Strong variability in the thermal structure of Tibetan Lithosphere




Bing Xia, Irina M. Artemieva, Hans Thybo, Simon L. Klemperer

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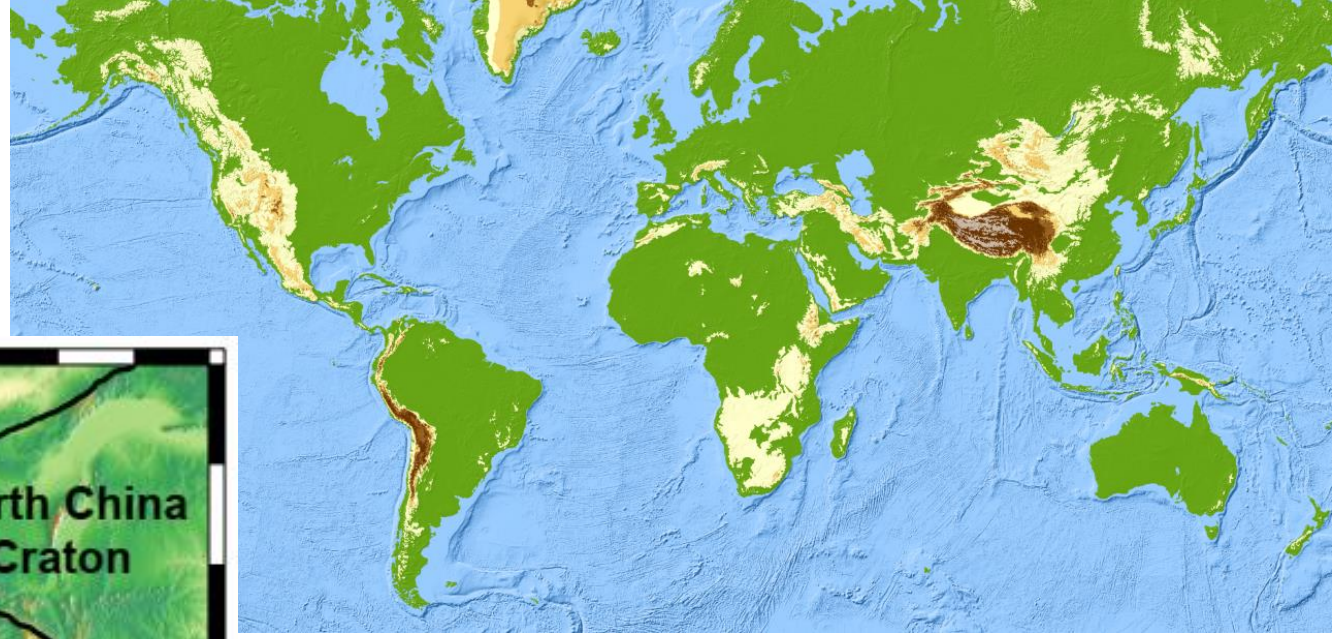
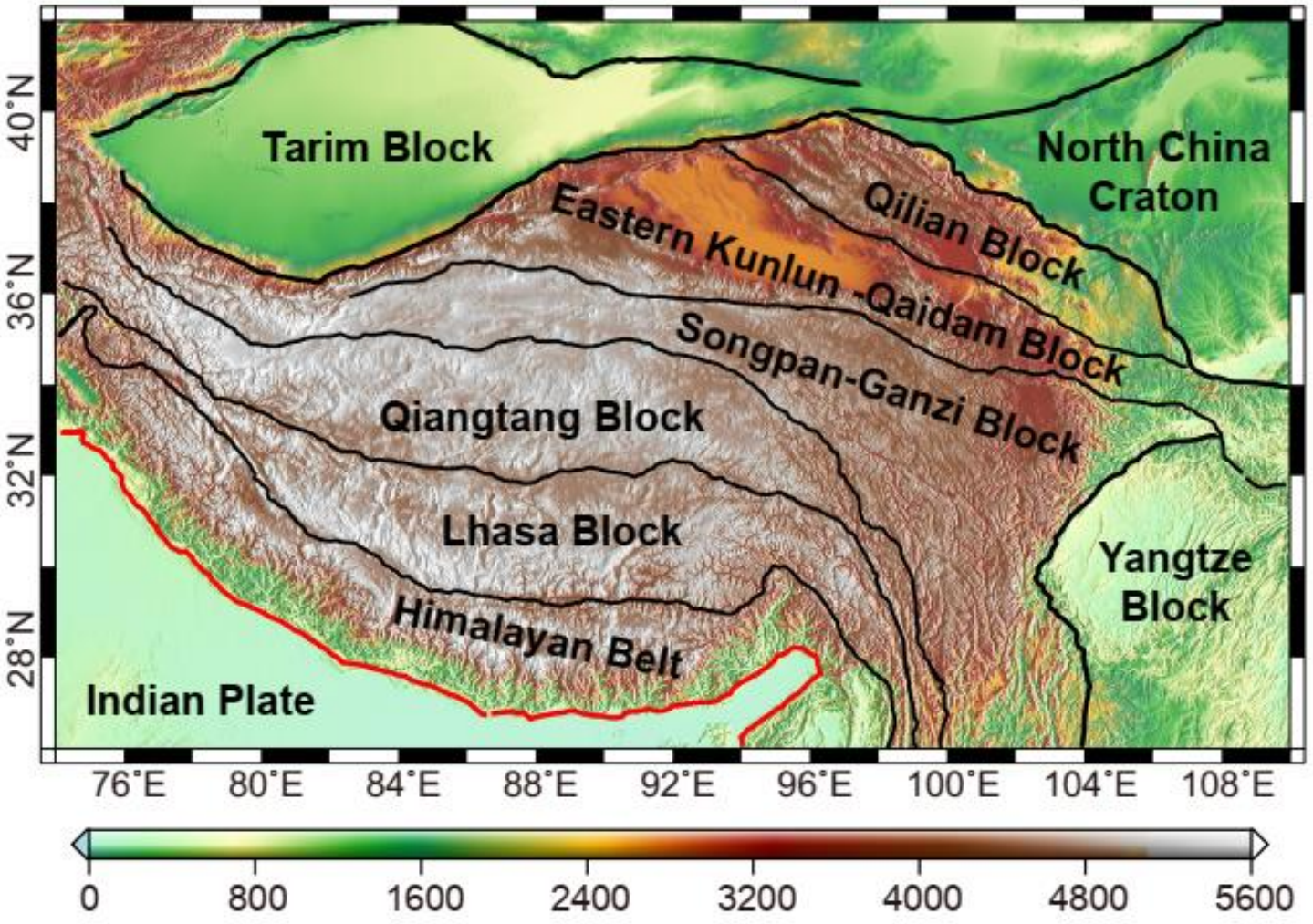
The Roof of the world





