



*The Abdus Salam
International Centre for Theoretical Physics*



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From Core to Crust: Towards an Integrated Vision of Earth's Interior

20 - 24 July 2009

**Regional Variations of 1-Hz Lg Coda Q and Intermediate-period Rayleigh-wave
Attenuation across Continents**

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Regional Variations of 1-Hz Lg Coda Q across Continents

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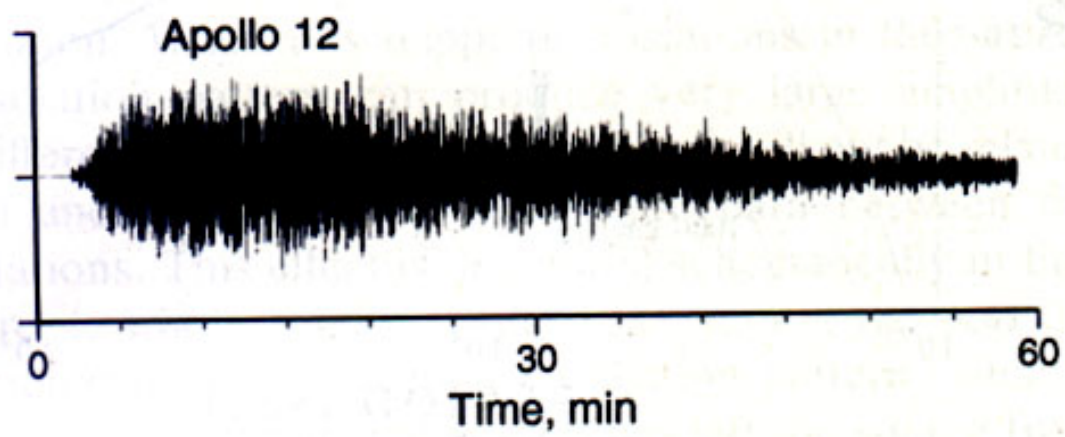
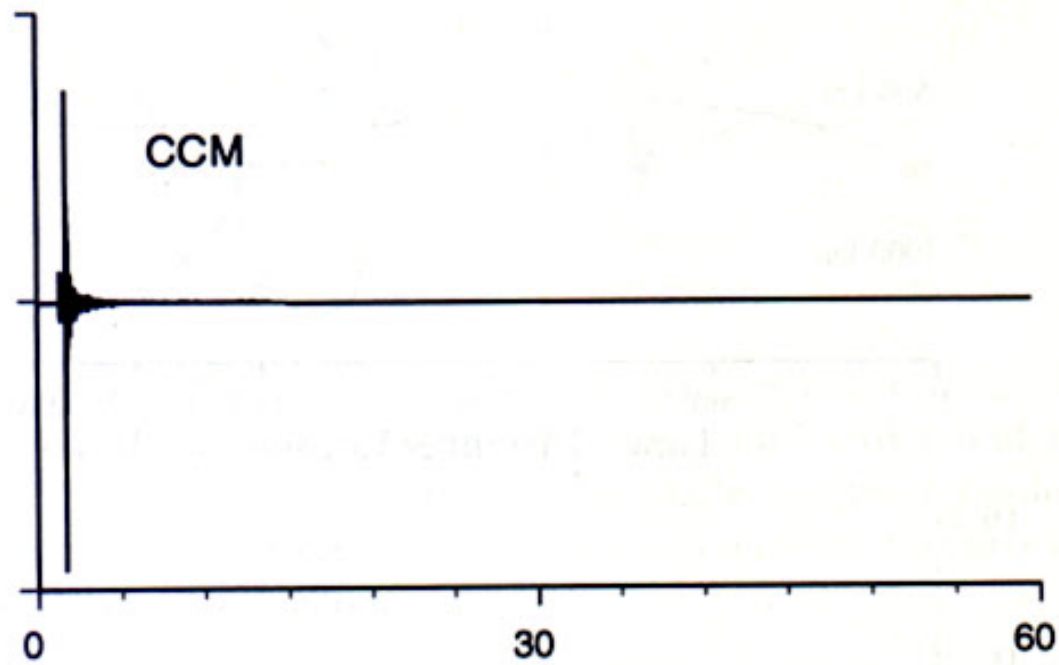
Their Upper Mantle Origins

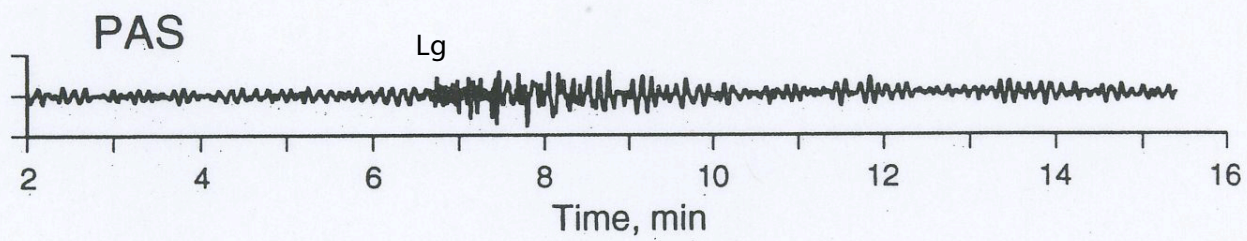
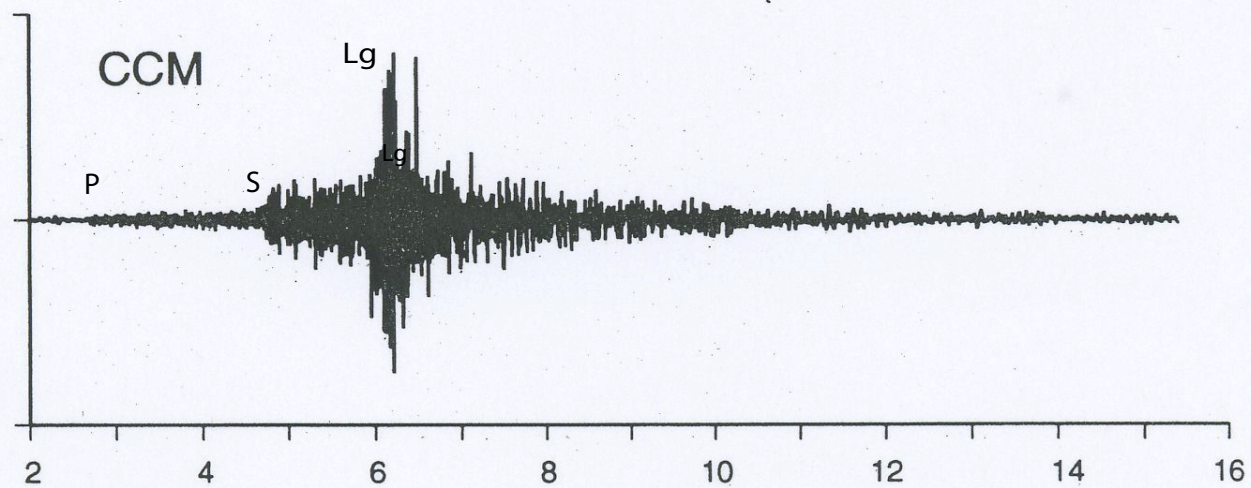
Brian Mitchell
Saint Louis University

