

**Opposite symmetry in the lithospheric structure of the Alboran and Algerian basins and their margins (Western Mediterranean): Geodynamic implications**

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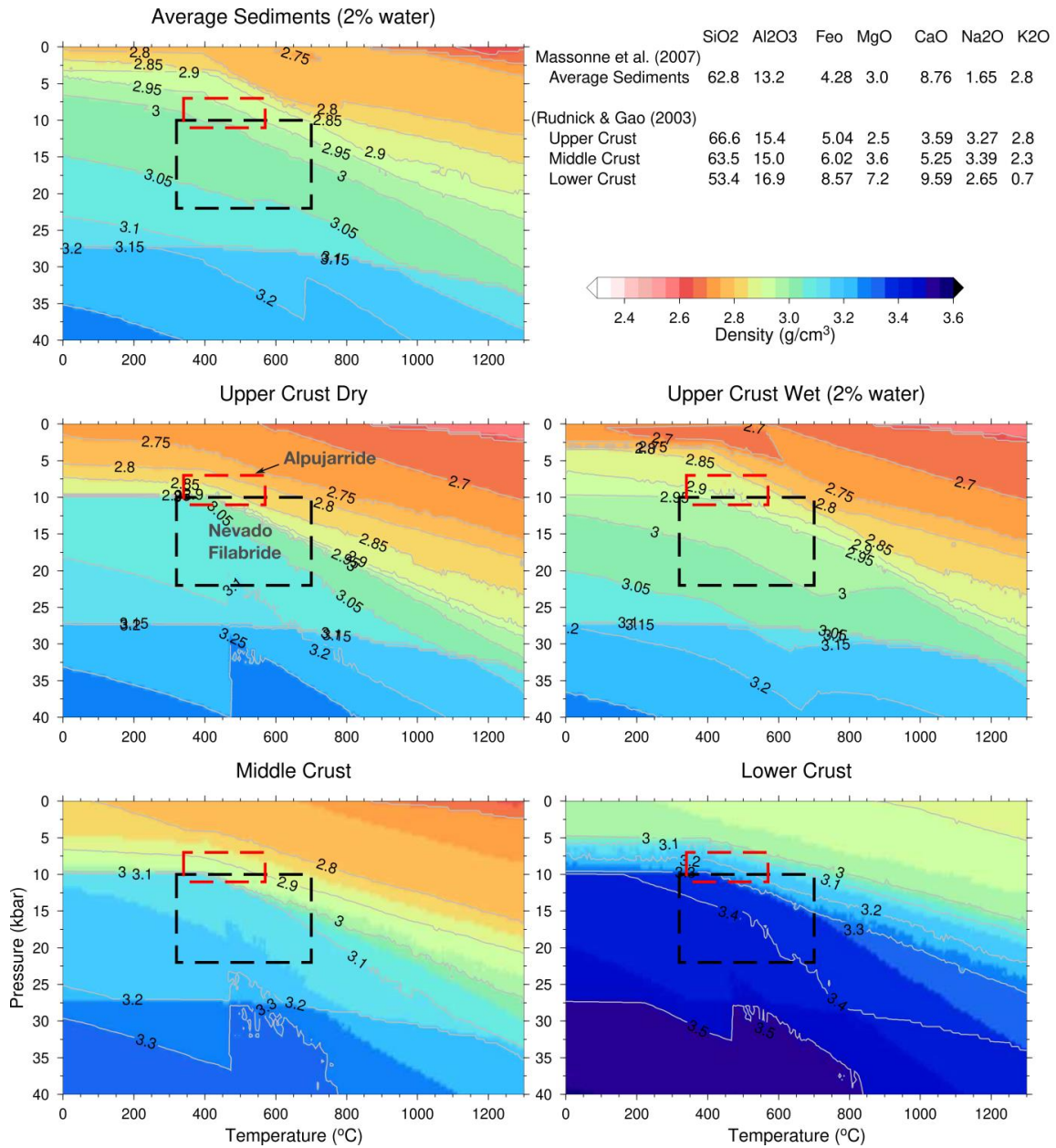
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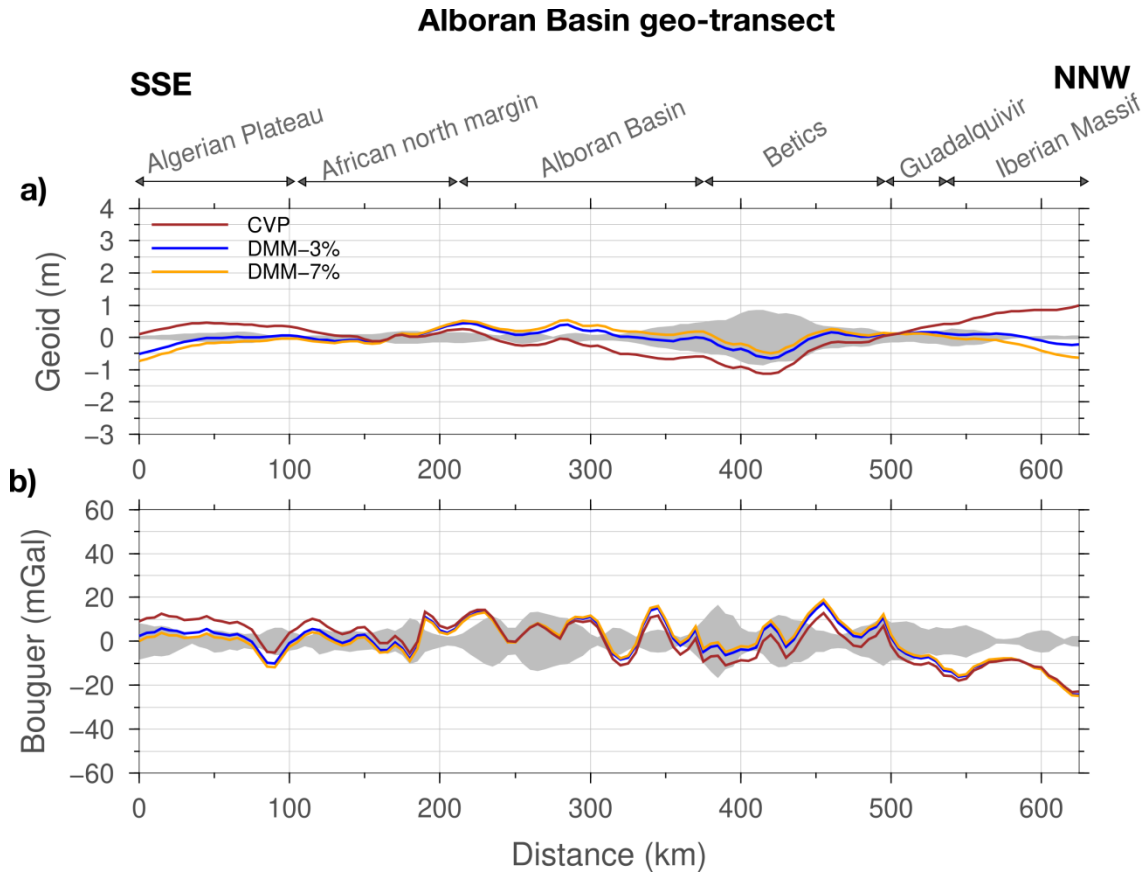
Figures S1 to S8