Mechanism maintains the high elevation of Tibet is a controversial topic.

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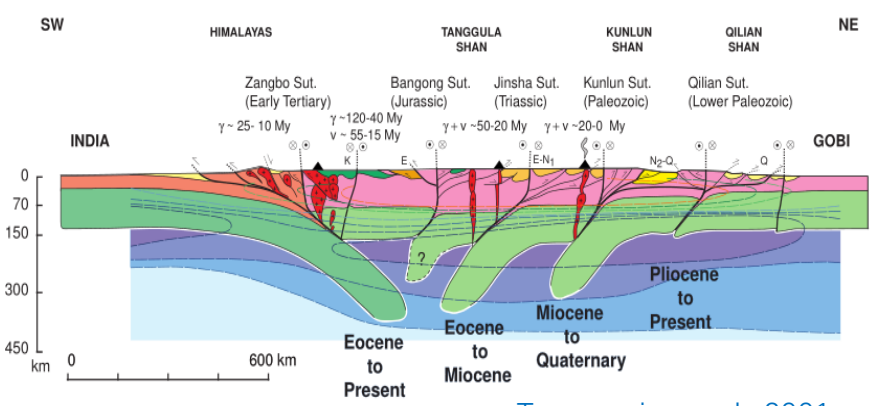
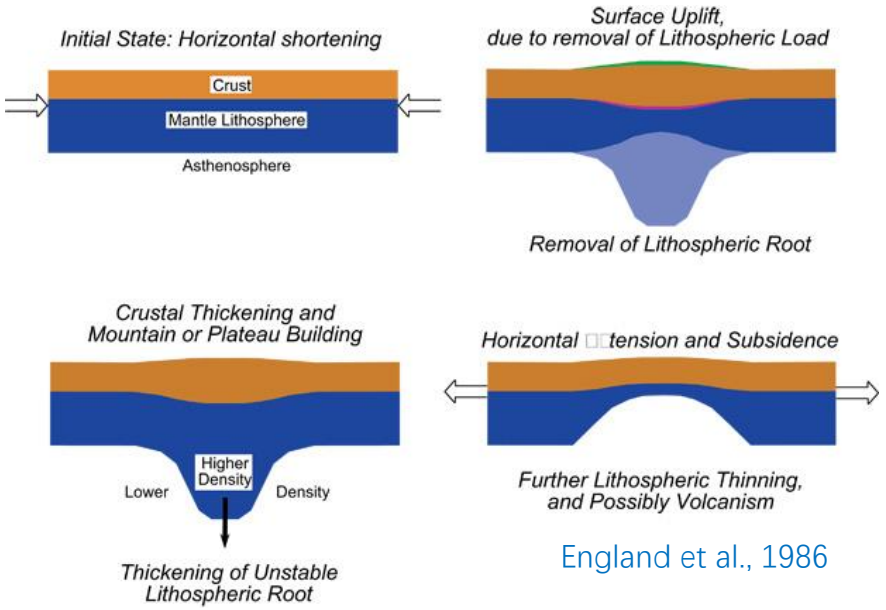
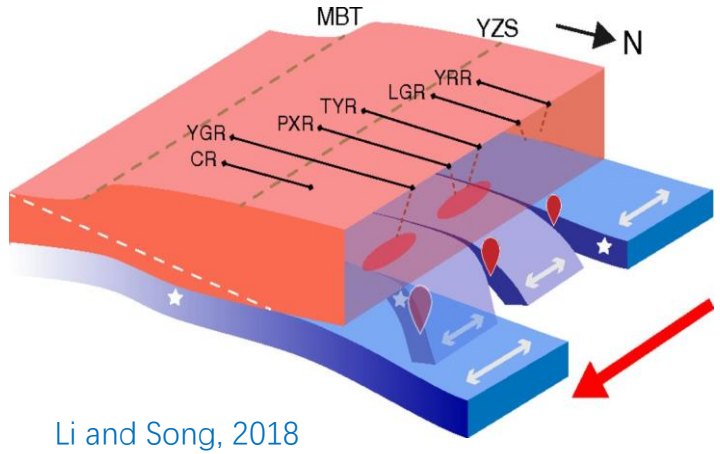
Different hypotheses for the Tibetan uplift