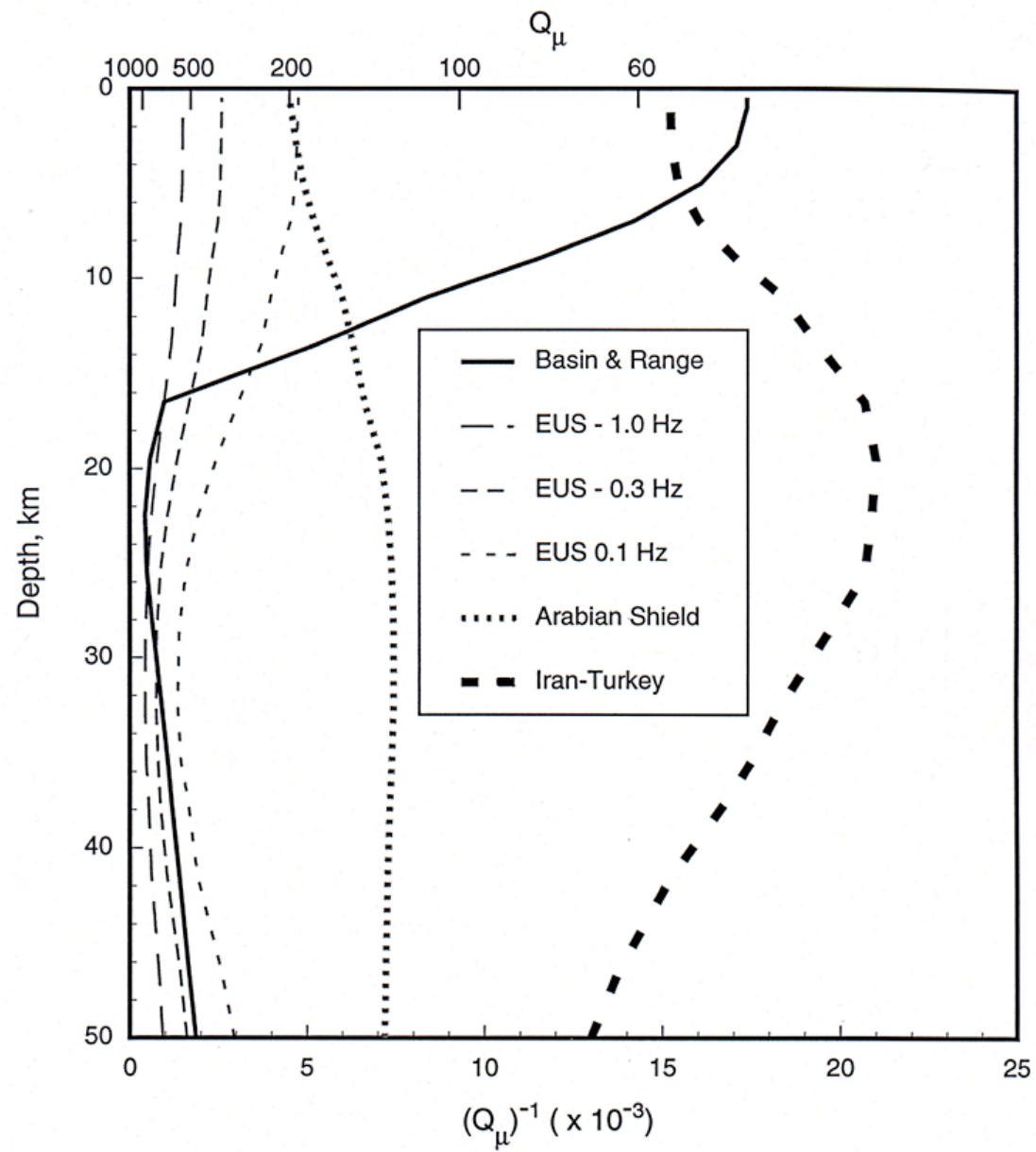
Co-workers
Jiakang Xie
Lianli Cong

Topics to be discussed

- Lg coda Q regional variations and their relation to other geophysical and geological properties
- Mechanisms that might produce regional variations in Lg coda Q
- A new method for mapping Rayleigh-wave attenuation in continents at intermediate periods
- Variations of crustal Q with time



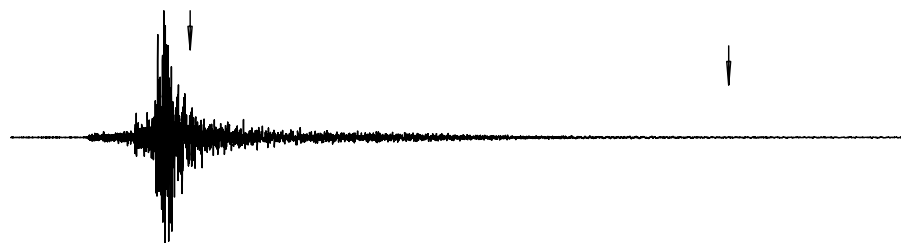
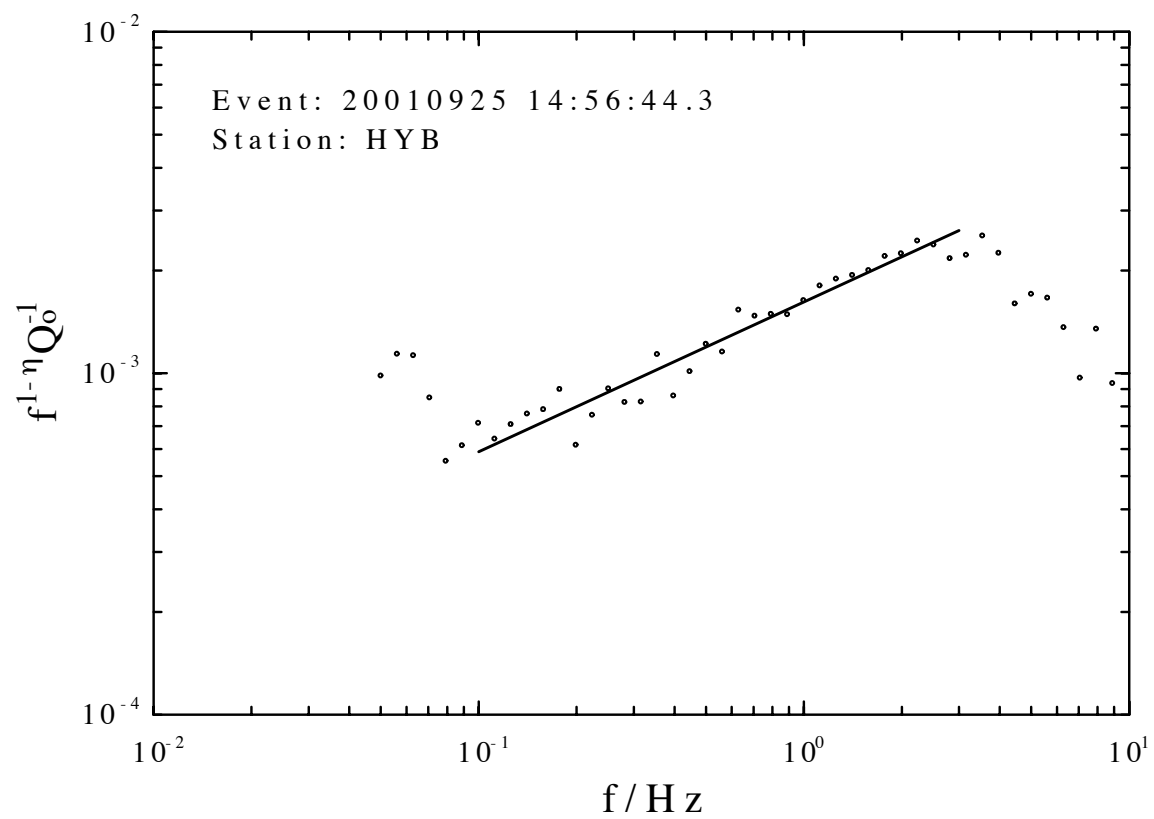


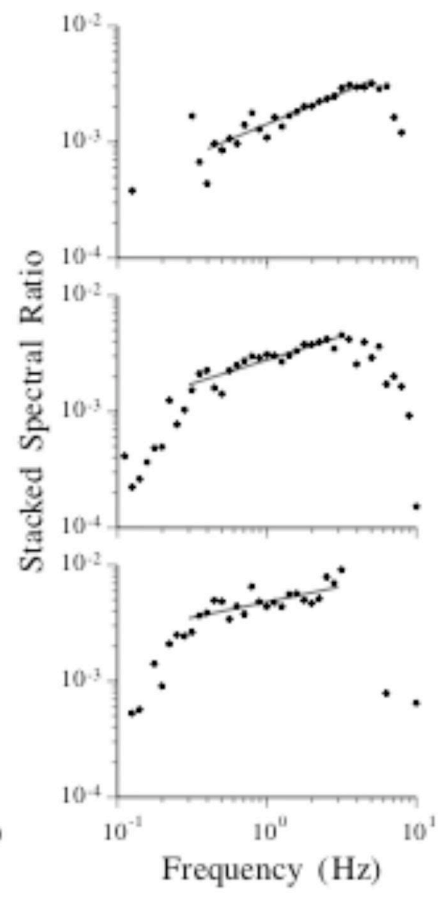
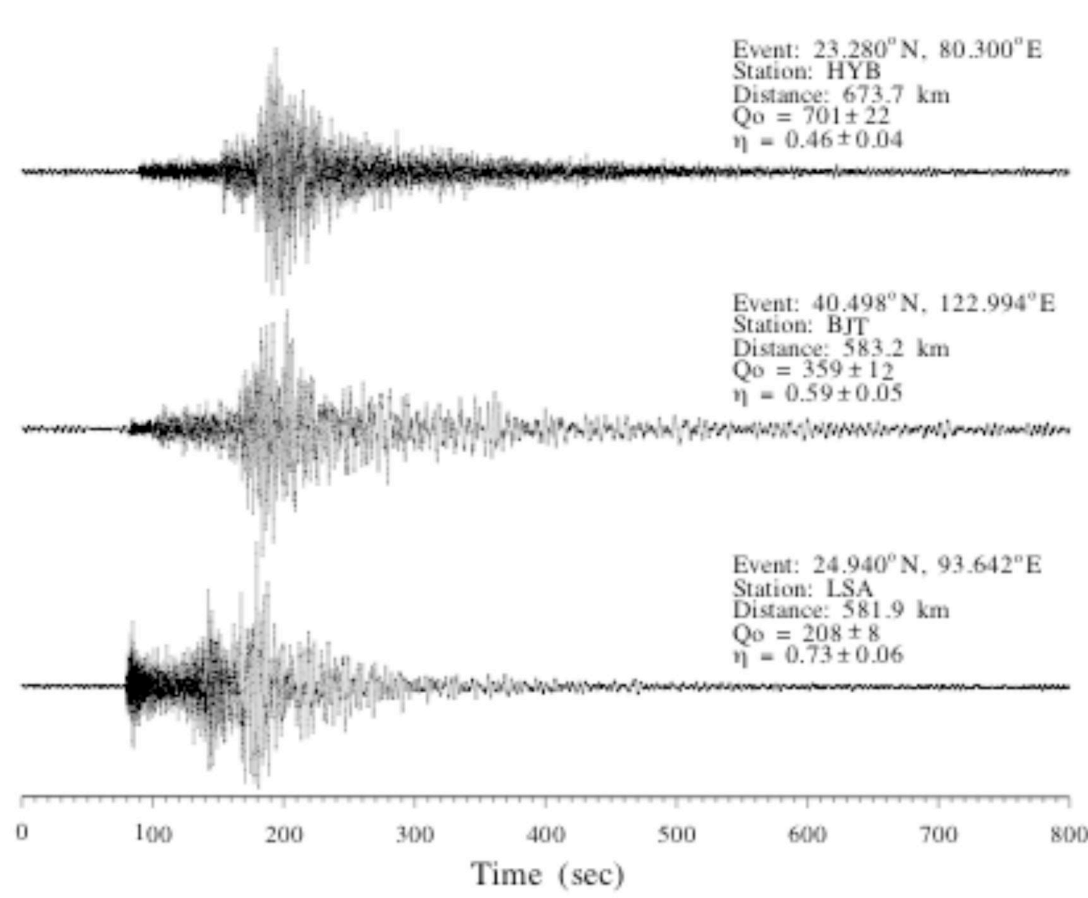


