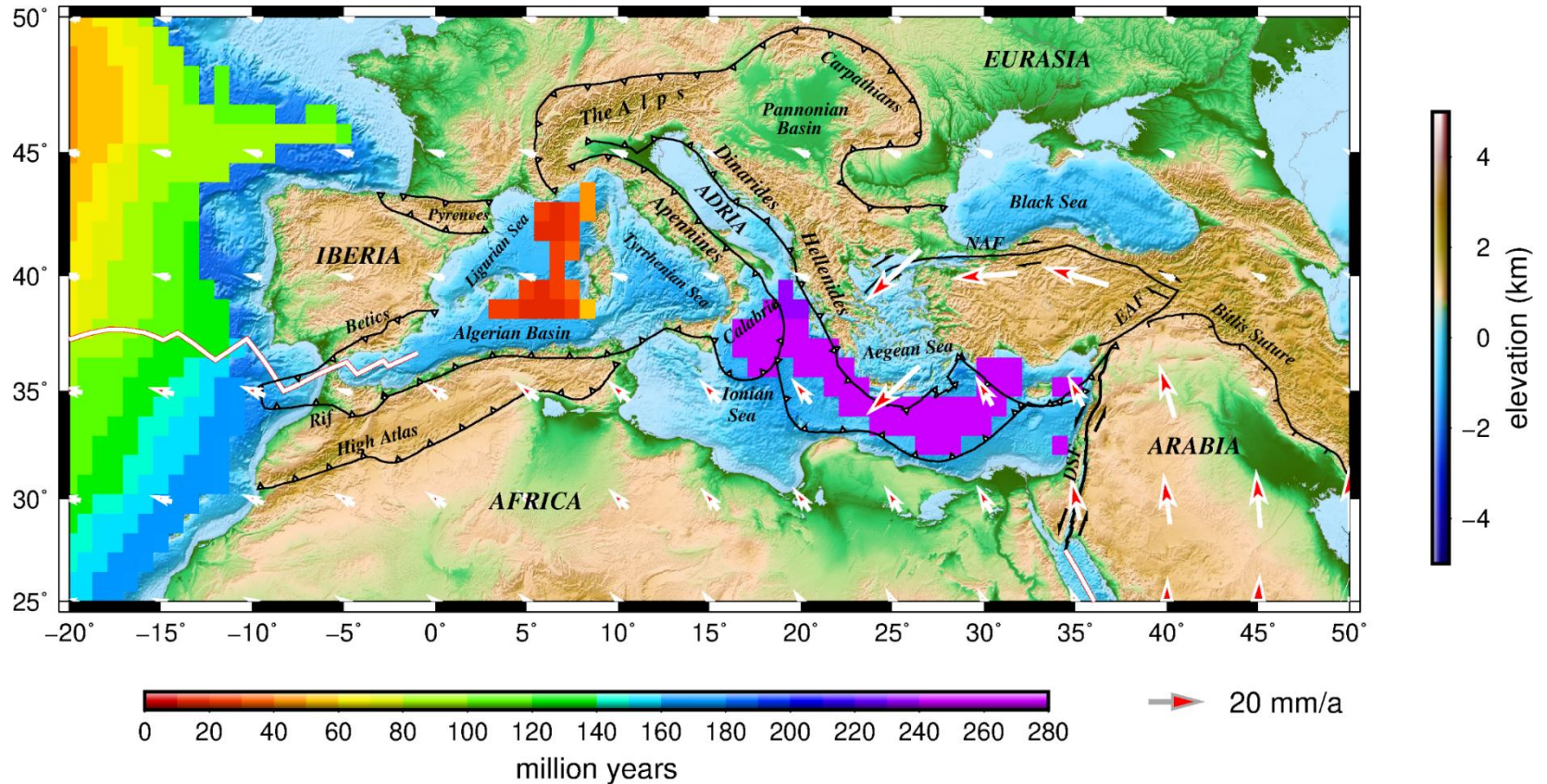


Shallow Asthenospheric Volumes in the Circum-Mediterranean and their Relation to Intraplate Volcanism and Topography

*T. Meier, A. El-Sharkawy (University Kiel),
S. Lebedev (DIAS), J. Behrmann (GEOMAR Kiel)*