Tapponnier et al., 2001



England et al., 1986



Li and Song, 2018

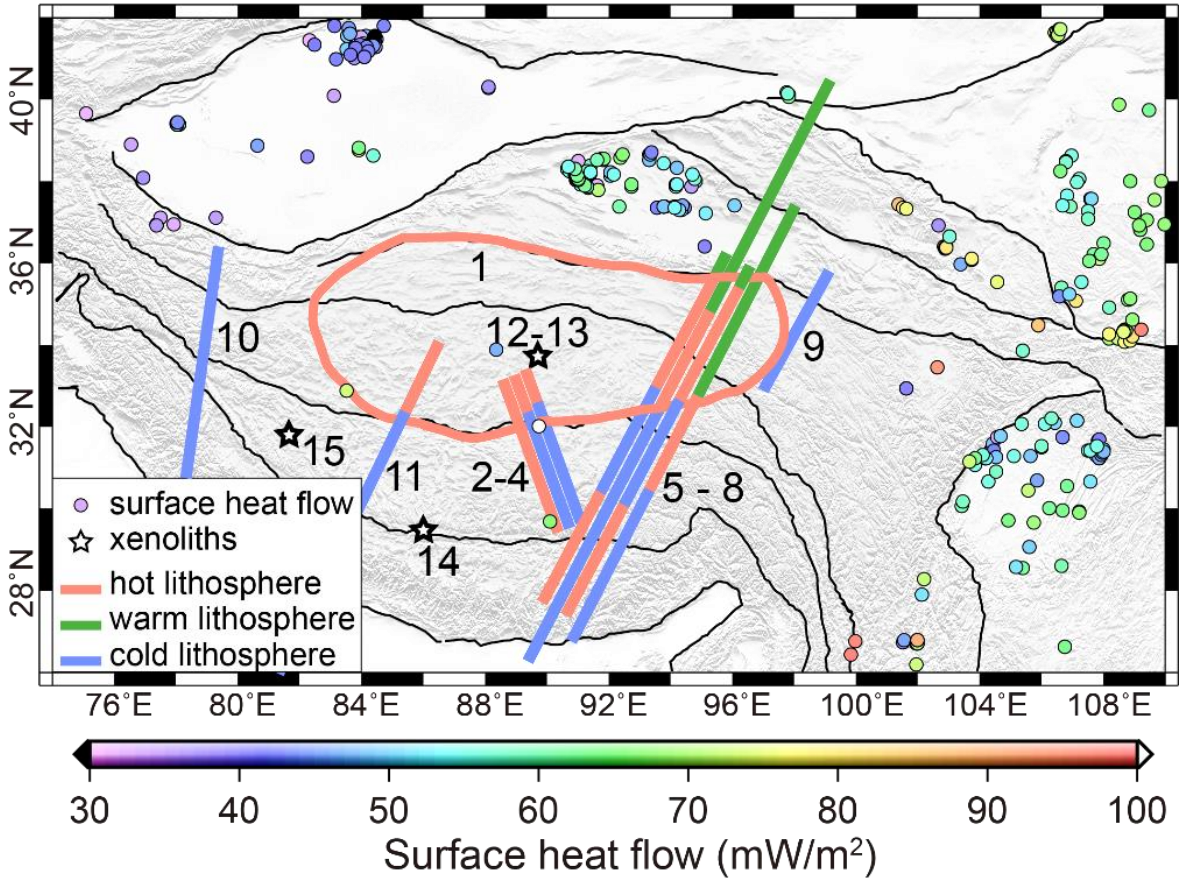
Cold lithosphere

Hot lithosphere

Hot lithosphere
+
Cold lithosphere

Knowledge of the thermal lithosphere structure is key to understanding the driving forces of the Tibetan uplift.

Thermal structure of Tibet is poorly constrained



high-quality surface heat-flow measurements are absent

geophysical and xenolith-based models are in 2D (N-S trend)

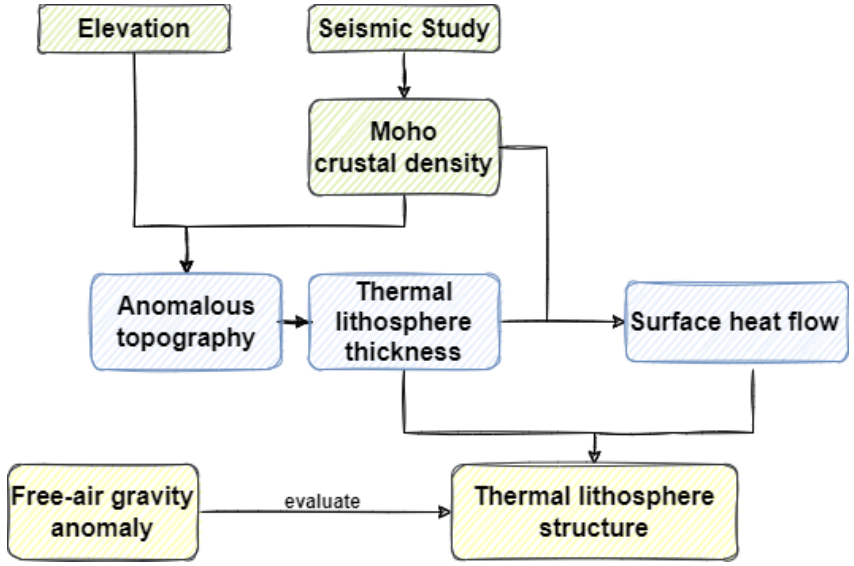
Thermal-isostasy

Input:

