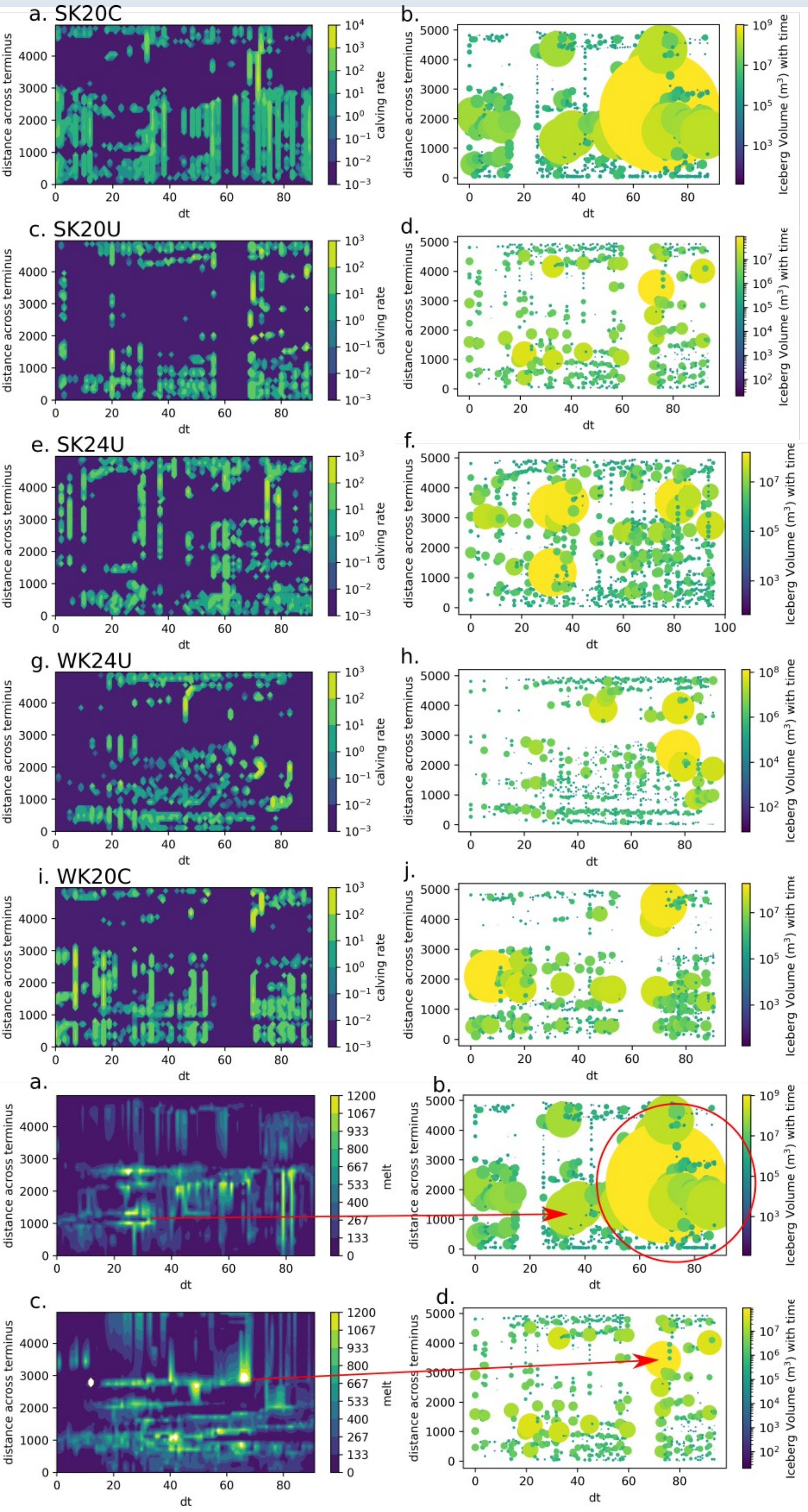
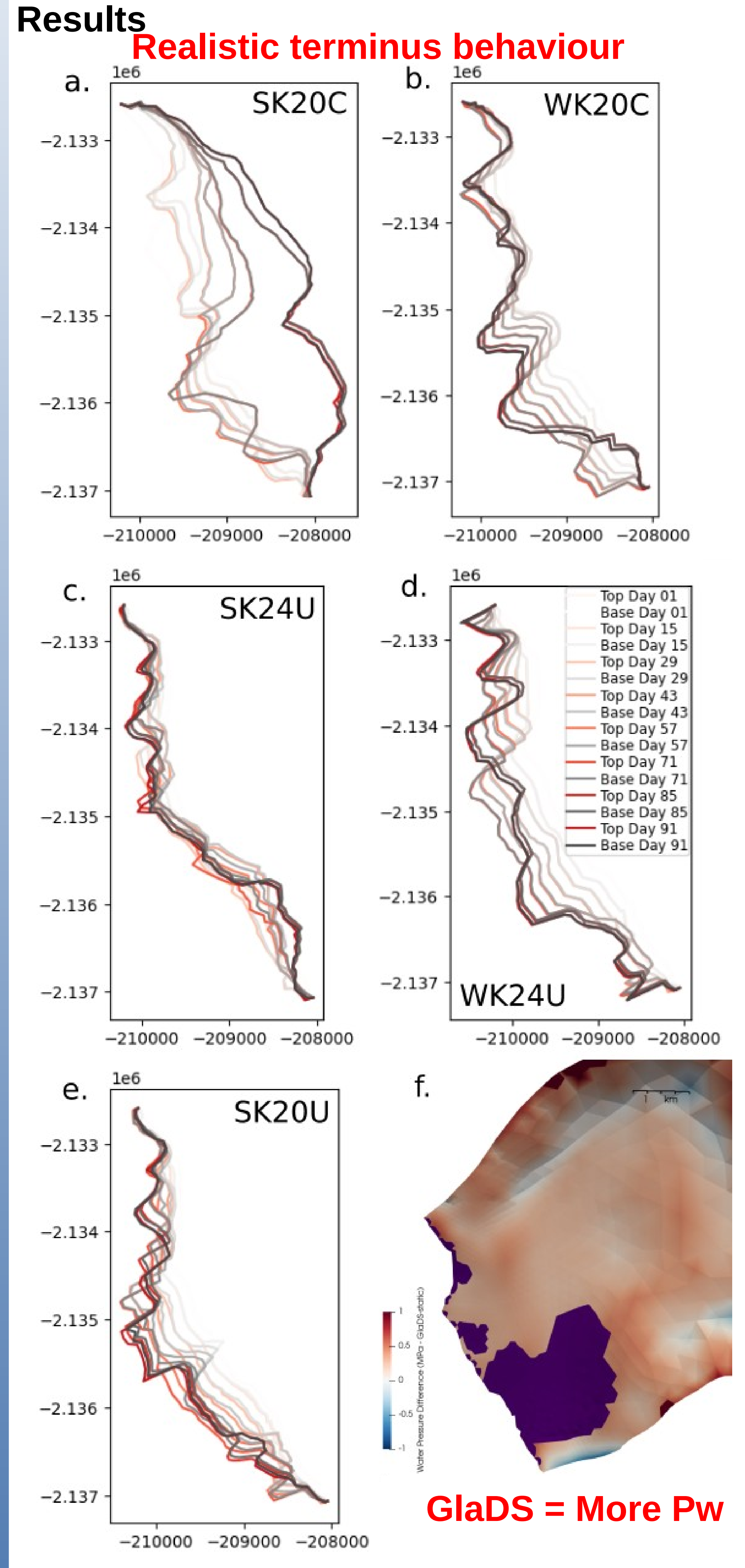
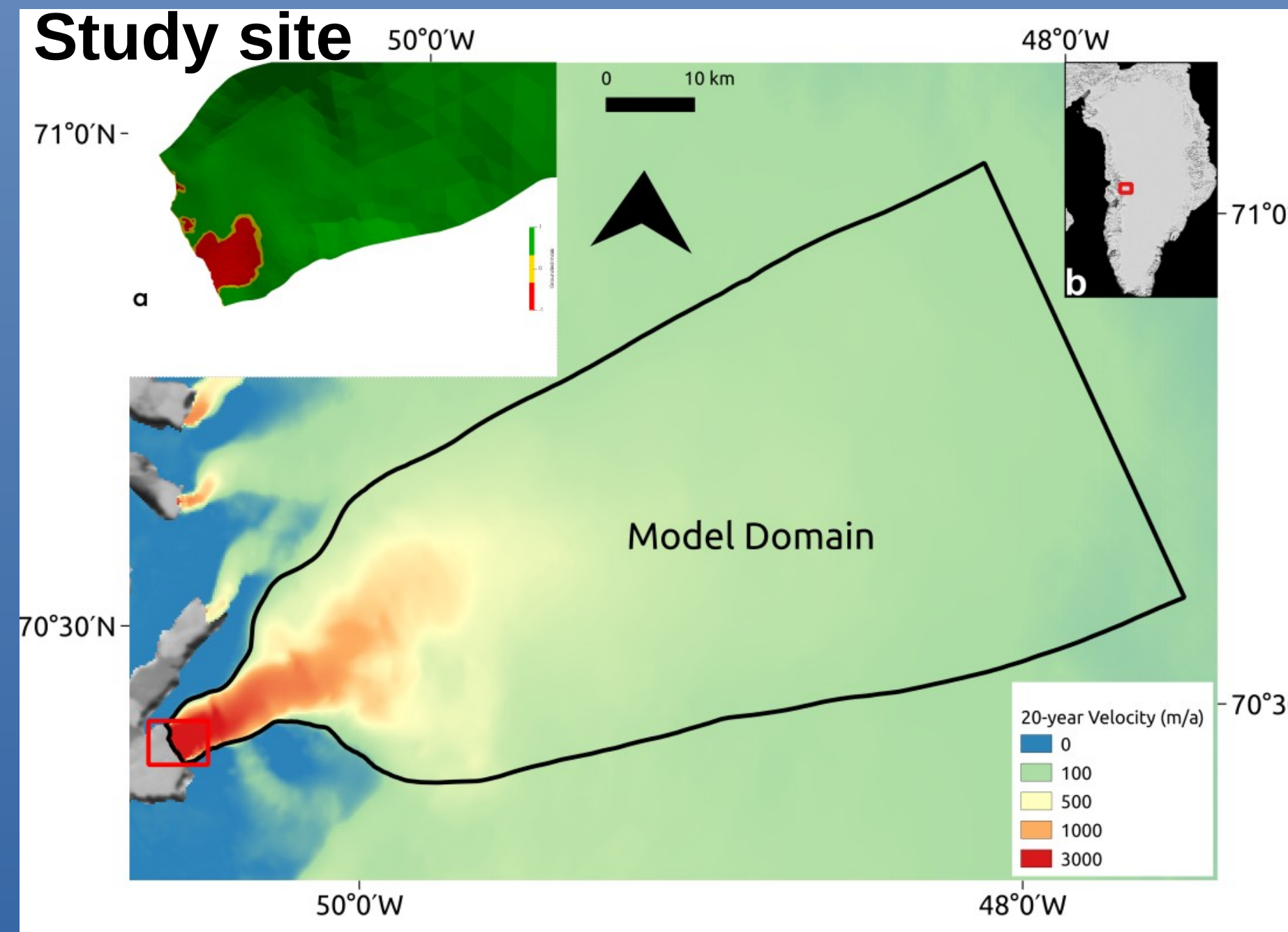
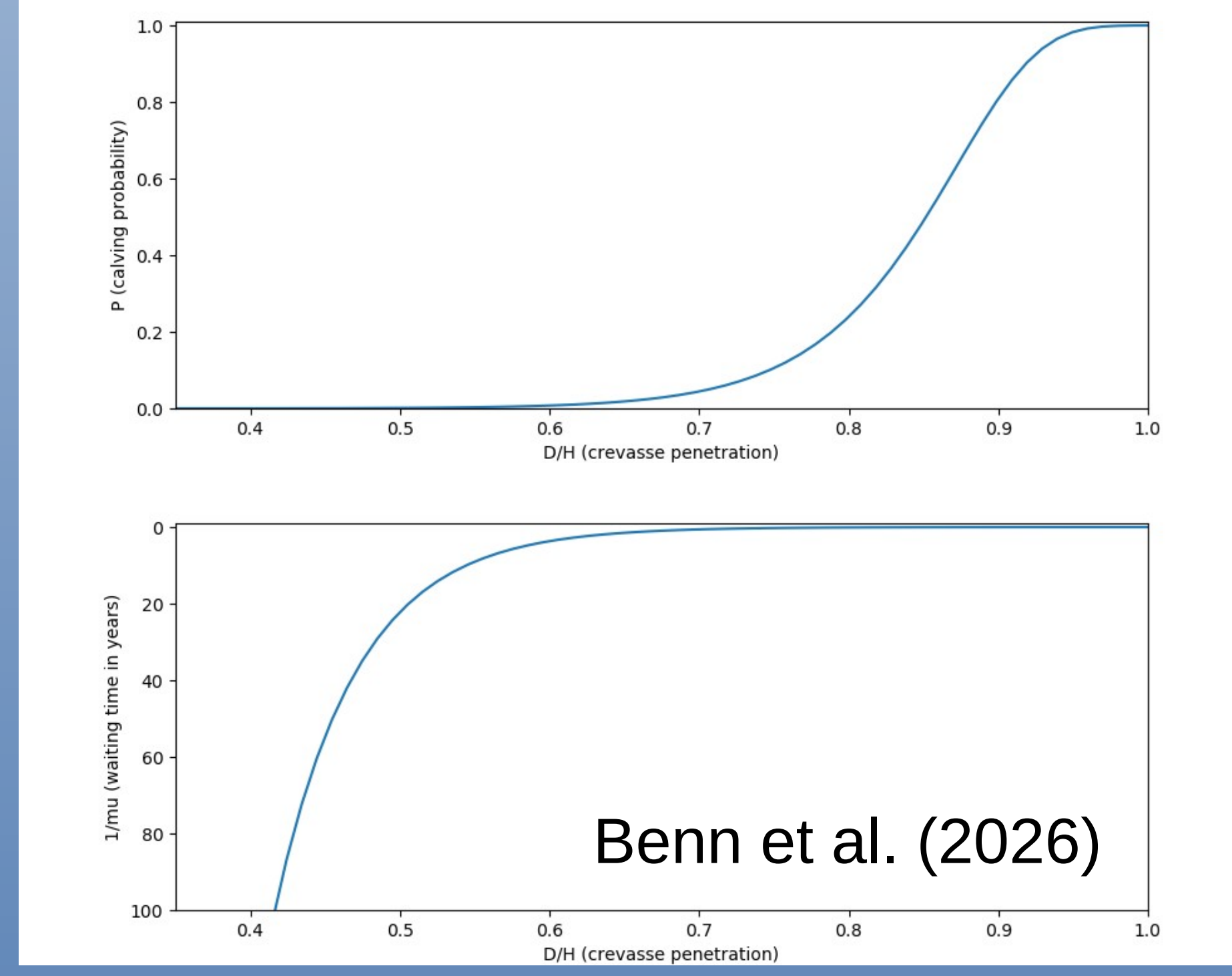
**See Also**  
 • Doug's talk: 08:35 Wednesday, CR2.4 – overview of stochastic calving  
 • Iain's poster: 10:45 Monday, CR2.4 – comparing Store and JI



**Why Calving?**  
 • Nearly all of mass loss in Antarctica  
 • 40 % in Greenland and accelerating everywhere (Greene et al., 2022, 2024)  
 • Yet very difficult to model well  