**Introduction**

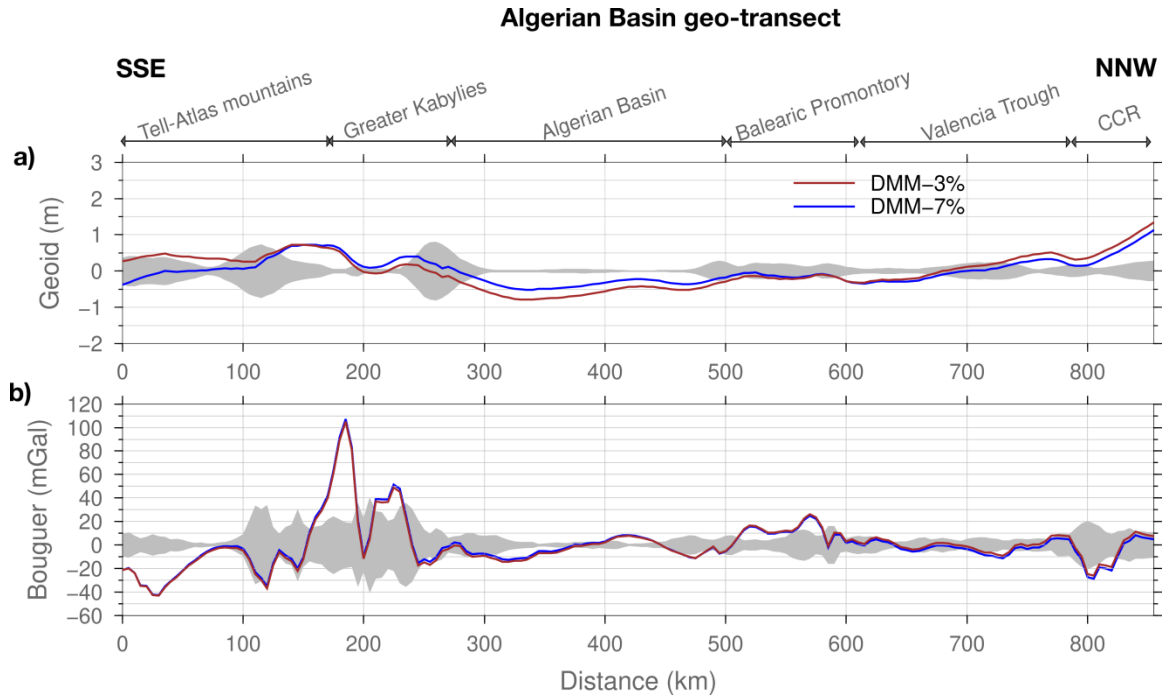
This file includes eight supplementary figures which are used to support the main text in the manuscript.



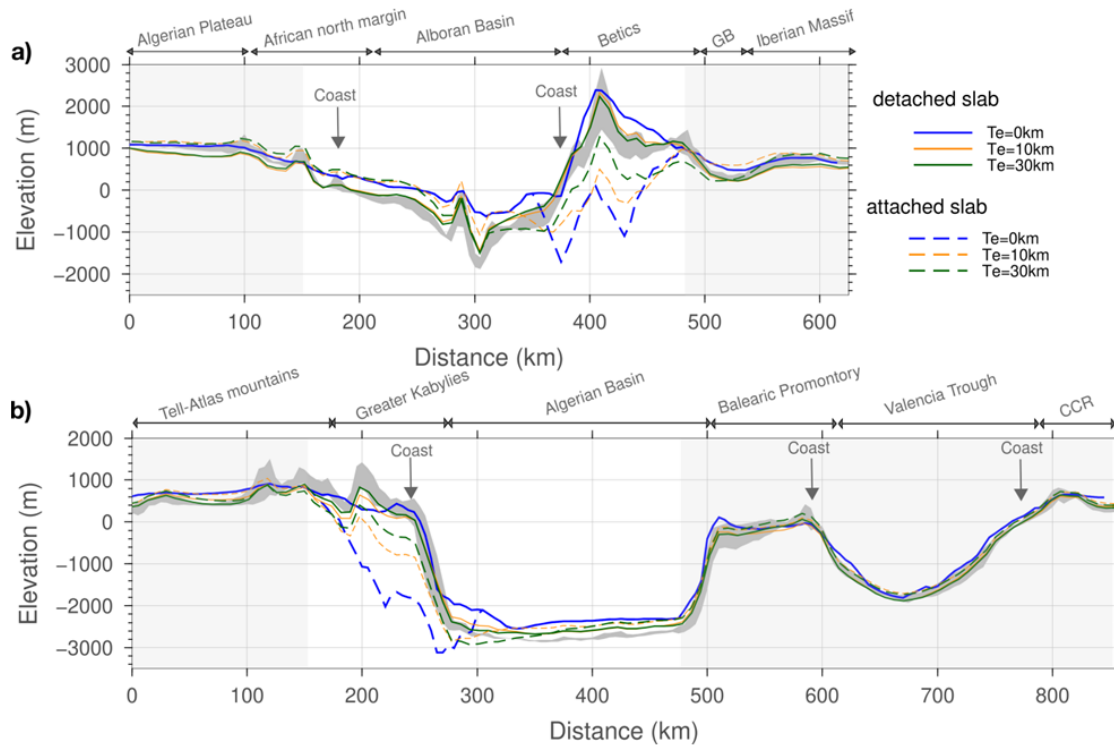
**Figure S1.** Pressure and Temperature dependent density distribution from average major oxides composition of sediments, upper crust, middle crust and lower crust (see the legend), resulting from stable phases and mineral assemblages computed using the Gibbs free-energy minimization algorithm (Connolly, 2005,2009). Red and black dashed line boxes mark the range of high pressure metamorphic peaks for Alpujarride and Nevado-Filabride, respectively, determined from thermo-barometry (Augier et al., 2005; López Sánchez- Vizcaíno et al., 2001; Puga et al., 2000; Azañón and Crespo-Blanc, 2000).



