How to identify continental plume tracks from heat flux and lithosphere thickness

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EGU General Assembly, Vienna, May 23-27, 2022

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How to identify continental hotspot tracks?

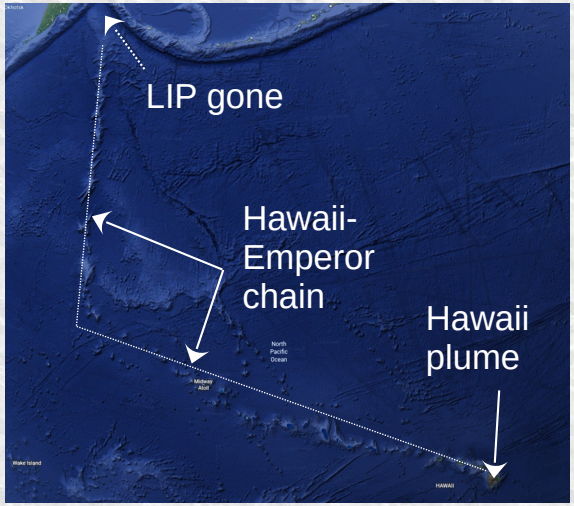
Oceanic plates:
- Plates are thin
- Magma easily erupted
  => chain of volcanic islands

Continental plates:
- Plates are thick
- Magma *not* easily erupted
  => missing volcanic track

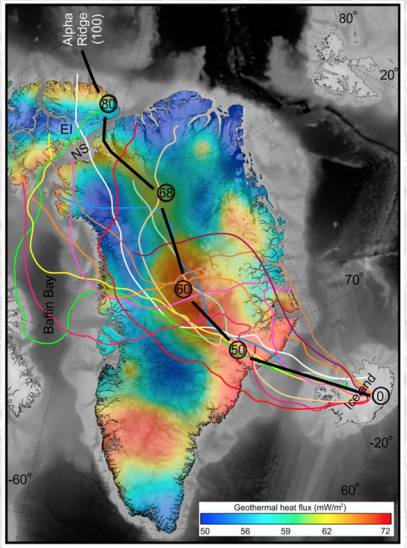
Available observations, e.g.:

Heat flux

Tomography

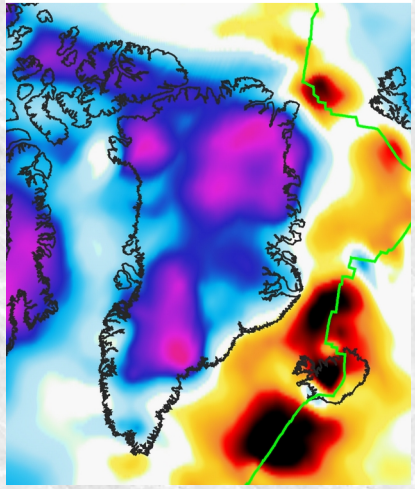


Google Earth



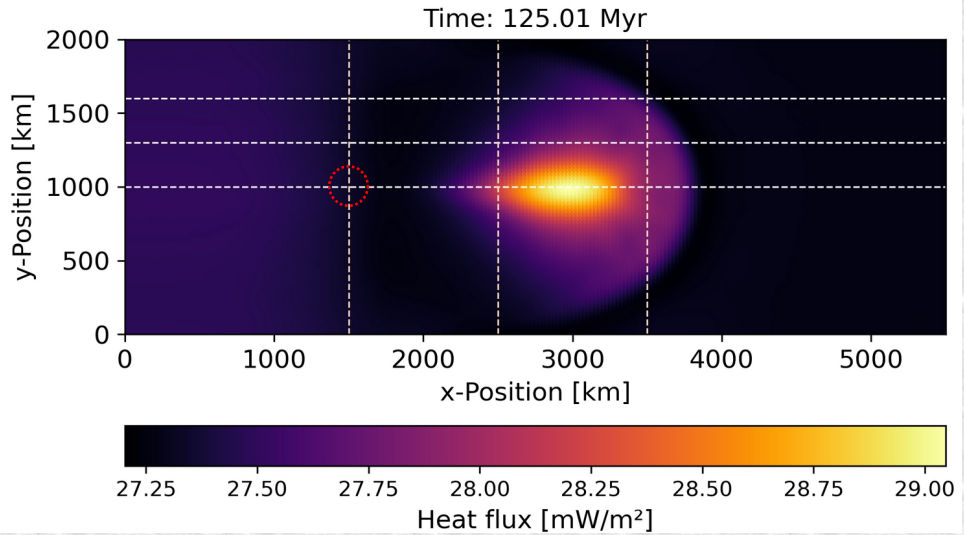
Martos et al. (2018)