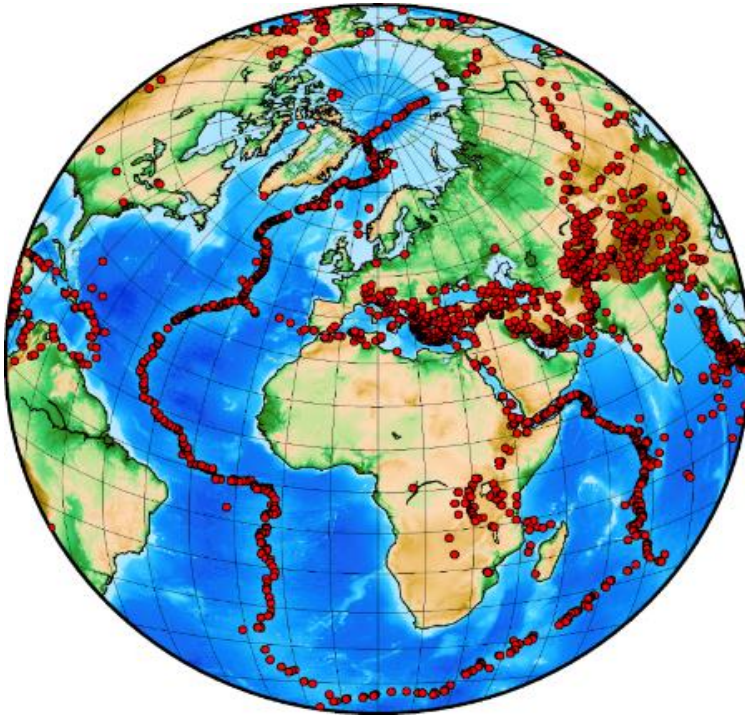
-
- Relation between thin lithosphere (shallow asthenosphere) and crustal tectonics, topography, and anorogenic volcanism?
 - Spatial distribution of shallow asthenosphere in the Mediterranean?
 - Consistent imaging of the upper mantle in the Mediterranean down to about 300 km depth by Rayleigh wave tomography
 - Unprecedentedly dense sampling with surface-wave measurements, using all available data (1990-2015)
 - Stochastic inversion of fundamental Rayleigh mode dispersion curves
 - Lateral resolution between about 75 km and 200 km
 - Vertical resolution between about 20 km and 50 km

The Mediterranean

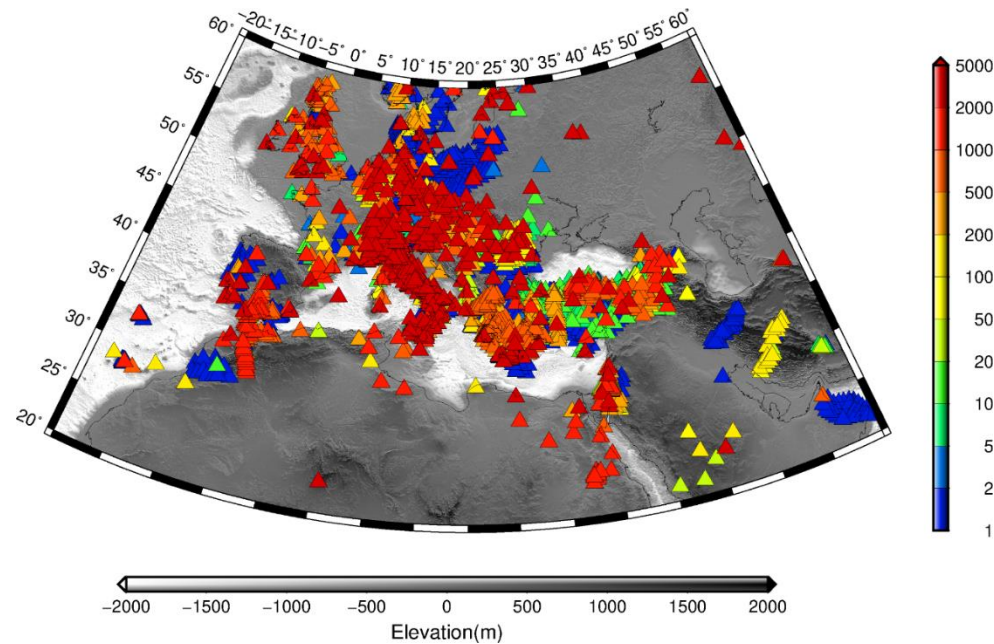


Faccenna et al., 2014
 Becker et al., 2015
 Müller et al., 2008
 El-Sharkawy et al. (submitted)

Measurement of Fundamental Rayleigh Mode Dispersion Curves



**ca. 3800 regional and teleseismic events
1990 - 2015**

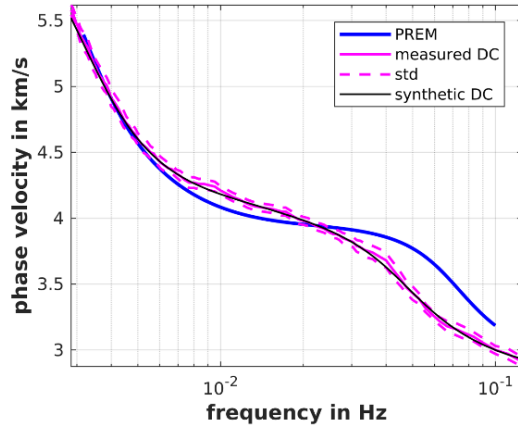


El-Sharkawy et al. (submitted)