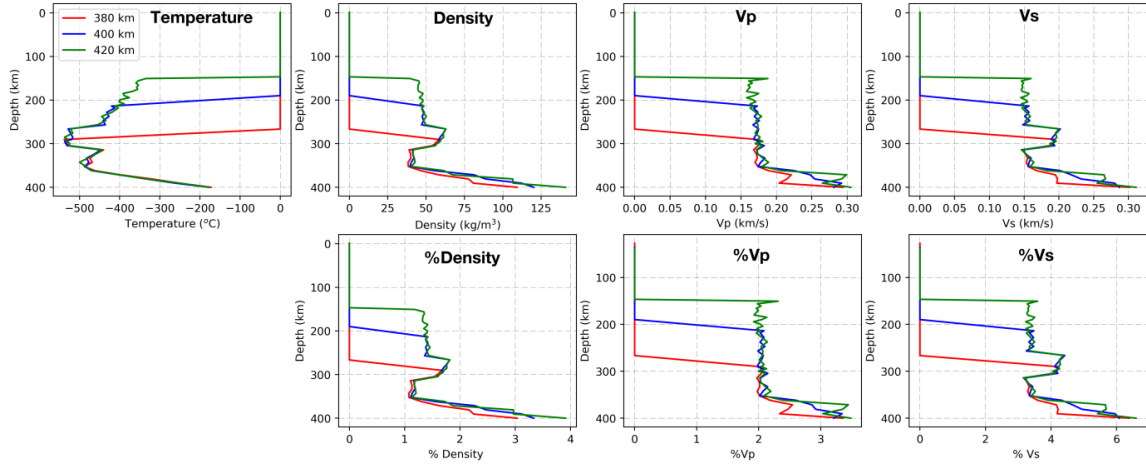
**Figure S2.** Sensitivity test for variations in the chemical composition of the Alboran slab to (a) geoid height and (b) Bouguer anomaly. Variation in chemical composition has minuscule effect on the Bouguer anomaly and has noticeable effect on the geoid height. Variation in the Alboran slab composition, situated at depths >140 km, changes the mass distribution in the slab region and consequently affects the geoid at longer wavelengths along the geo-transect. DMM-3% chemical composition fits the geoid better along the Alboran Basin geo-transect.