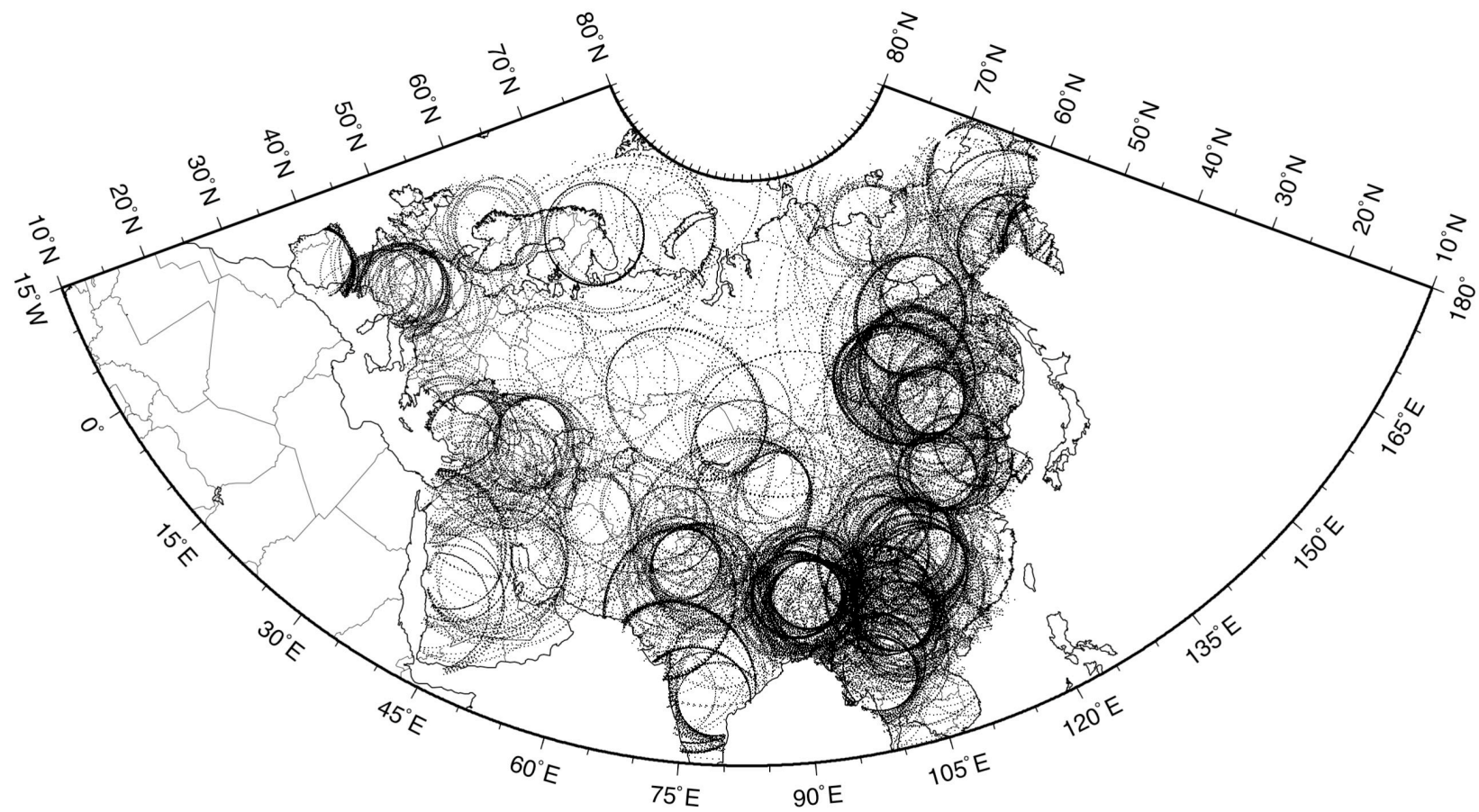
Lg Coda Q

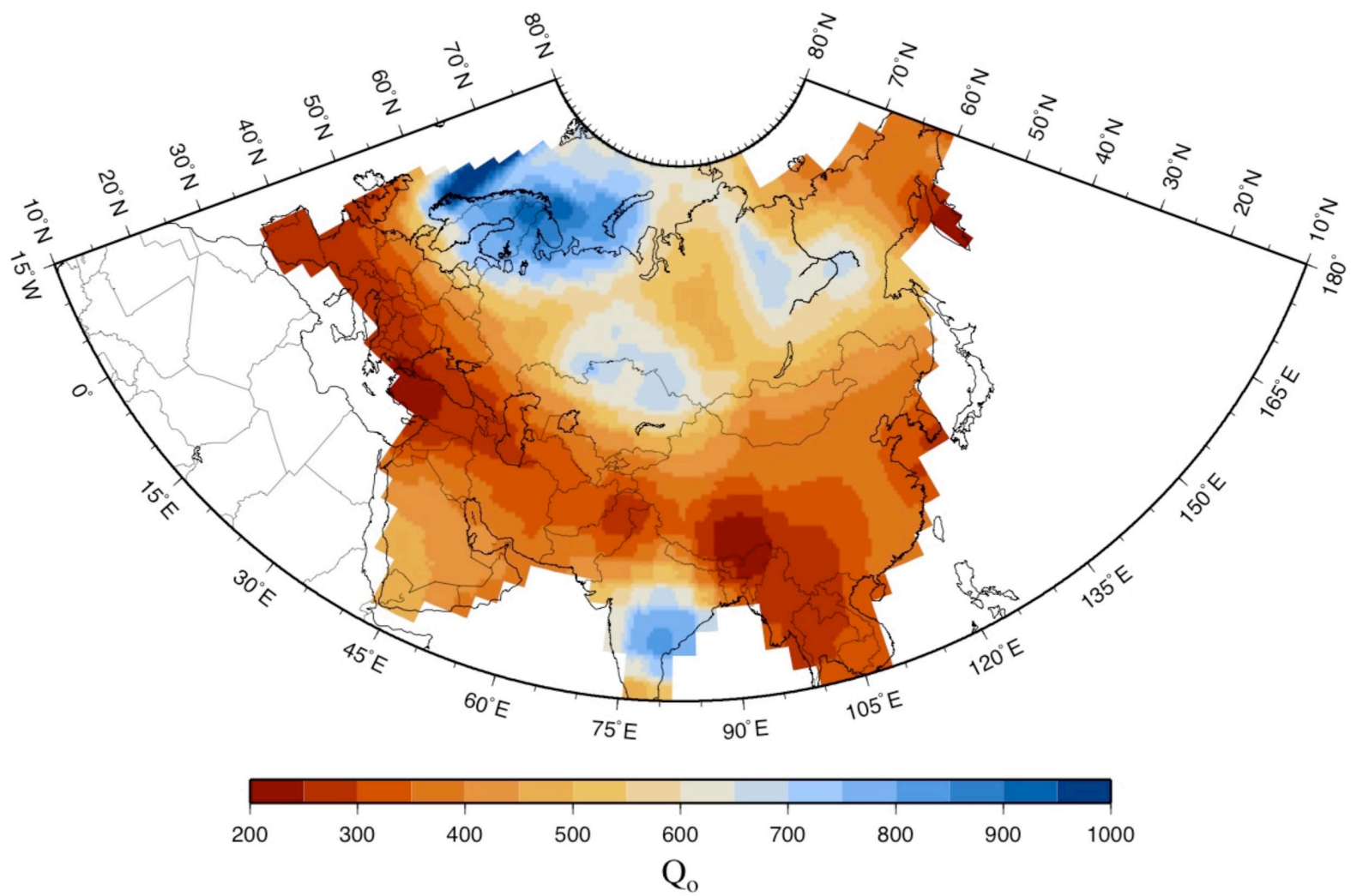
Factors that Affect Lg Coda Q

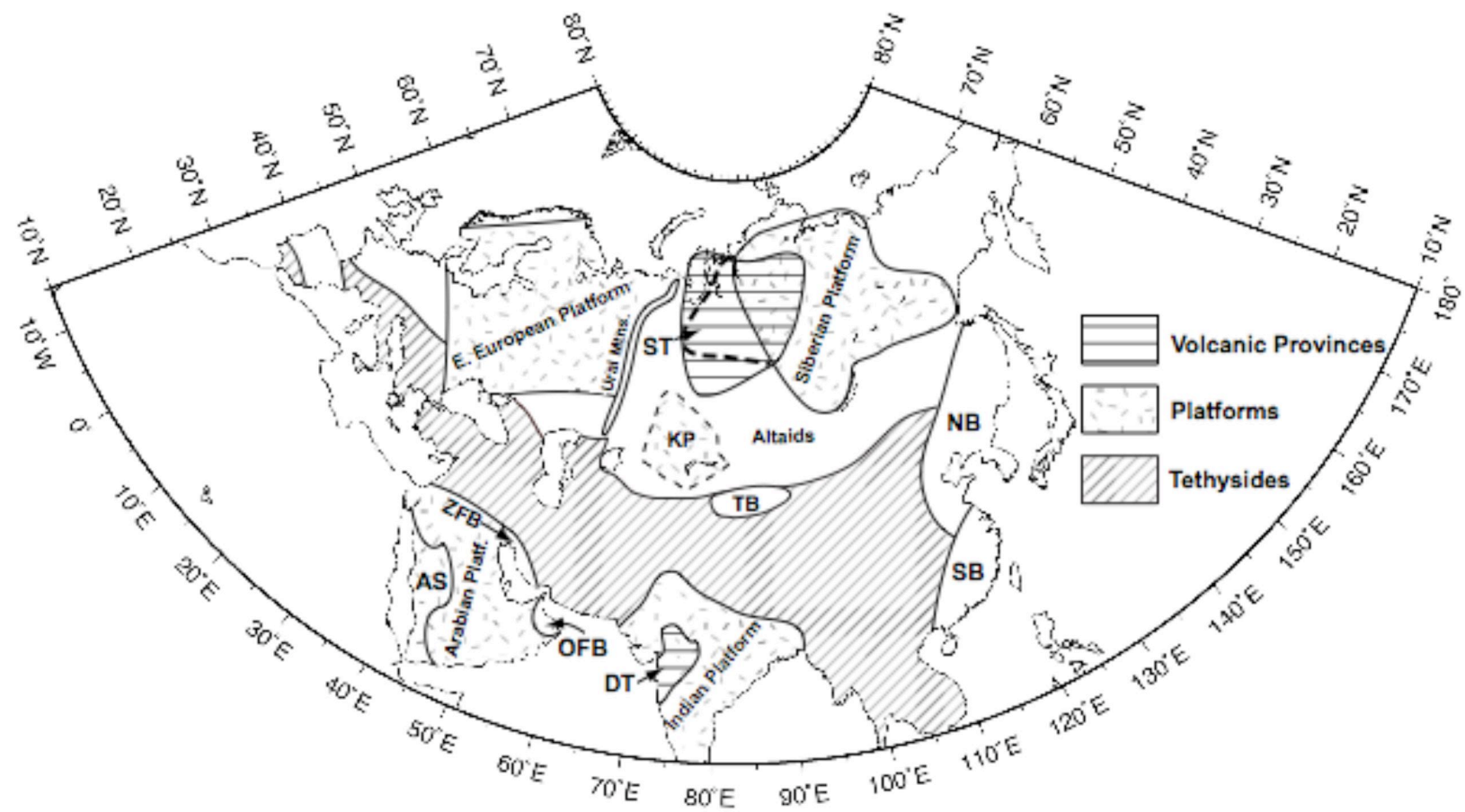
- Thick sedimentary basins, especially where young sandstones and shales overlie high-Q crustal rock
- Velocity gradients rather than sharp interfaces at the crust-mantle boundary
- Fluctuations in depth of the crust-mantle boundary (presumed but seldom observed)
- Past tectonic or orogenic activity (especially if it occurred recently)