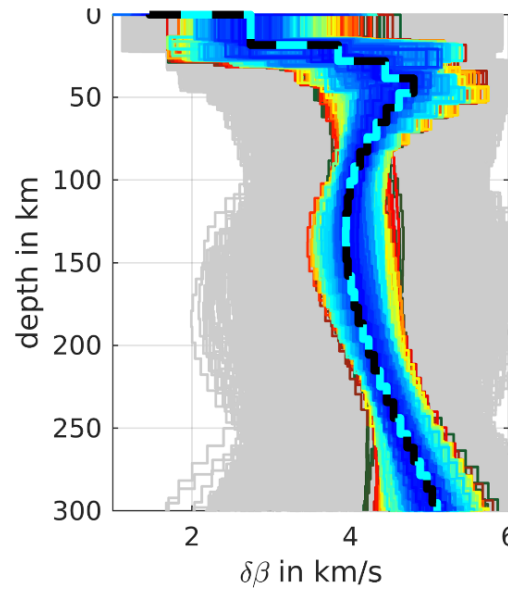
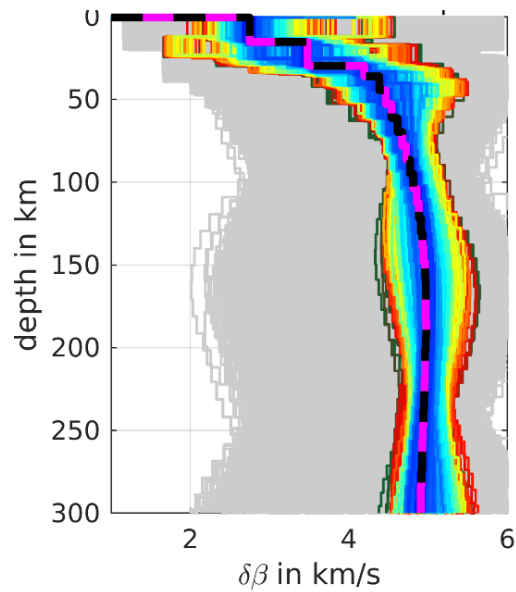
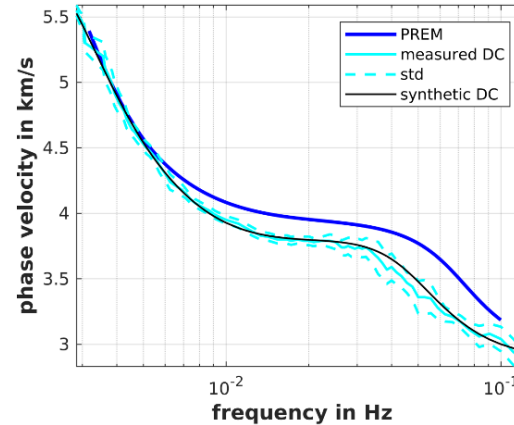
**ca. 4500 stations
ca. 3.5 M waveforms
heterogeneous station distribution and
data quality**