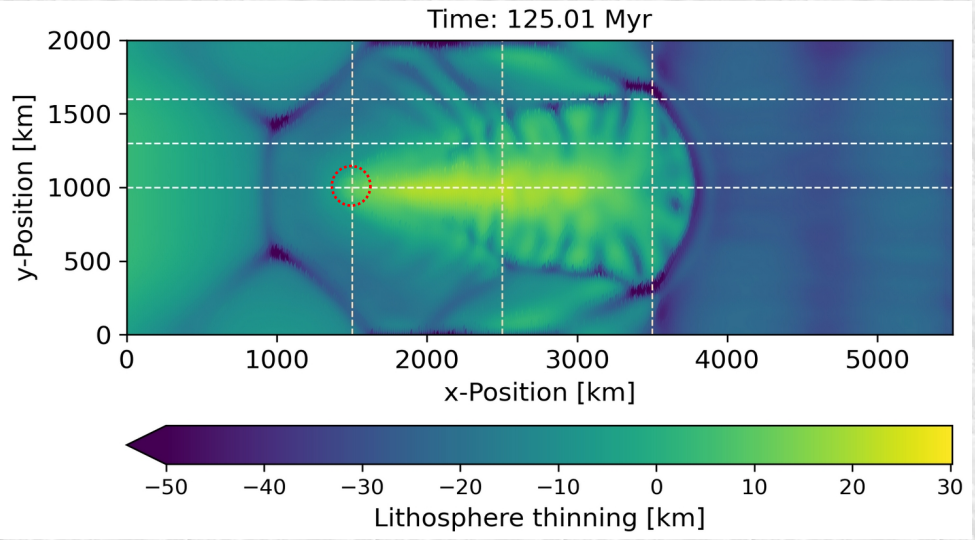
150 km depth



Celli et al. (2021)