Elevation + Moho depth

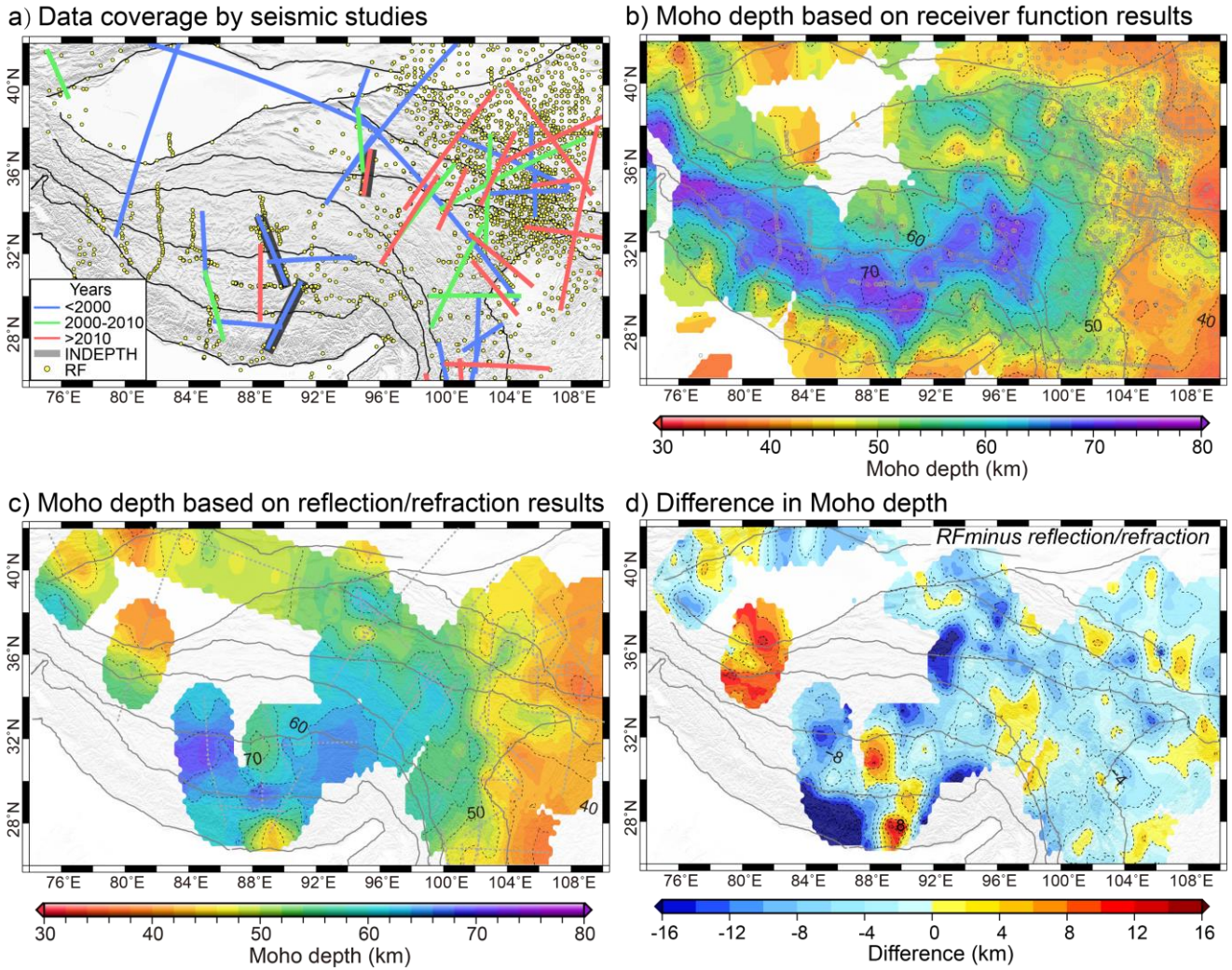
Output:

Thermal lithosphere structure



Artemieva, 2018

Moho Depth



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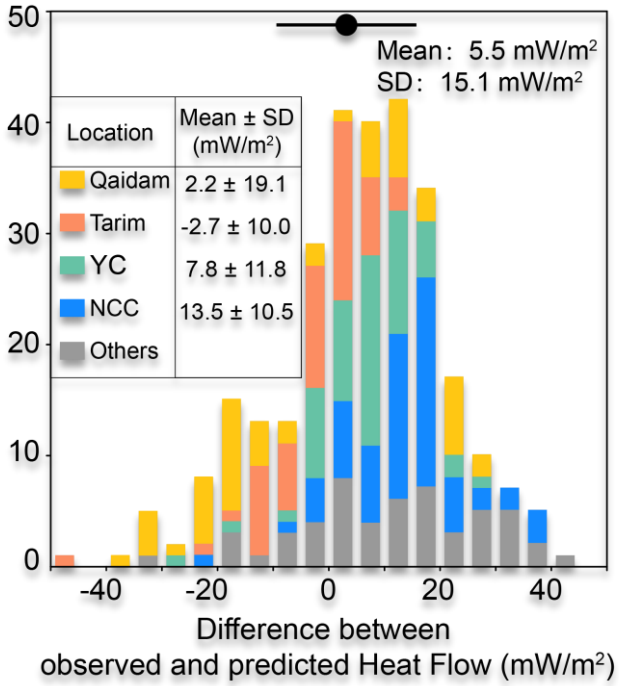
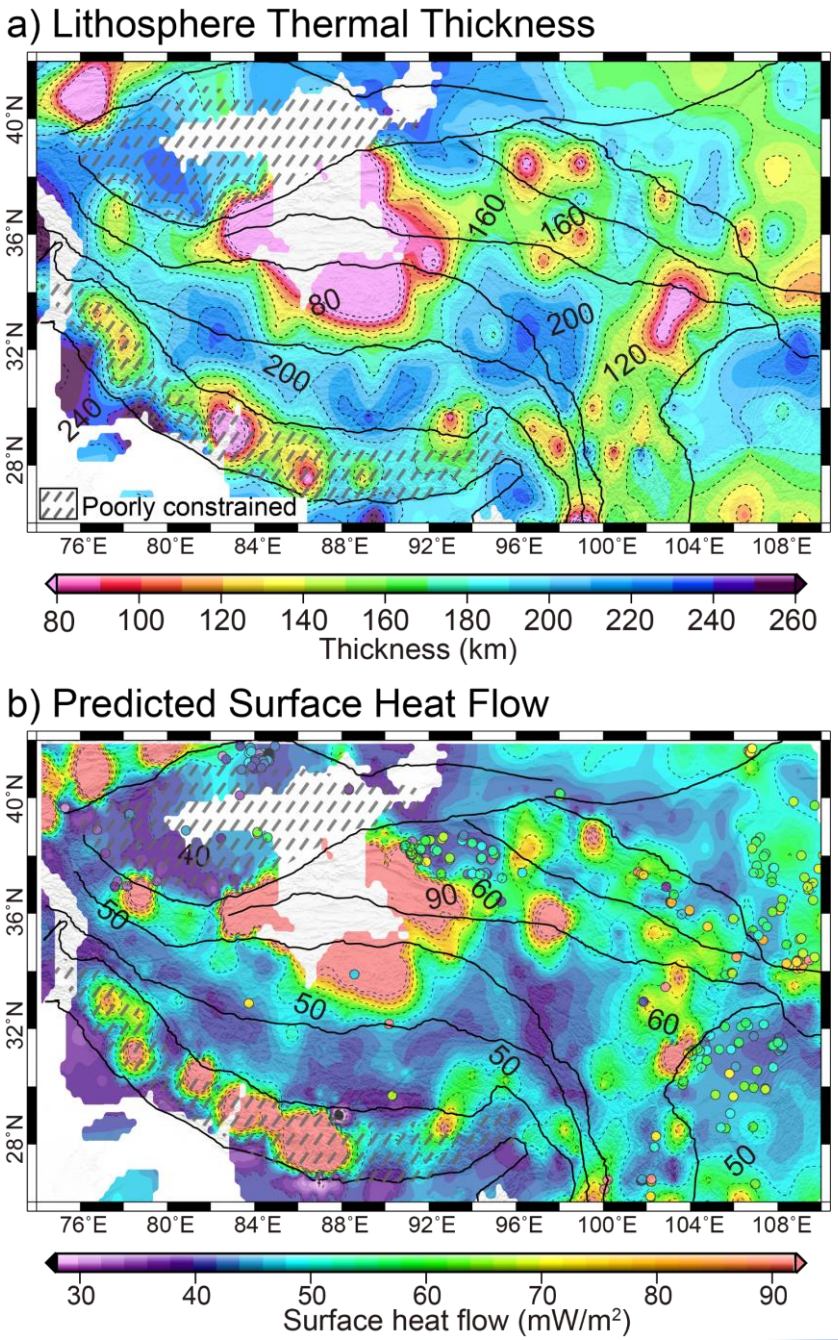


Predicted and measured surface heat flow are statistically similar



Heterogeneous thermal lithospheric structure:

- ✓ The Lhasa Block and central-eastern Tibet have cold thermal lithosphere;
- ✓ The lithosphere of the northern Tibet is very thin (<80 km) with heat flow > 80-100 mW/m²;
- ✓ The north-eastern Tibet has a strongly heterogeneous lithosphere thermal structure