Stochastic Inversion of Fundamental Rayleigh Mode Dispersion Curves

Examples: Eastern Alps



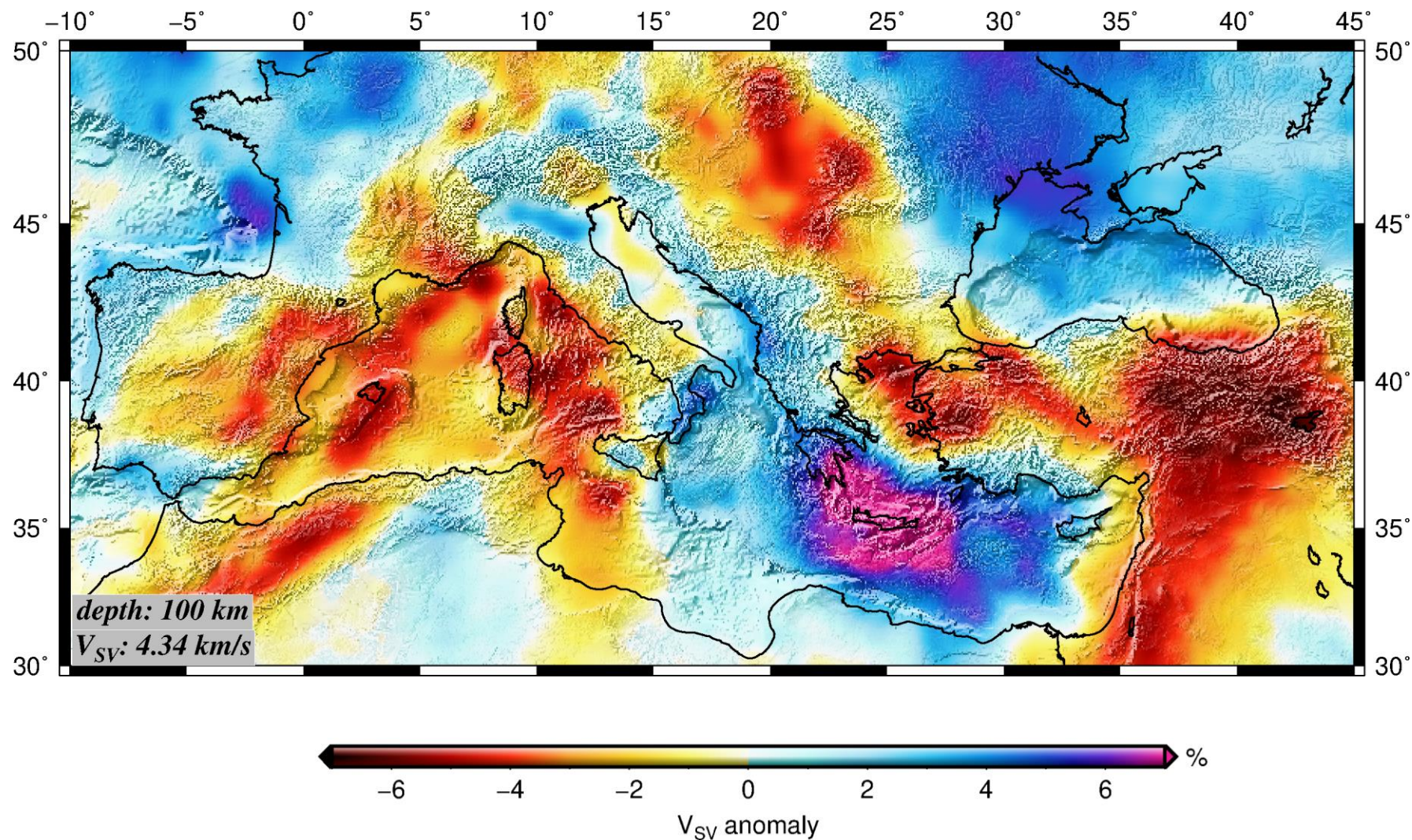
Anatolia



**Low Vs between
about 70 km and 200
km depth: shallow
asthenosphere**

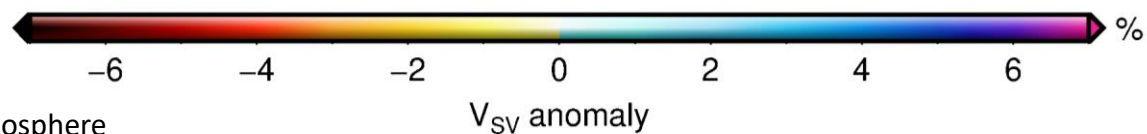