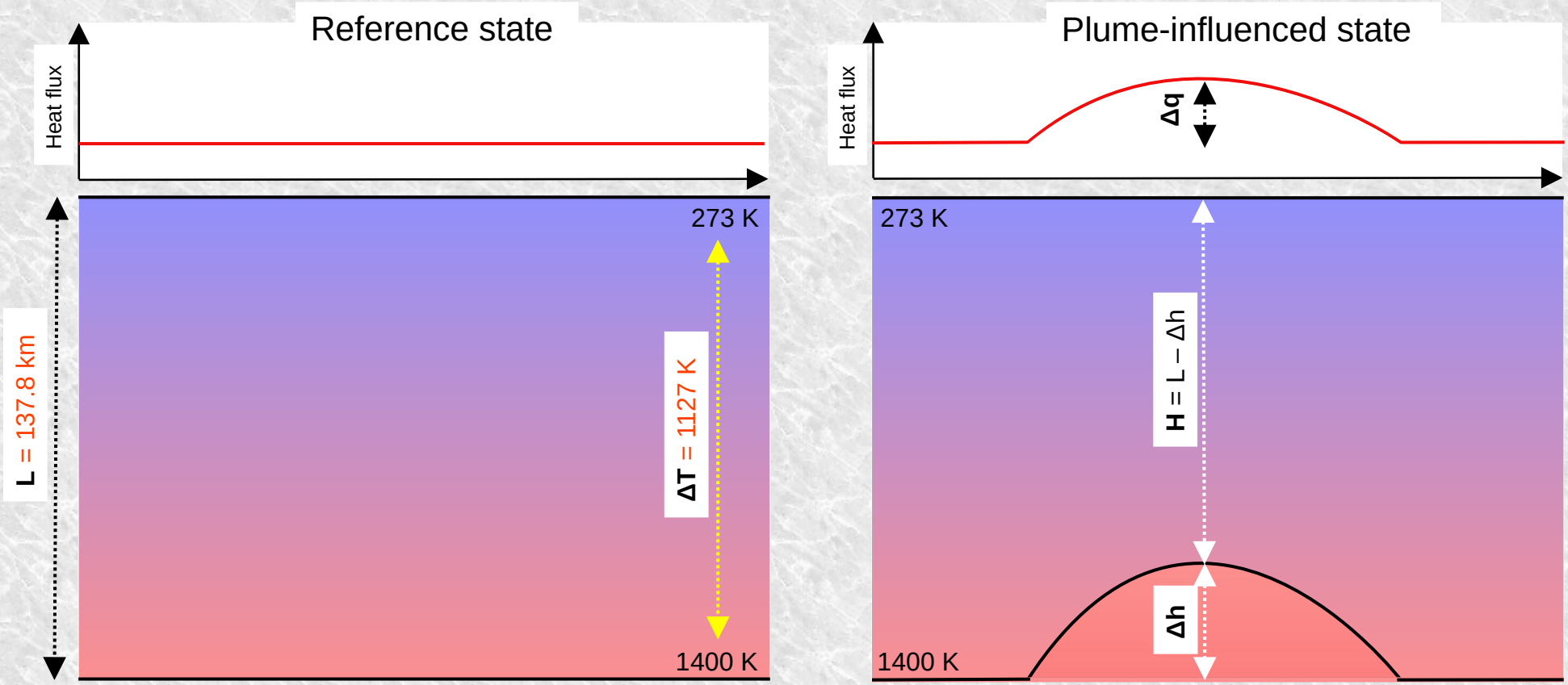
Method: 2-D and 3-D numerical models





- Lithosphere erosion via drips next to plume track
  - Anomalies are shifted relative to each other

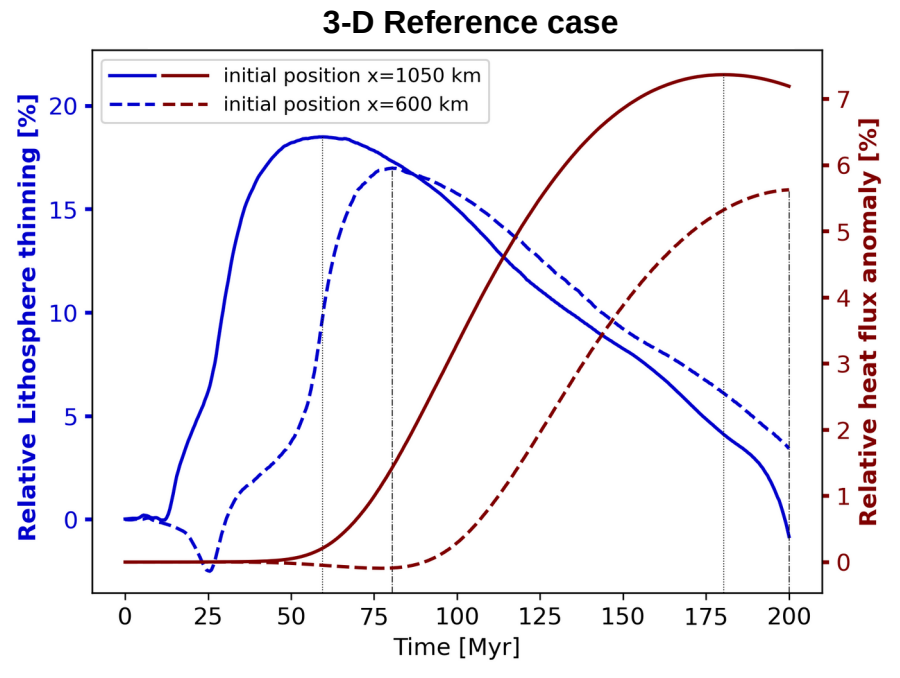
Analytical solution for heat flux anomaly

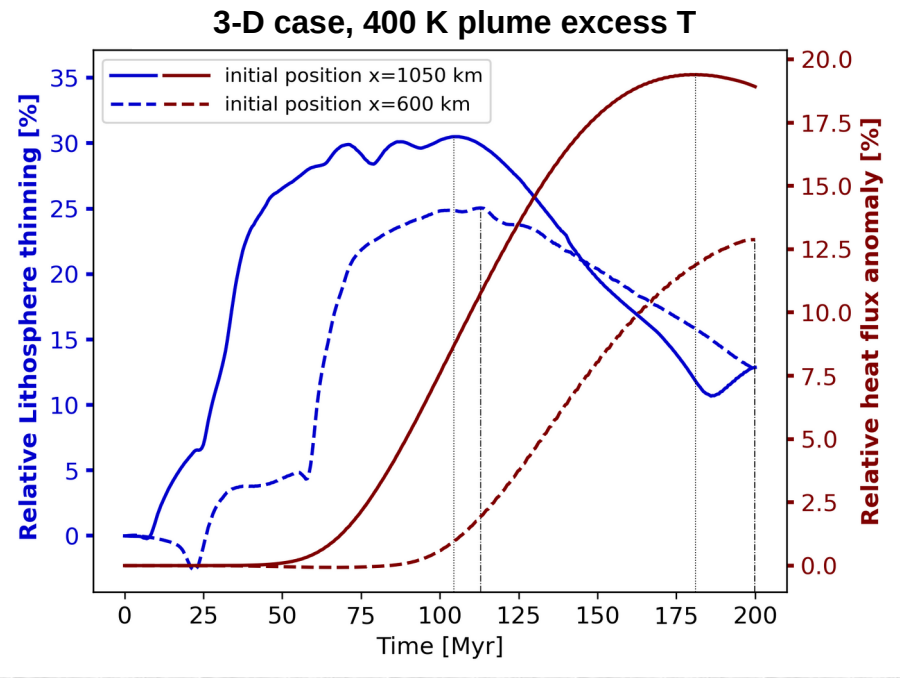


Parameters:

L: initial lith. Thickness **ΔT**: temperature drop **Δh**: lith. Thinning **H**: lith. Thickness **Δq**: heat flux anomaly

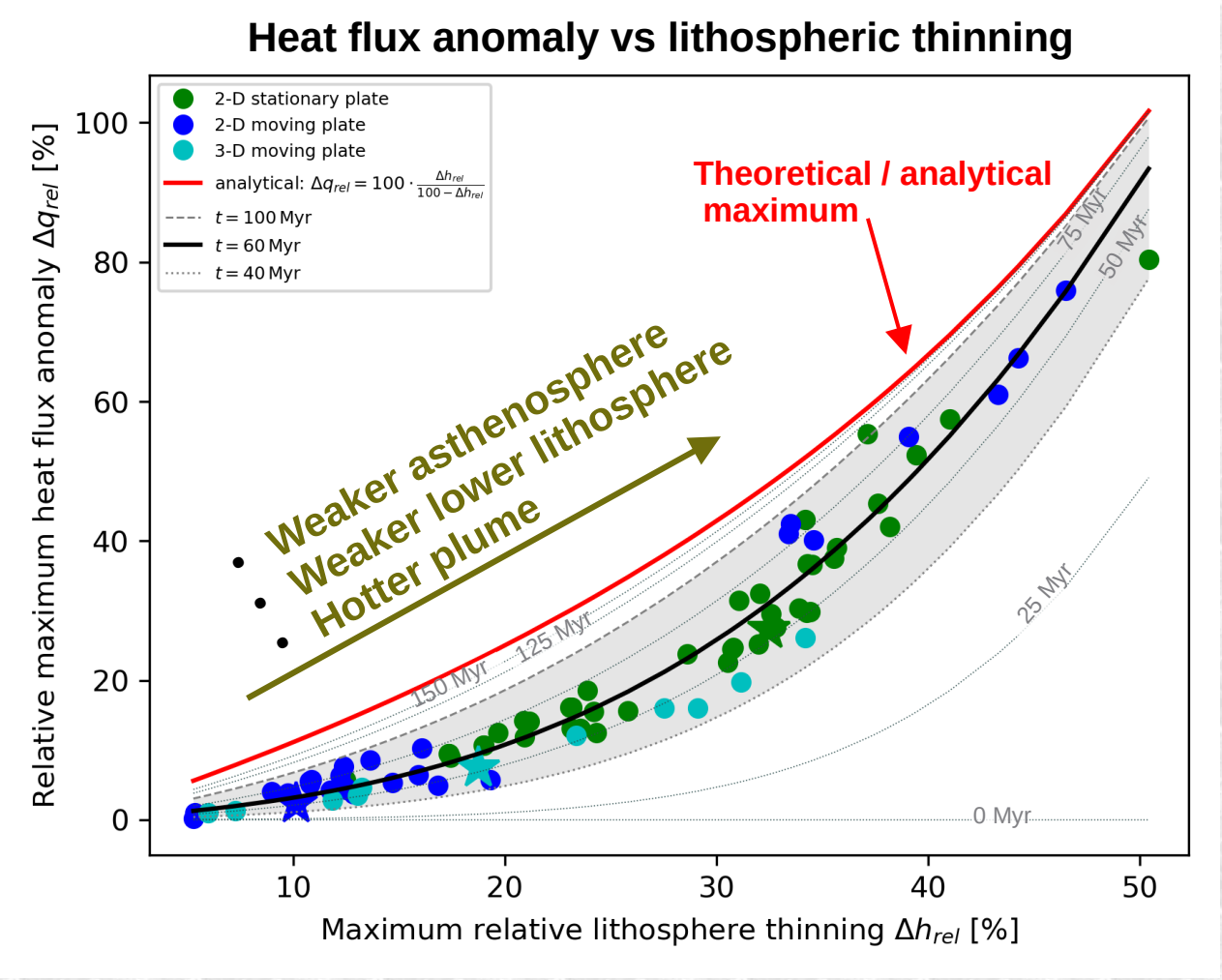
Timing and maximum of anomalies





- **Maximum heat flux about 40-140 Myr delayed**
- Delay depends on e.g.:
  - Initial lithisphere thickness
  - Thinning

Relation between maxima of anomalies



Read more under:

Heyn and Conrad (2022), GRL, doi: 10.1029/2022GL098003