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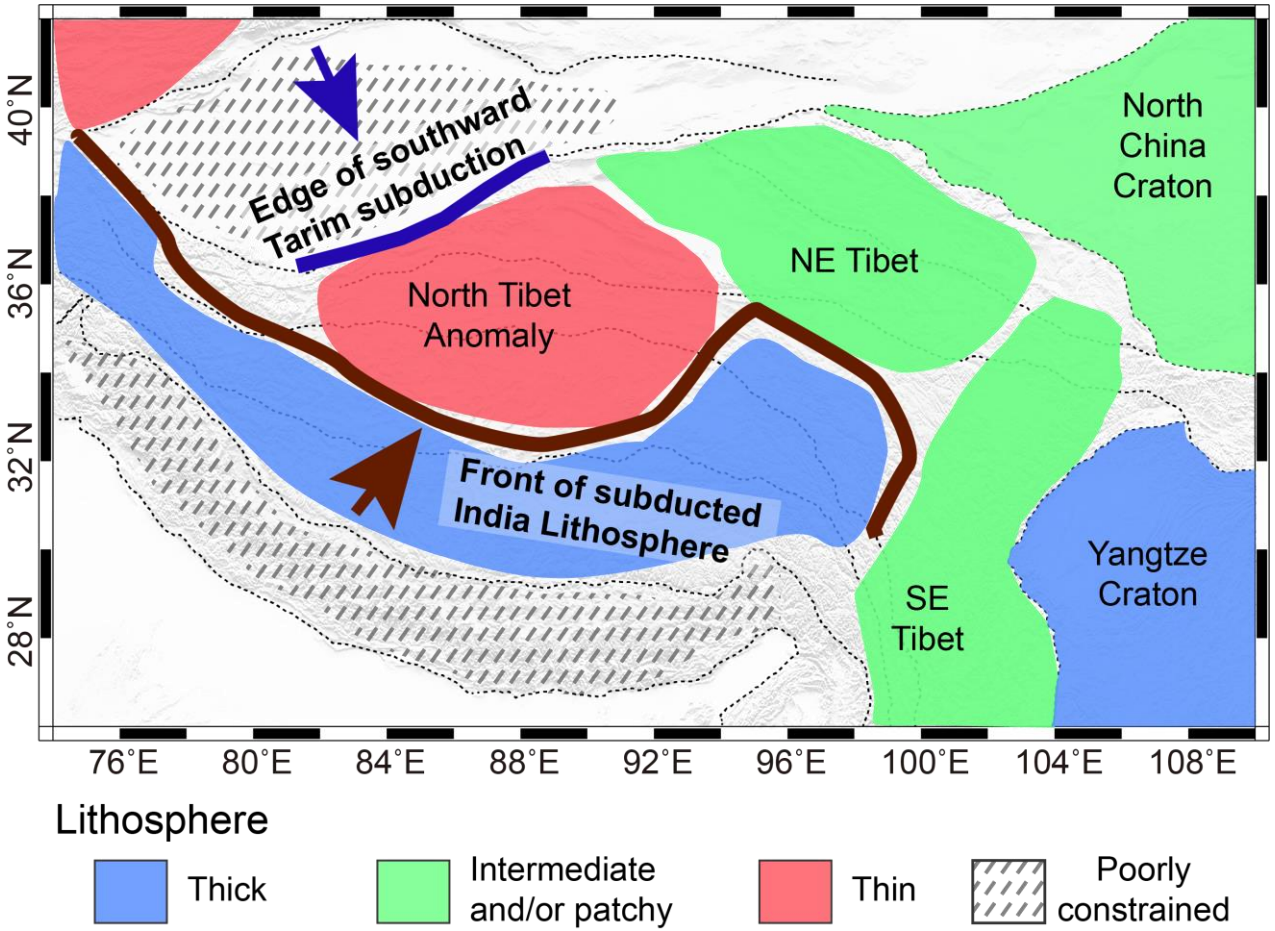
Heterogeneous thermal lithospheric structure



- Thick thermal lithosphere in southern and eastern Tibet is likely to represent **on-going underthrusting** of the Indian lithosphere.
- The North Tibet Anomaly, may be caused by **lithosphere delamination and asthenospheric upwelling.**
- **several mechanisms** maintains the high elevation of Tibet.

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