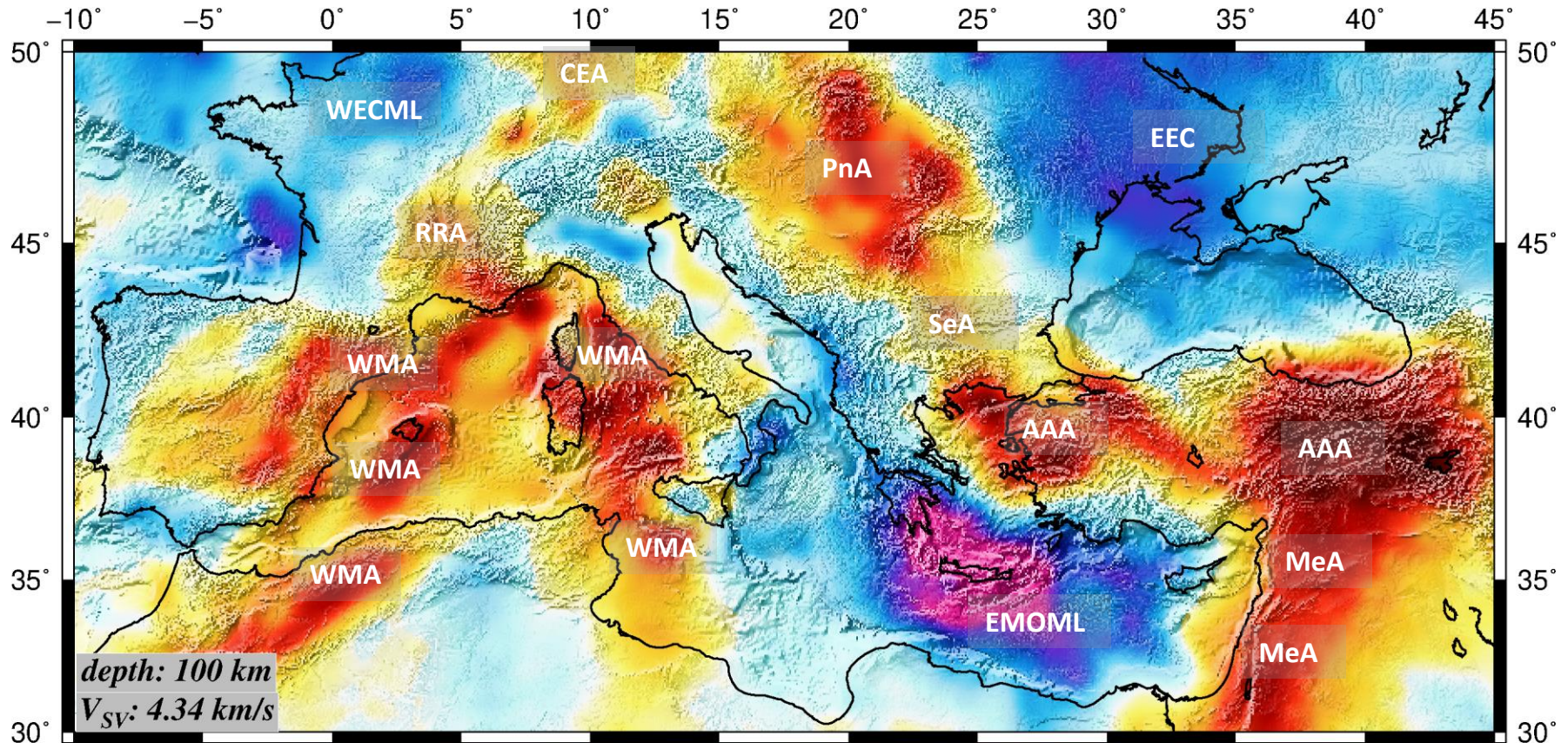
El-Sharkawy et al. (submitted)

3D Shear-Wave Velocity Model (70 km – 300 km depth)



El-Sharkawy et al. (submitted)

Shallow Asthenospheric Volumes



El-Sharkawy et al. (submitted)