 • Also important for mountain glaciers?

**Stochastic calving**  
 • Observations suggest calving can be represented as a stochastic process (Benn et al., 2026)  
 • Self-organised critical systems (Åström et al., 2014)

**Stochastic calving in practice**  
 $p = 1 - \exp(-\Delta t / \tau)$   
 $\tau = \tau_0 \exp(k(1 - \tilde{d}))$   
 •  $p$  is a random number between 0 and 1  
 • Work back to get  $d$  threshold in CD function



**Conclusions**  
 • Stochastic calving works well – able to reproduce observed behaviour at Store  
 • Explicit modelling of subglacial hydrology crucial for reproducing calving – more important than seasonality  
 •  $k$  fairly robust against changes in model  
 • Further work required to refine concept and turn this into a simple function that could be implemented in an ice-sheet model at scale

**References**  
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 • Benn, D.I., Wheel, I., Christoffersen, P., Åström, J., Cook, S.J., Luckman, A., Nick, F., Hulton, N., Hewitt, I., and Bassis, J.: Calving laws and where to find them, *Journal of Glaciology*, 2026 (accepted)  
 • Greene, C. A., Gardner, A. S., Schlegel, N.-J., and Fraser, A. D.: Antarctic calving loss rivals ice-shelf thinning, *Nature*, 609, 948–953, <https://doi.org/10.1038/s41586-022-05037-w>, 2022.  
 • Greene, C. A., Gardner, A. S., Wood, M., and Cuzzone, J. K.: Ubiquitous acceleration in Greenland Ice Sheet calving from 1985 to 2022, *Nature*, 625, 523–528, <https://doi.org/10.1038/s41586-023-06863-2>, 2024.