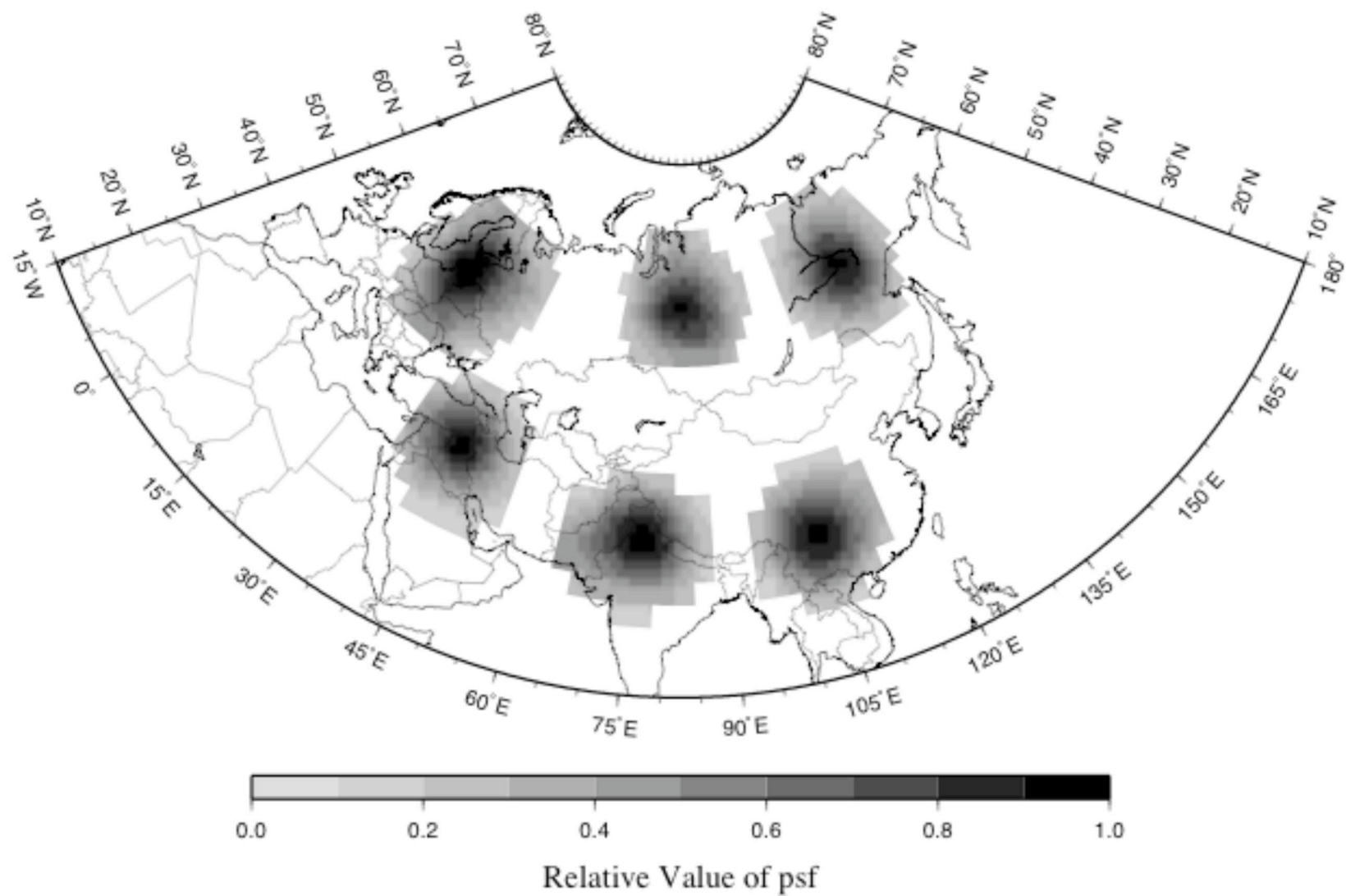


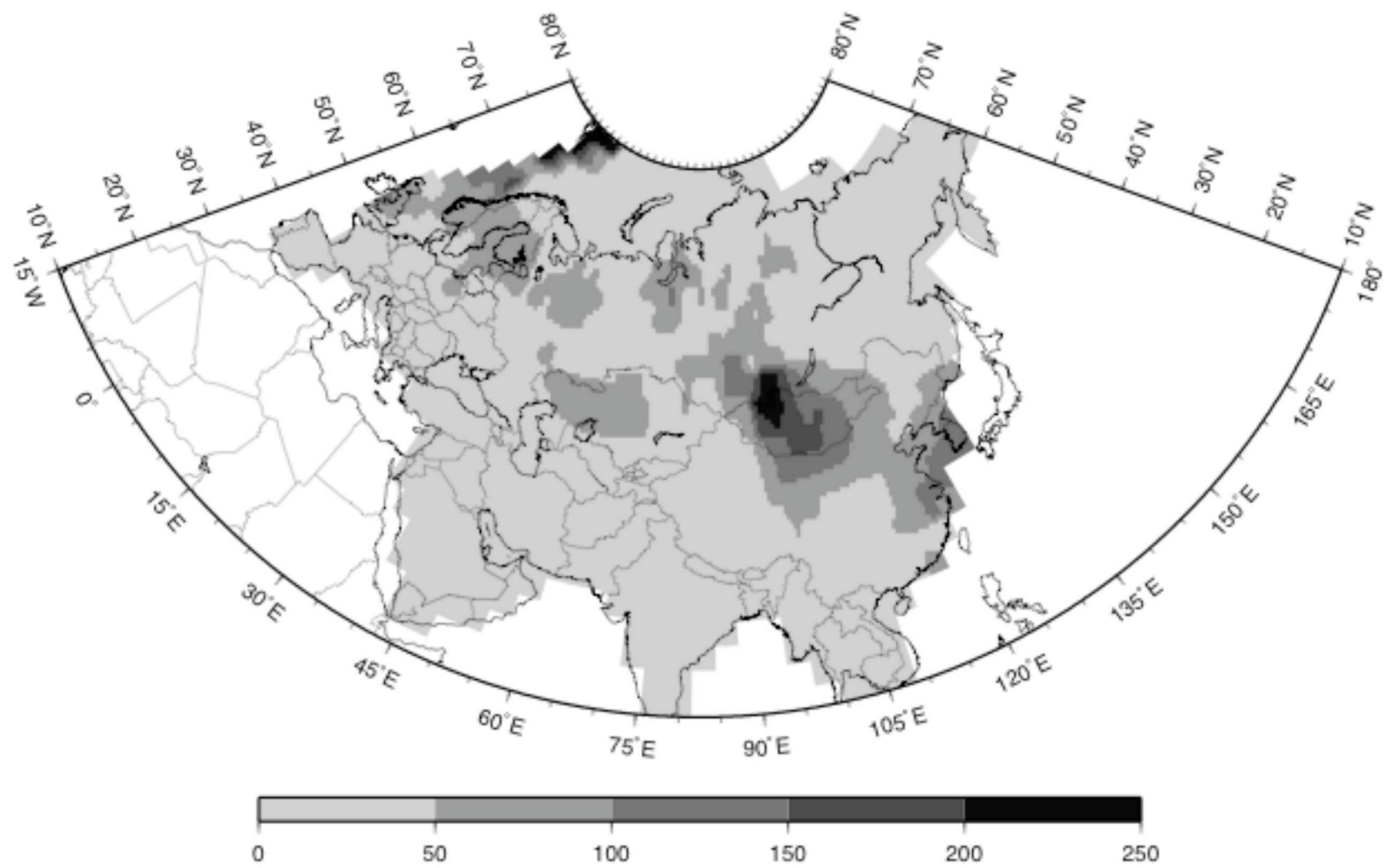




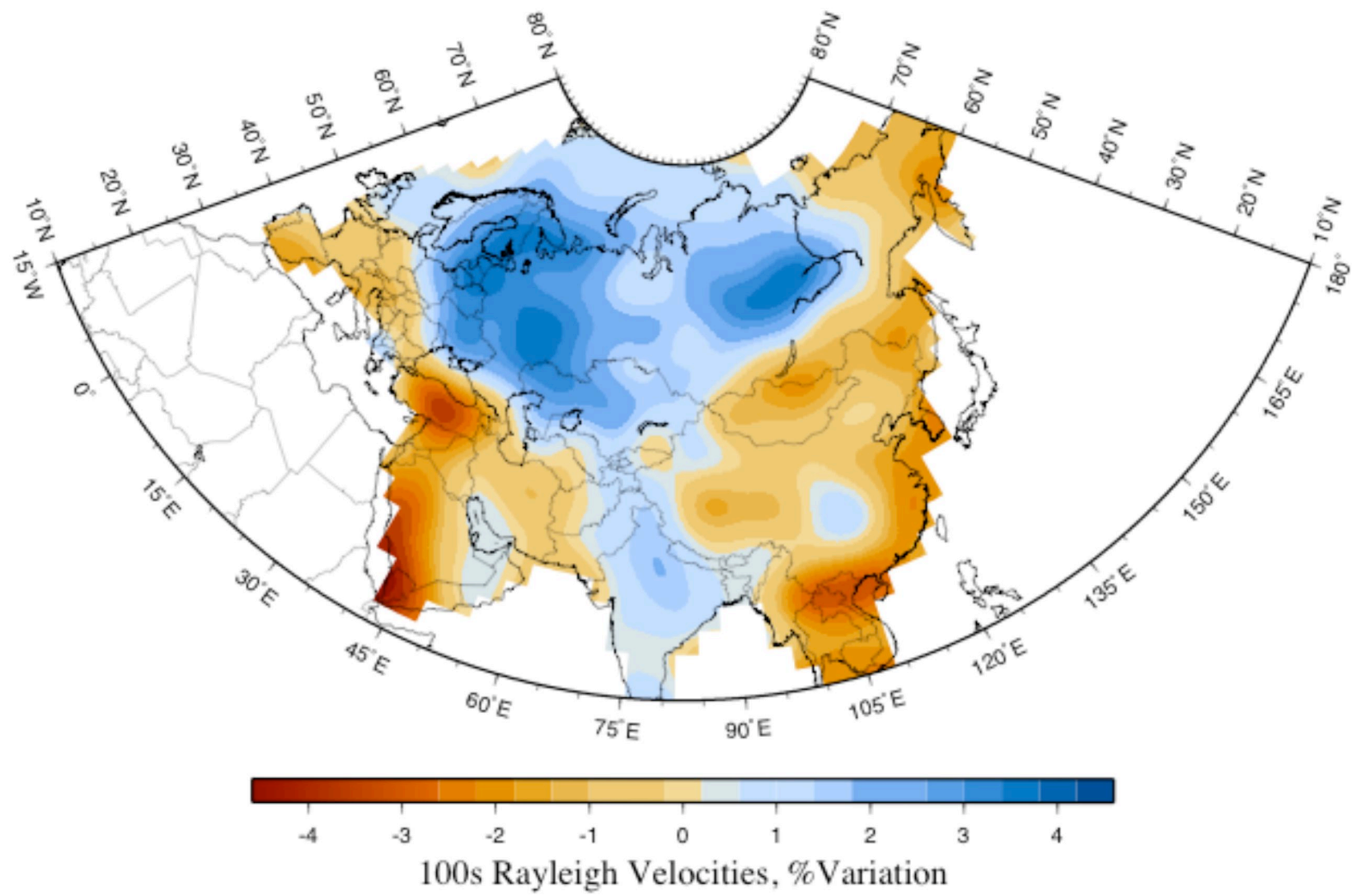