AAA: Aeagean Anatolian Asthenosphere

CEA: Central European Asthenosphere

MeA: Middle East Asthenosphere

PnA: Pannonian Asthenosphere

RRA: Rhone-Rhein Asthenosphere

SeA: Serbian Asthenosphere

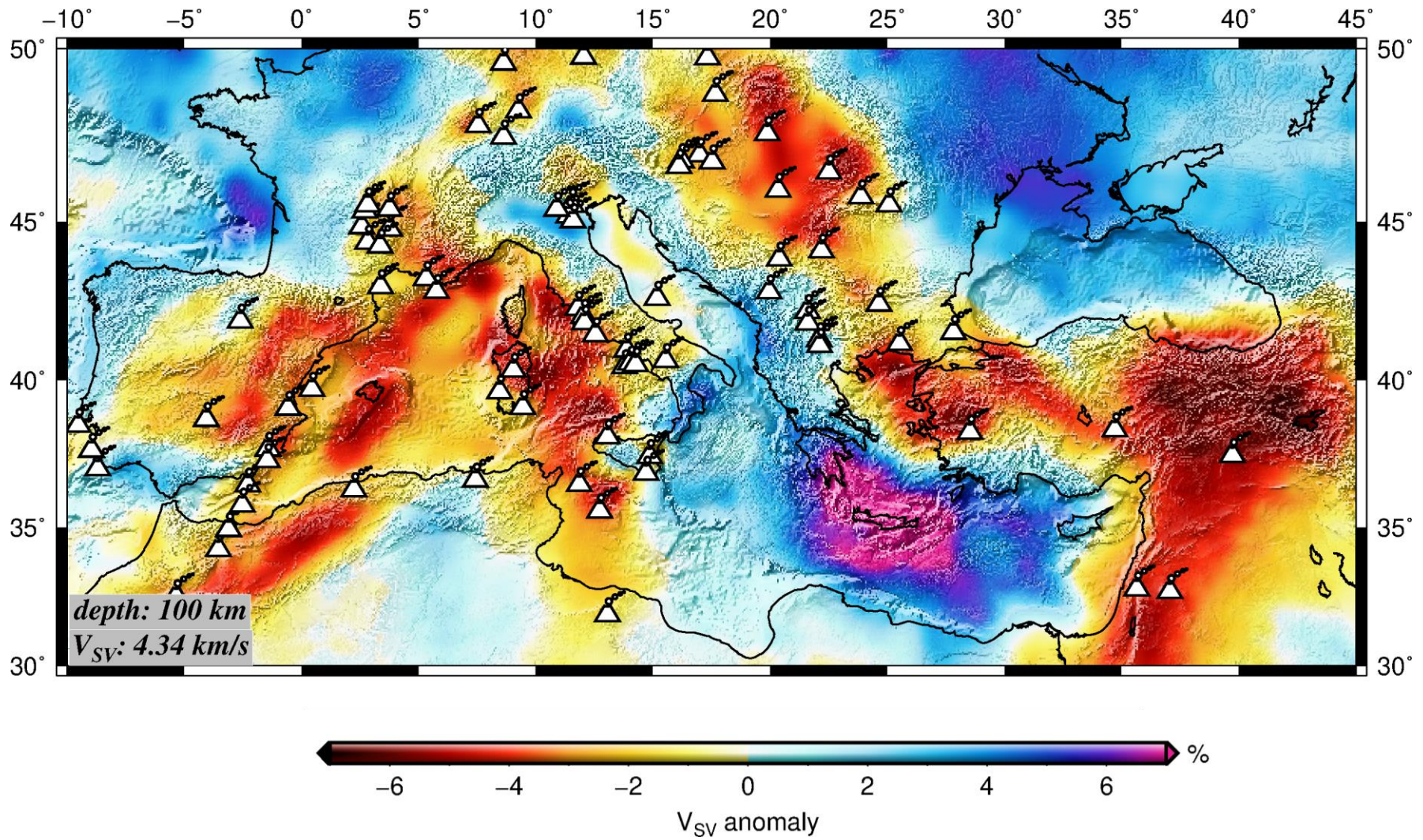
WMA: Western Mediterranean Asthenosphere

EEC: East-European Craton

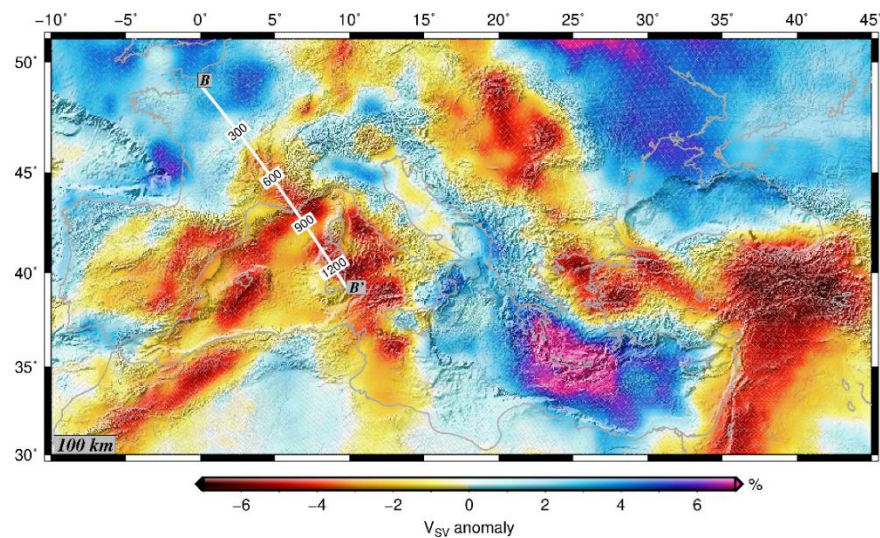
EMOML: Eastern Med. Oceanic Mantle Lithosphere

WECML: Western Europ. Cont. Mantle Lithosphere

Shallow Asthenospheric Volumes and Anorogenic Volcanism



El-Sharkawy et al. (submitted)



