Temperature and composition are two major causes for subsurface seismic anomalies. Positive temperature anomalies will lead to a reduction in both attenuation and velocity; however, compositional anomalies should not necessarily produce a strong correlation in attenuation and velocity. As a result, by combining velocity and attenuation structure we can distinguish between compositional and temperature anomalies. Using efficiency tomography and Q tomography, I have constructed Sn attenuation models for two continental-continental collision zones, the northern Middle East and the eastern Tibetan Plateau.

The Tibetan Plateau was formed by the continental collision between Indian and Eurasian plates that has been going on at least since ~50Ma. Two tomographic techniques have been used to determine the attenuation structure of the uppermost mantle beneath the eastern Tibetan Plateau. I observe lateral heterogeneity of Sn attenuation beneath the southern Tibetan Plateau that indicates a complex geometry of the underthrusting Indian continental lithosphere (UICL). Sn is blocked with relative low Q values across the Qiangtang block and Songpan-Ganzi block indicating a hot and weak lithosphere. This observation can be caused by mantle upwellings induced by the sinking slab detached from the UICL.

The Turkish-Iranian plateau and Zagros, the main tectonic feature of the northern Middle East, was formed as a result of the continental collision between the Arabian and Eurasian plates since Early Cenozoic (23-35Ma). I have collected a large Sn waveform data set in the northern Middle East that I have quality controlled using both automated and manual approaches. Two tomographic techniques have been used to determine the attenuation structure of the uppermost mantle. I observe inefficient/blocked Sn and low Q values in the Turkish-Iranian plateau indicating a hot and thin mantle lithosphere. Intrinsic attenuation is the dominant uppermost mantle shear wave attenuation mechanism beneath the eastern Anatolian plateau and Lesser Caucasus. Partial melting appears to be the main cause of high attenuation in two of the regions. Scattering attenuation appears to be the dominant mechanism in the Zagros. The high attenuation in the Iranian plateau is likely not caused by partial melting thus the seismic anomalies in the uppermost mantle are likely compositional.

Data censorship is a common problem in seismic attenuation studies. Discarding blocked Sn paths will cause left censored data problem and the resulting model will be biased to high Q values. Using Level of Detection Divided by Two (LOD/2) technique, I am able to obtain lower Q values and smoother variations in the resulting models comparing with censored models.