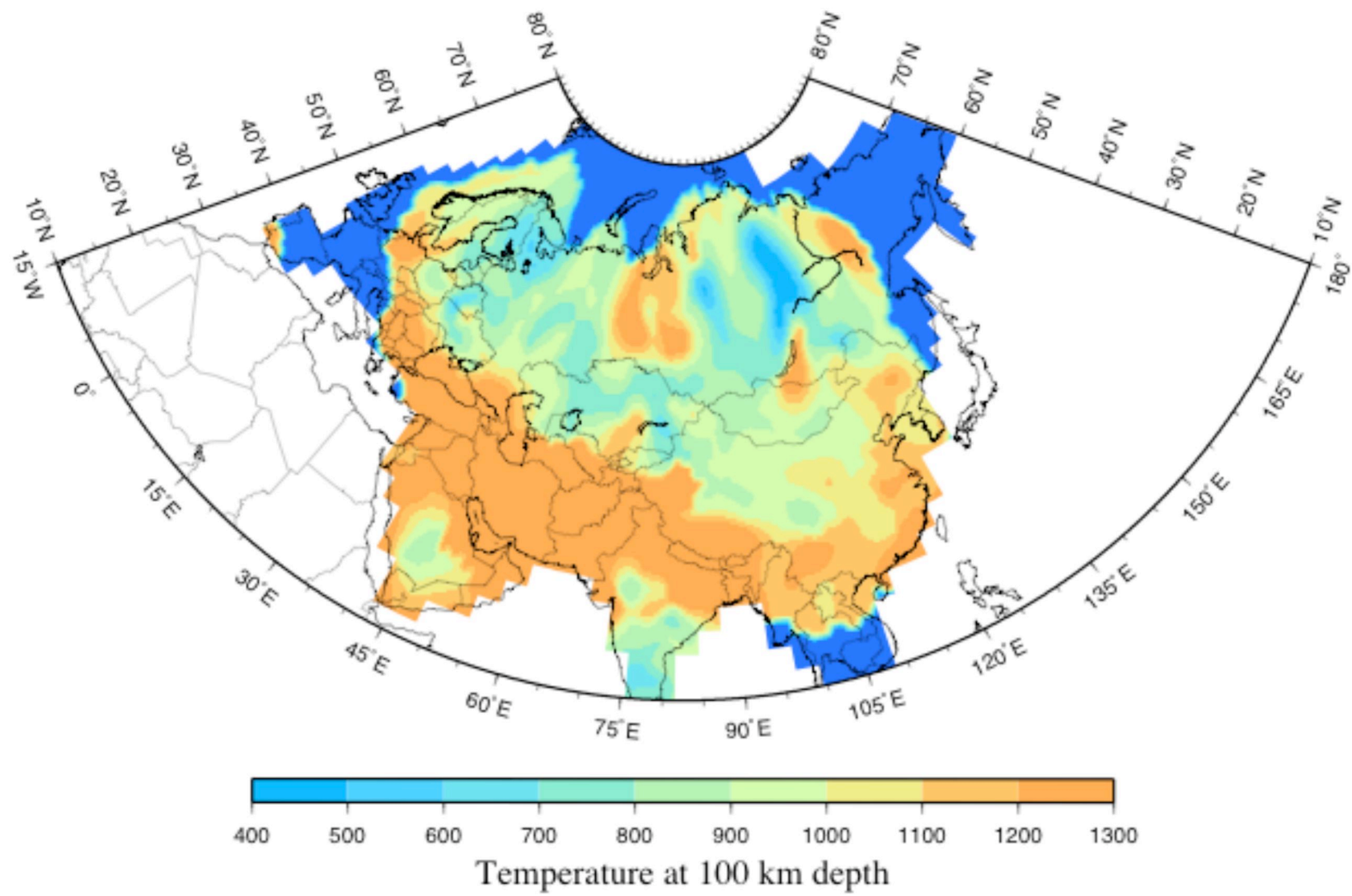


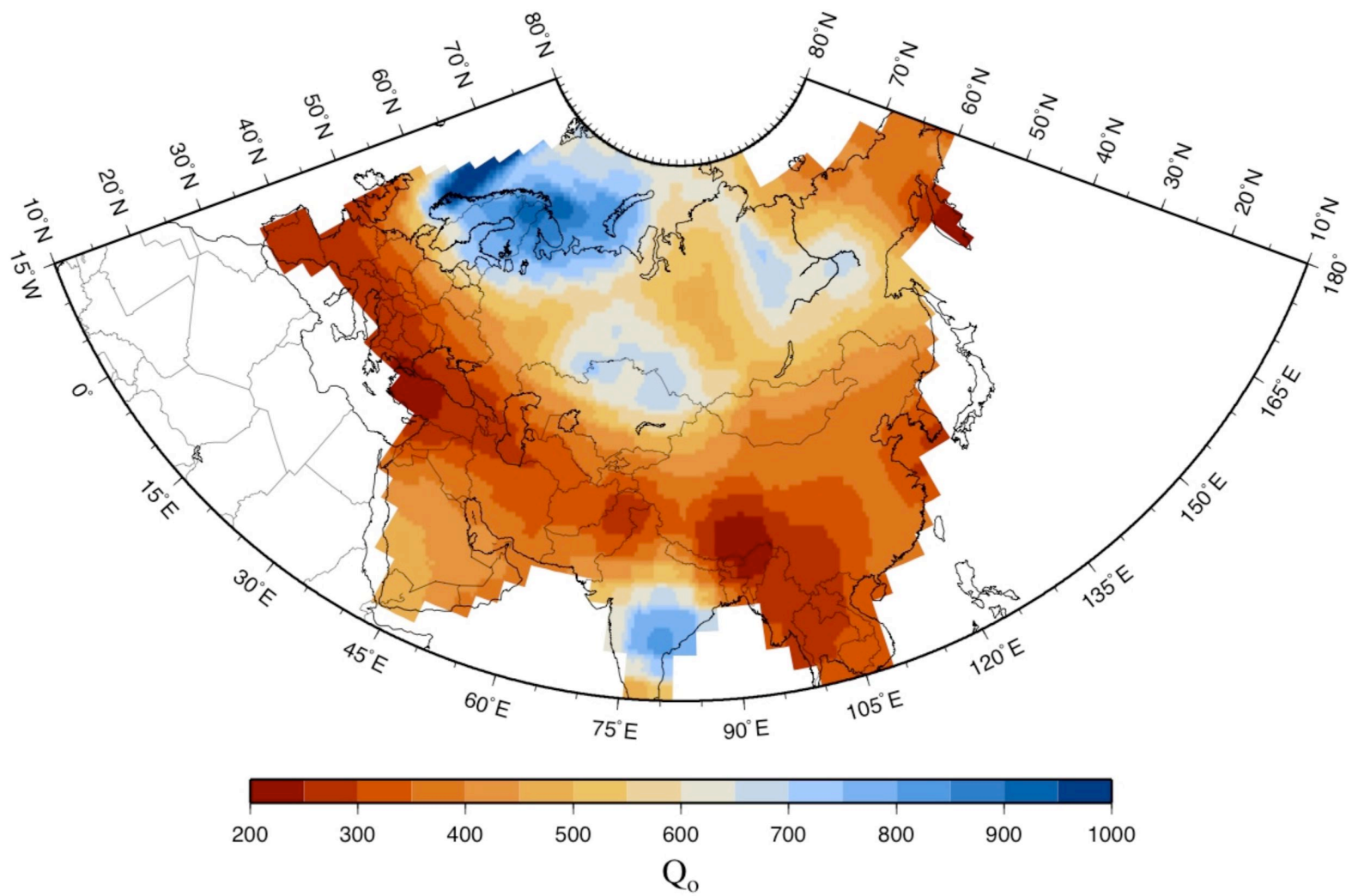


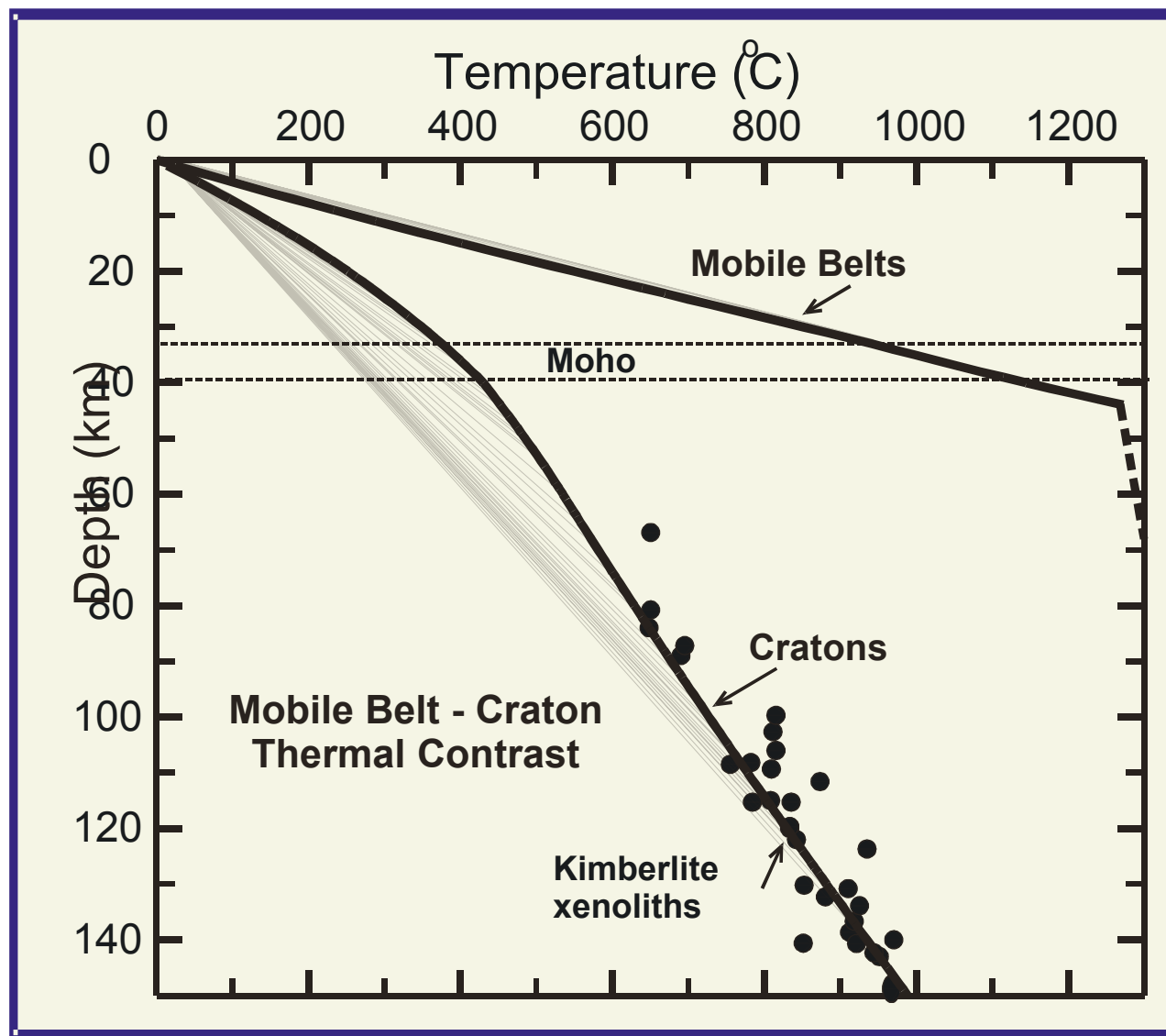


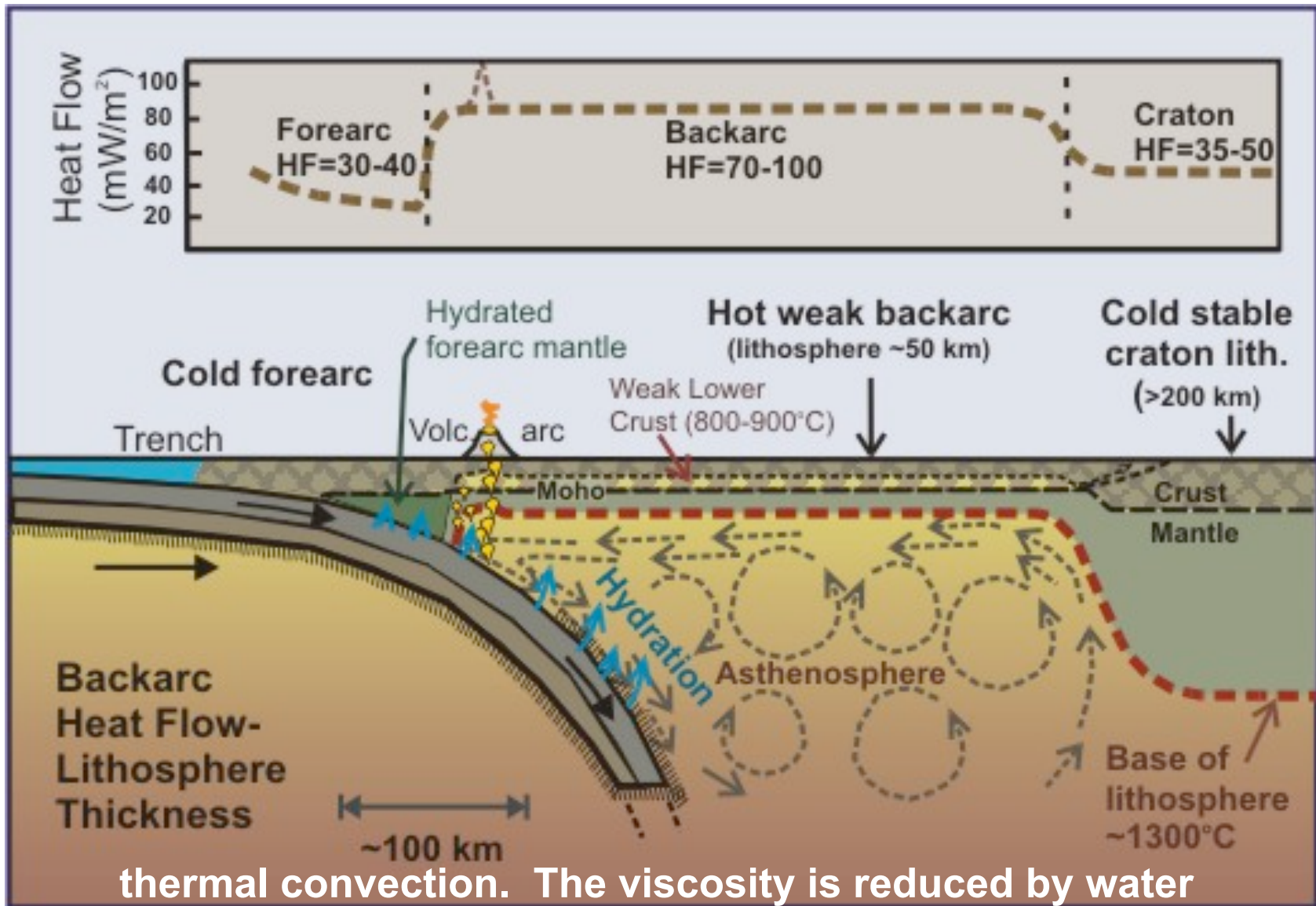