Shallow asthenosphere beneath Massif Central, Ligurian Sea, and Sardinia

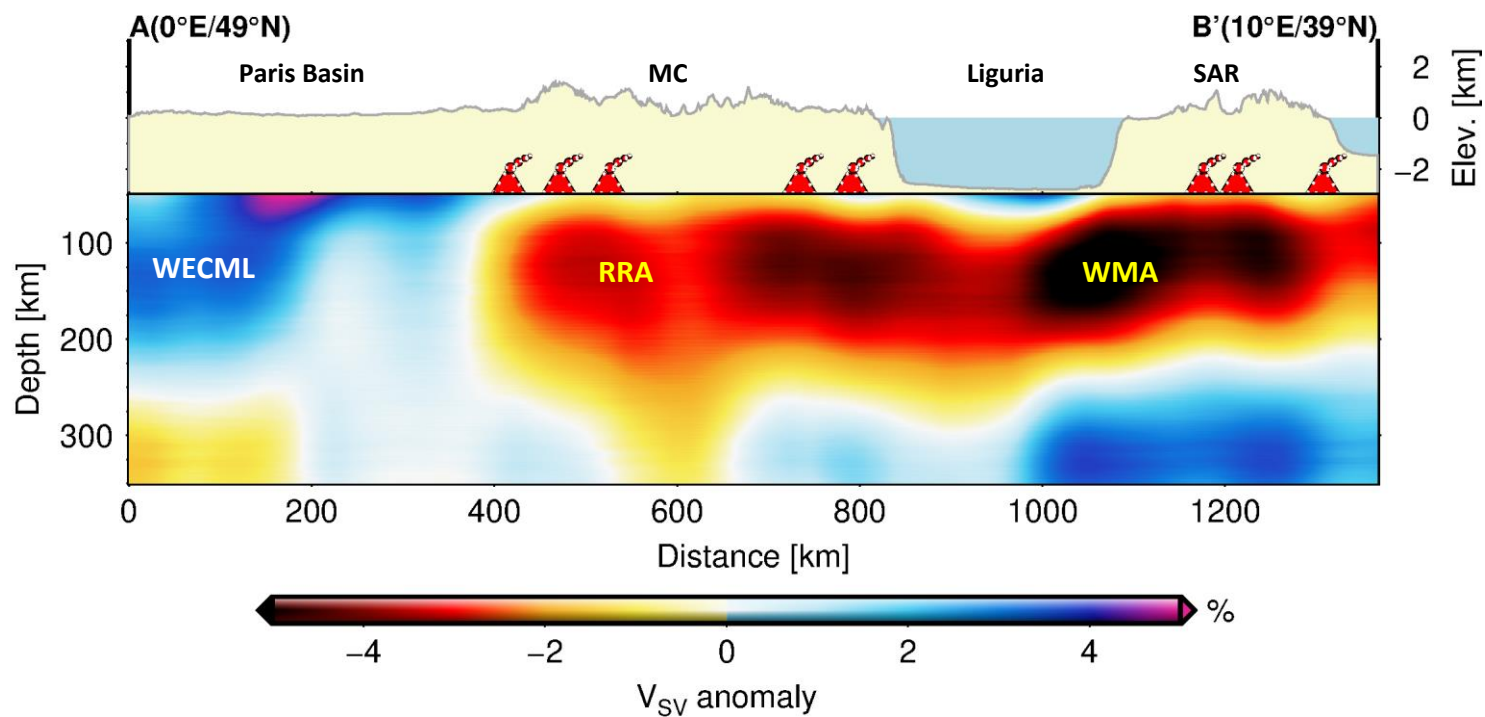
MC: Massif Central

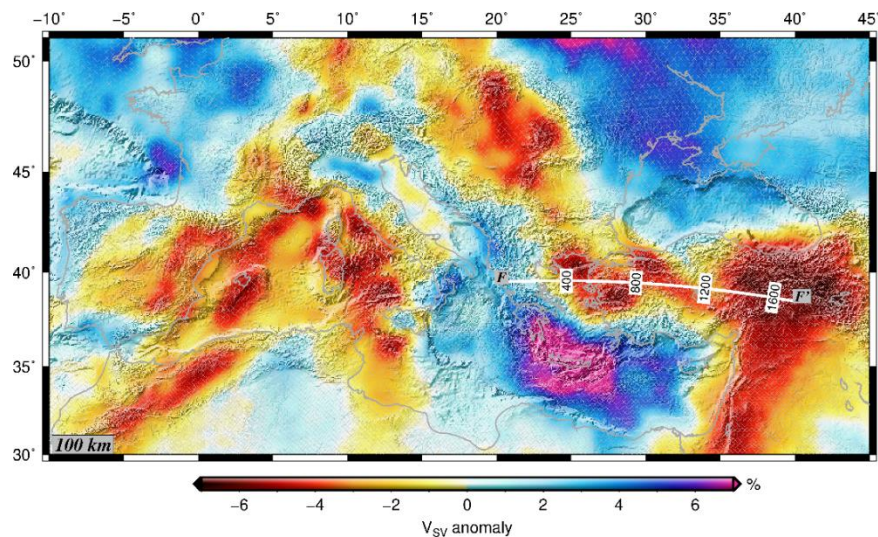
SAR: Sardinia

RRA: Rhone-Rhine Asthenosphere

WECML: Western European Continental Mantle Lithosphere

WMA: Western Mediterranean Asthenosphere



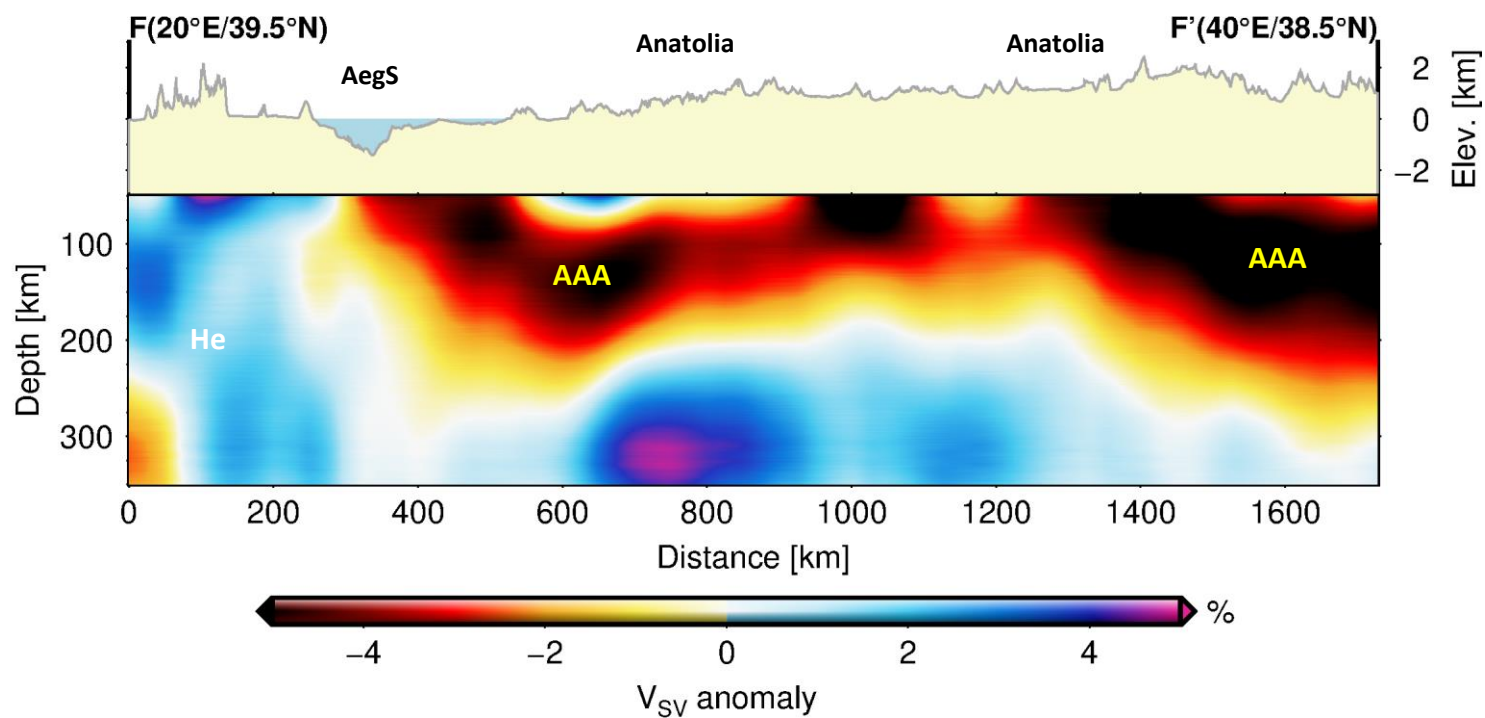


Shallow asthenosphere beneath northern Aegean and Anatolia

AegS : Aegean Sea

AAA: Anatolian-Aegean Asthenosphere

He: Hellenides Slab



Conclusions

- Almost closed circular belt of shallow asthenosphere around Mediterranean comprising of: Western Mediterranean, Rhone-Rhein, Central European, Pannonian, Serbian, Aegean-Anatolian, and Middle East Asthenosphere
- Shallow asthenosphere and elevated topography:
 - Continental Plateaus (Iberia, Anatolia, central European mid-mountain ranges)
 - Continental Shoulders (e.g. Atlas, Bohemian Massive, Middle East)
- Shallow asthenosphere and subsidence in extensional regimes:
 - Graben systems (Rhone-Rhein Graben)
 - Back-arc basins (Western Mediterranean, Pannonian Basin, Aegean)
- Spatial correlation: shallow asthenosphere and anorogenic volcanic fields
- Growing of continental lithosphere by cooling (e.g. North German Basin, Paris Basin)