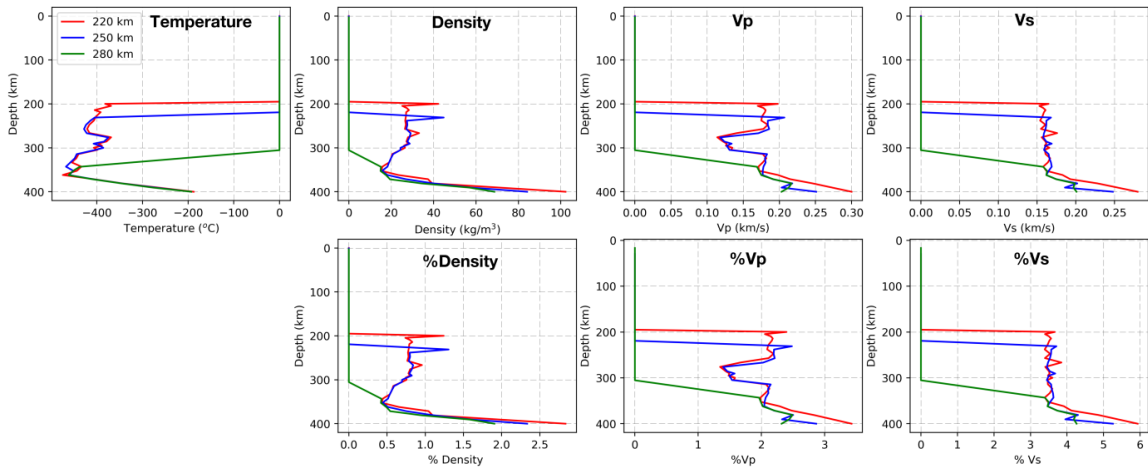
**Figure S3.** Sensitivity test for variations in the chemical composition of the Algerian slab to (a) geoid height and (b) Bouguer anomaly. DMM-7% chemical composition, resulting from 7% decompressional melting of DMM, fits the geoid better along the Algerian Basin geo-transect. CCR, Catalan Coastal Ranges.



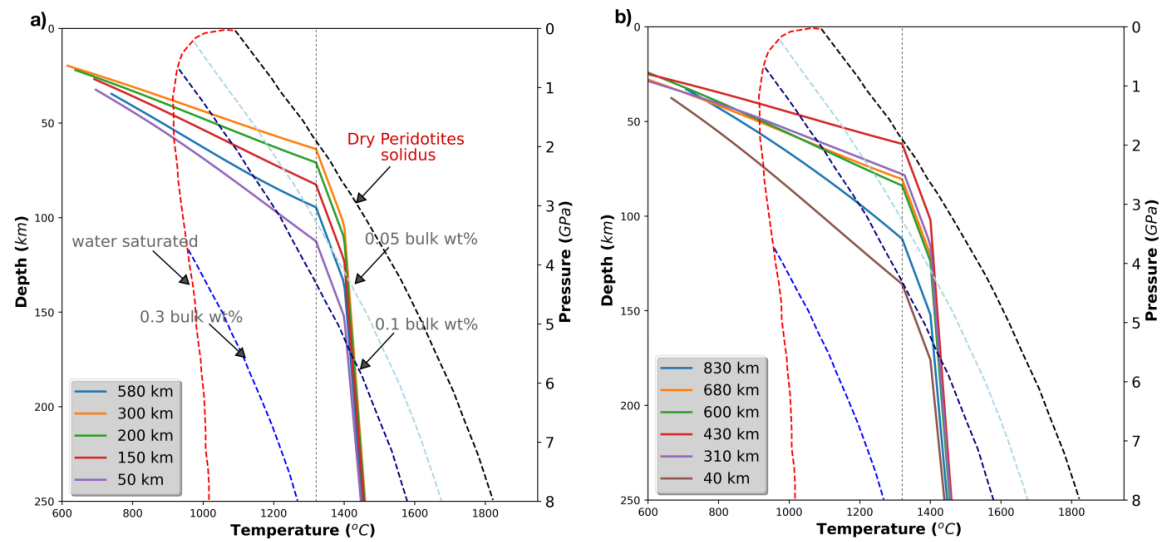
**Figure S4.** Observed and modeled elevation across the (a) Alboran Basin and (b) Algerian Basin geo-transect. Region highlighted in white shows extend along the geo-transect to which the slabs would affect the elevation. Dark-grey shaded strip shows the observed elevation across 50 km wide swath along the geo-transects. Solid colored lines represent calculated elevation with no slab anomaly, while dashed color lines show calculated elevation considering the slab. Blue line shows isostatic elevation (i.e.  $T_e = 0\text{ km}$ ). Orange and green lines show elevation considering flexural isostasy,  $T_e = 10\text{ km}$ , and  $30\text{ km}$ , respectively.