Standard Error for Q_o



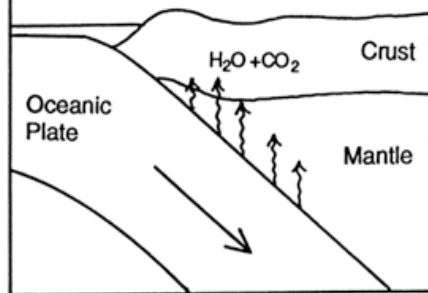




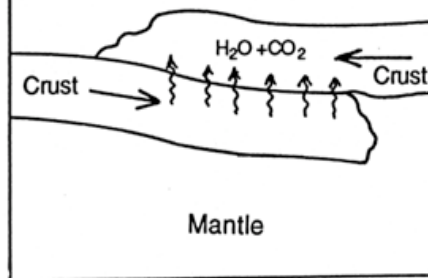




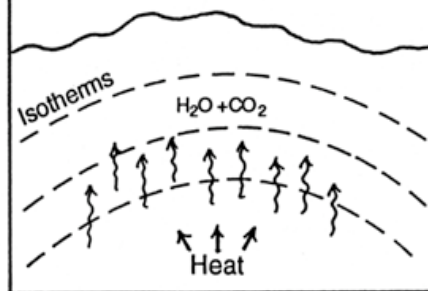
Subducting Oceanic Plate

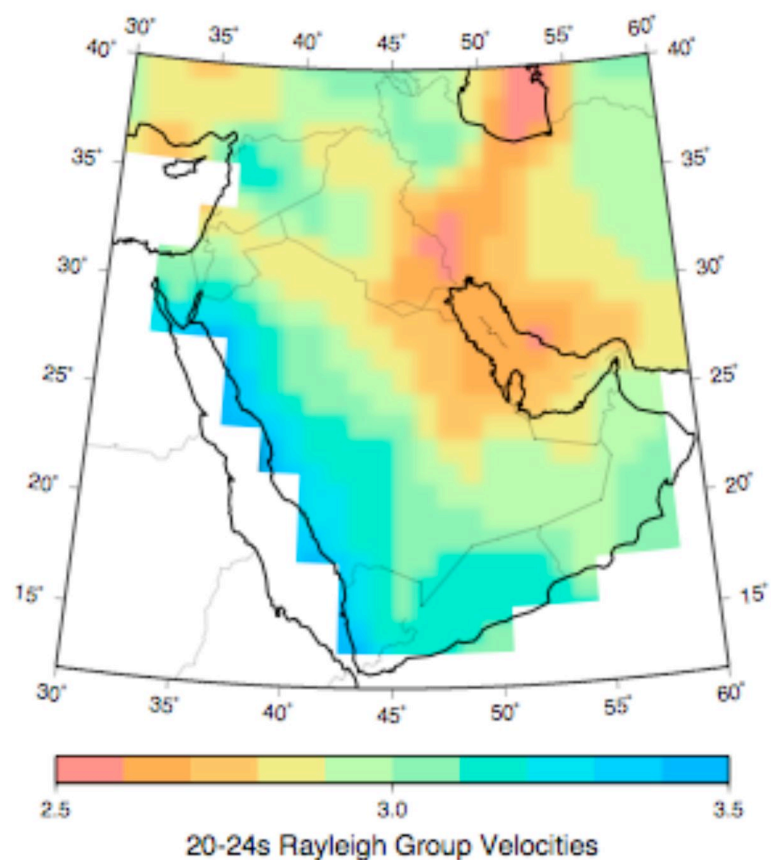
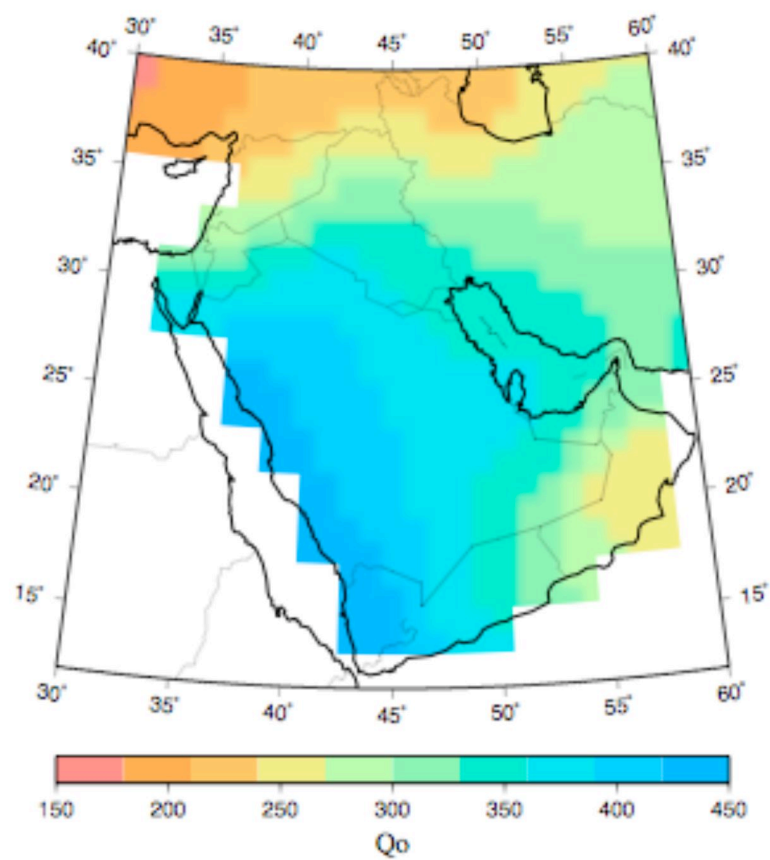


