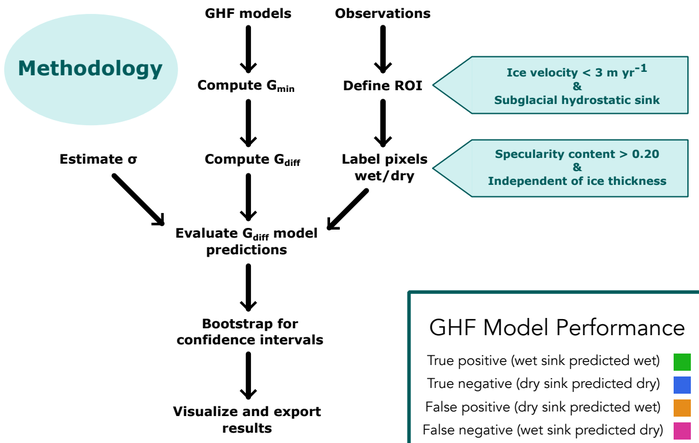
South Pole Basin heterogeneity is not captured by current GHF models

Assessing Antarctic GHF models using radar observations in the South Pole Basin

Megan Kerr and Duncan Young

Background

Geothermal heat flow (GHF) remains one of the least constrained parameters influencing ice sheet dynamics due to the difficulty of obtaining direct measurements and validating existing models. Using **radar observations** from NSF COLDEX, we evaluate the performance of seven published GHF models, each derived from distinct statistical or geophysical approaches, in predicting the basal thermal state of the South Pole Basin (SPB) and Dome A.

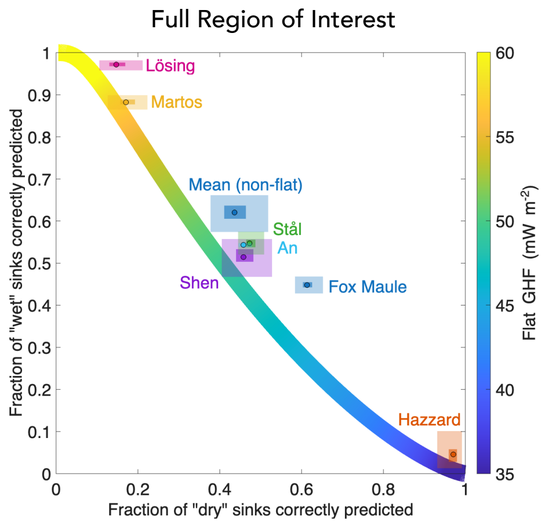


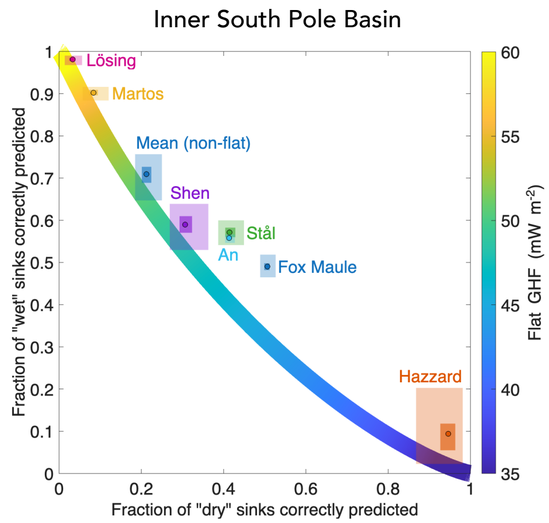
Results and Discussion

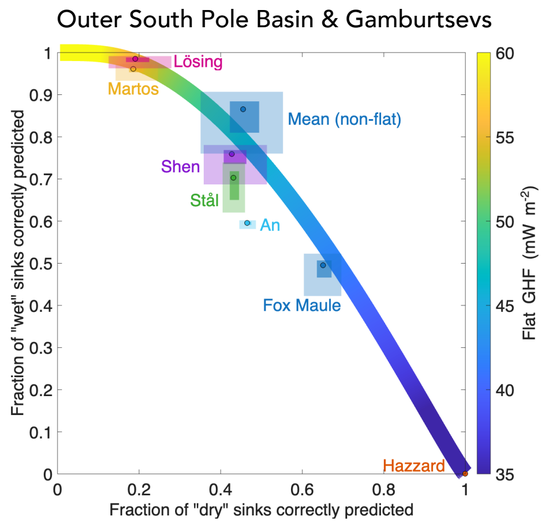
No models correctly predict both wet and dry sinks well, suggesting that the GHF field in this region is neither homogeneous nor captured by the spatial variance in geophysics-based models.

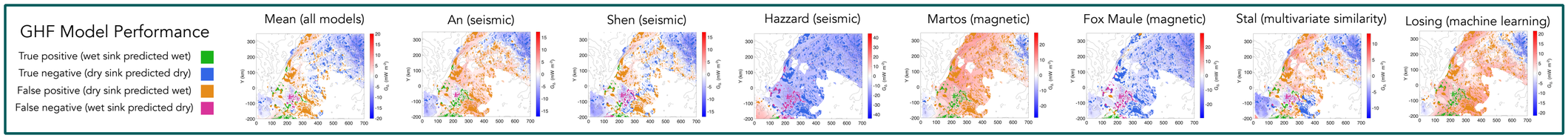
GHF models perform poorly within the Inner SPB and improve in the Outer SPB, implying that the Outer SPB and Dome A region is both more homogeneous and better captured by current GHF estimates than Inner SPB.

Because GHF directly affects basal melt rates, producing a heat flow model validated by radar observations of subglacial hydrological systems is essential for the oldest ice search.









TEXAS Geosciences
The University of Texas at Austin
Jackson School of Geosciences
Institute for Geophysics

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