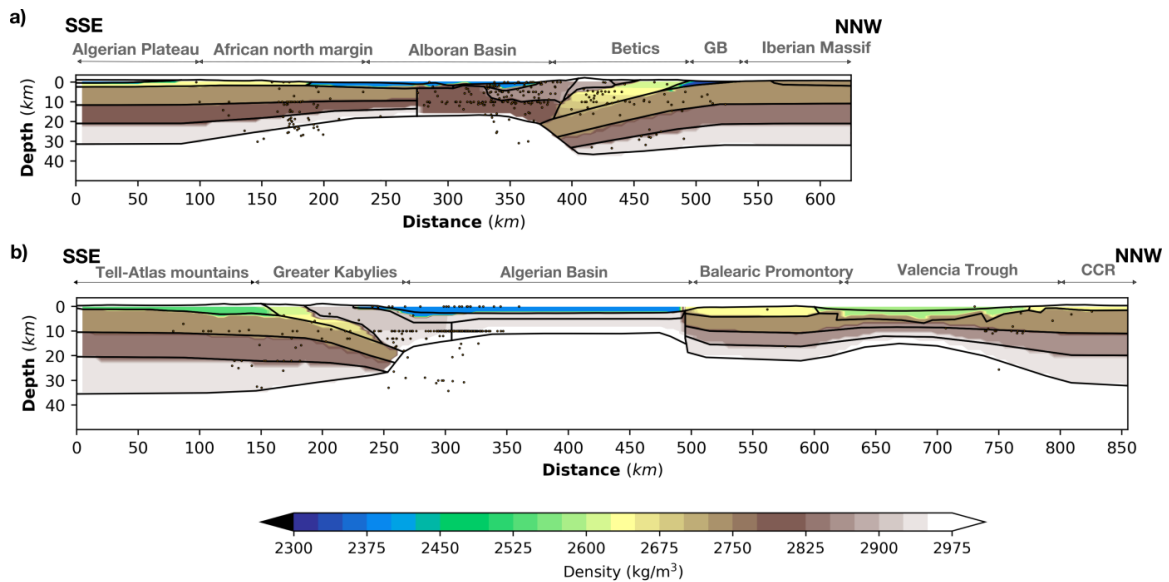
**Figure S5.** Temperature, density, and P- and S-wave velocity depth distribution in the Alboran slab at three locations spanning the slab region along the Alboran Basin geo-transect (see the legend). Upper panel shows the absolute deviation with respect to the LitMod reference column (Kumar et al., 2020) and lower panel shows the percentage change.



**Figure S6.** Temperature, density, and P- and S-wave velocity depth distribution in the Algerian slab at three locations spanning the slab region along the Algerian Basin geo-transect (see the legend). Upper panel shows the absolute deviation with respect to the LitMod reference column (Kumar et al., 2020) and lower panel shows the percentage change.



**Figure S7.** Geotherms at selected locations along (a) the Alboran basin and (b) the Algerian basin geo-transects. Dry and wet peridotite solidus for different amount of bulk water from Katz et al. (2003) are also plotted to indicate the presence of partial melts.



**Figure S8.** Crustal density distribution along the (a) Alboran Basin and (b) Algerian Basin geo-transects. Seismicity is also plotted (See Figure 4 in the main text for legend). Note the increasing density with depth in the External Units reaching values close to the upper crust.