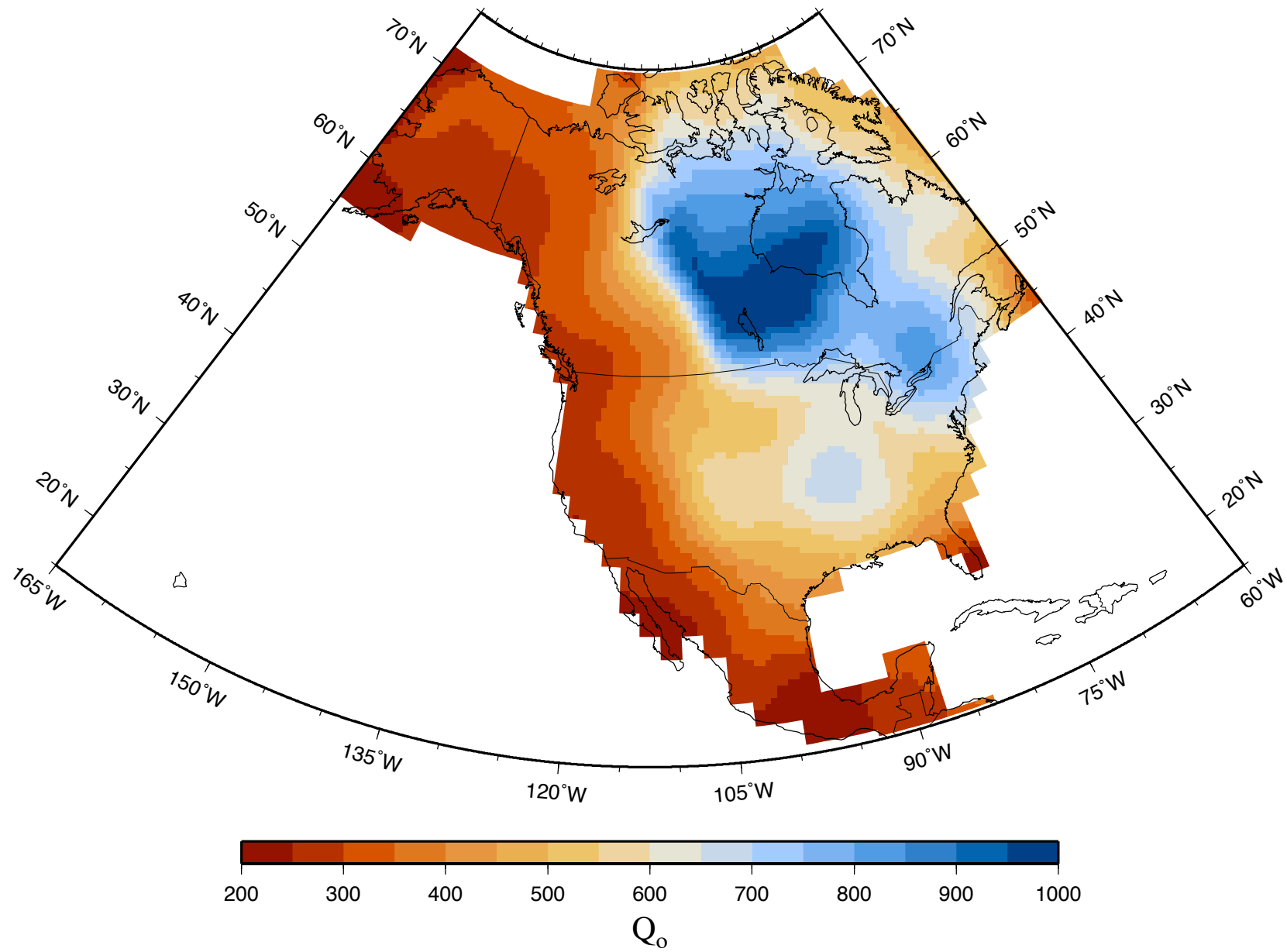
Continent-Continent Collision

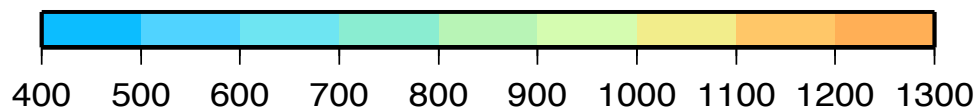
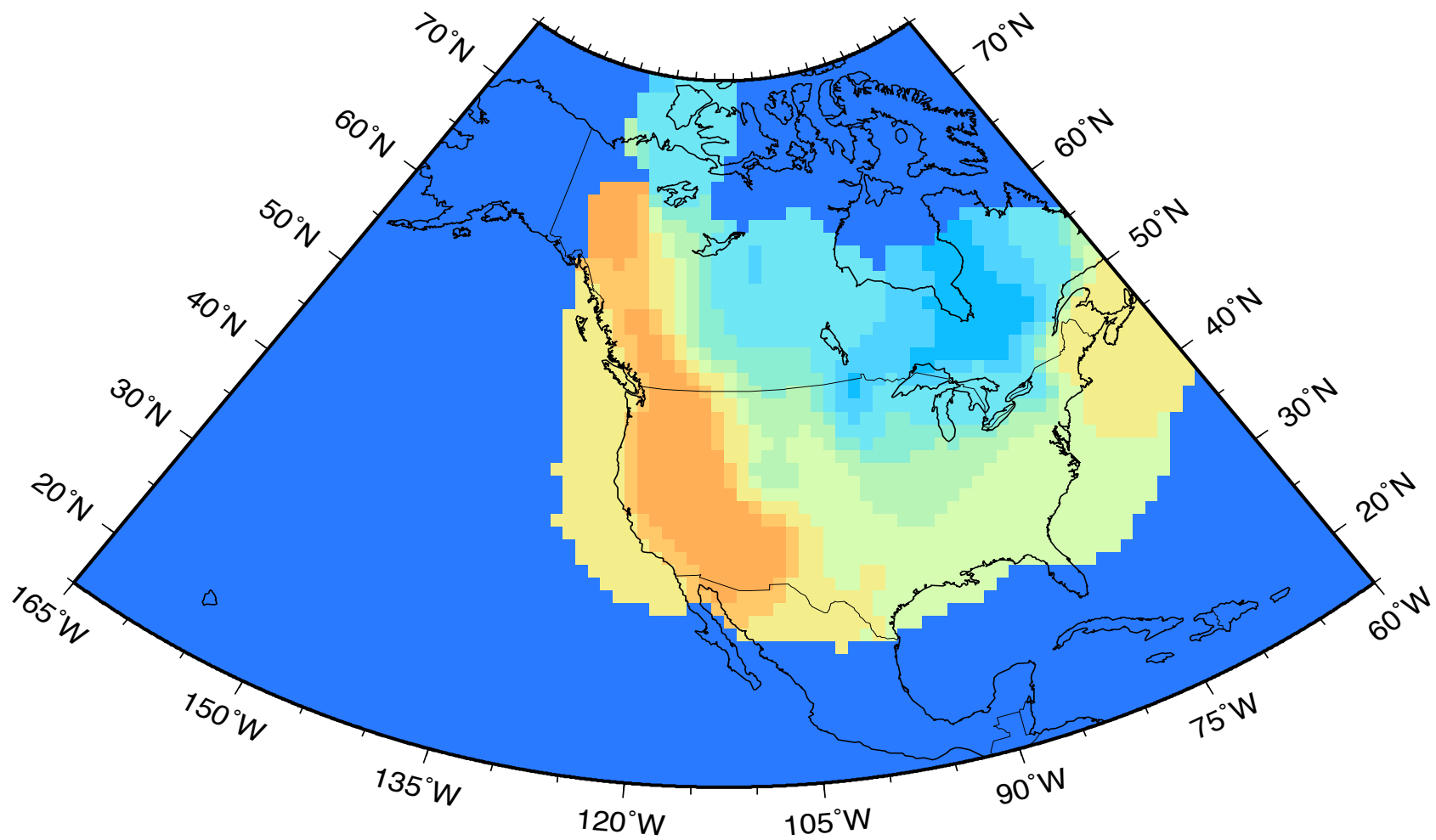


Mantle Heat Source

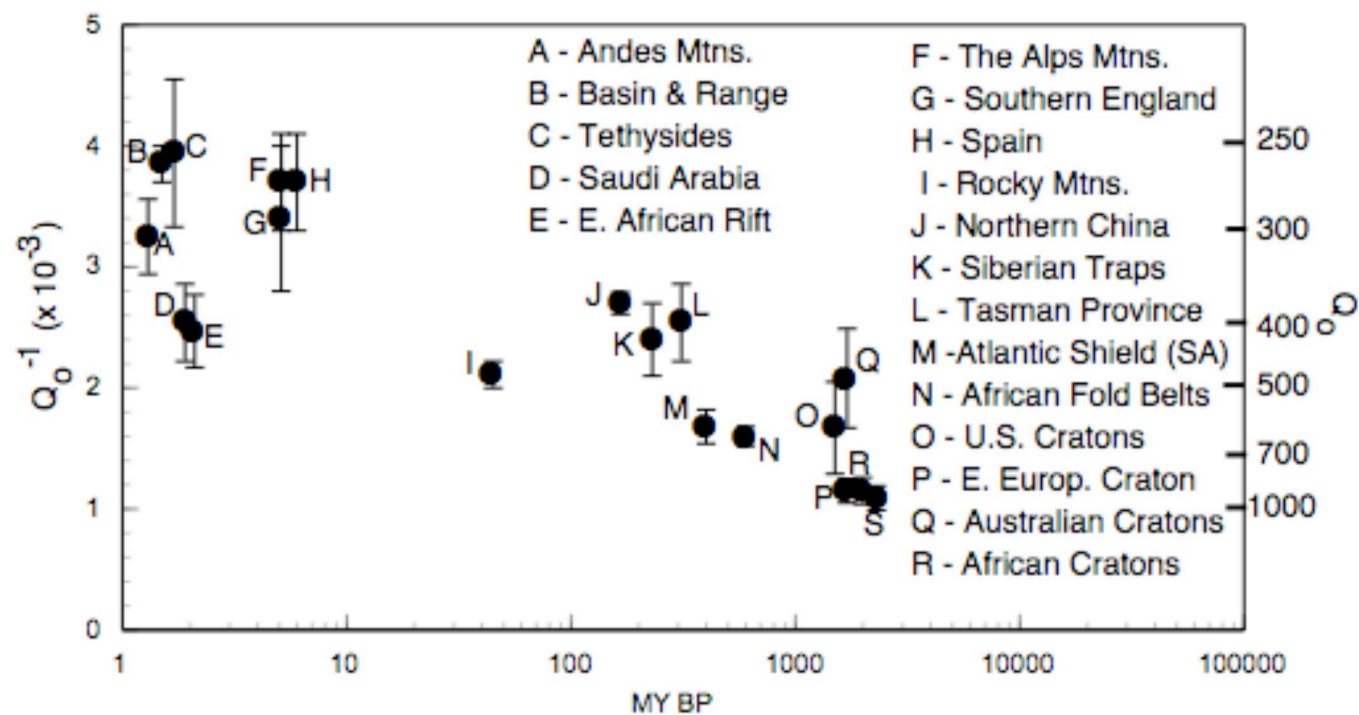








Temperature at 100 km depth



Conclusions – Lg Coda

- Lg coda Q in any crustal region is closely related to the past tectonic or orogenic history of that region.
- Q_0 in most cases is directly proportional to the time that has elapsed since the most recent major episode of tectonic or orogenic activity there.
- A process that explains almost all crustal Lg coda Q variation is that hydrothermally generated fluids released during tectonic or orogenic activity travel at a relatively quick rate to the crust and then dissipate much more slowly.