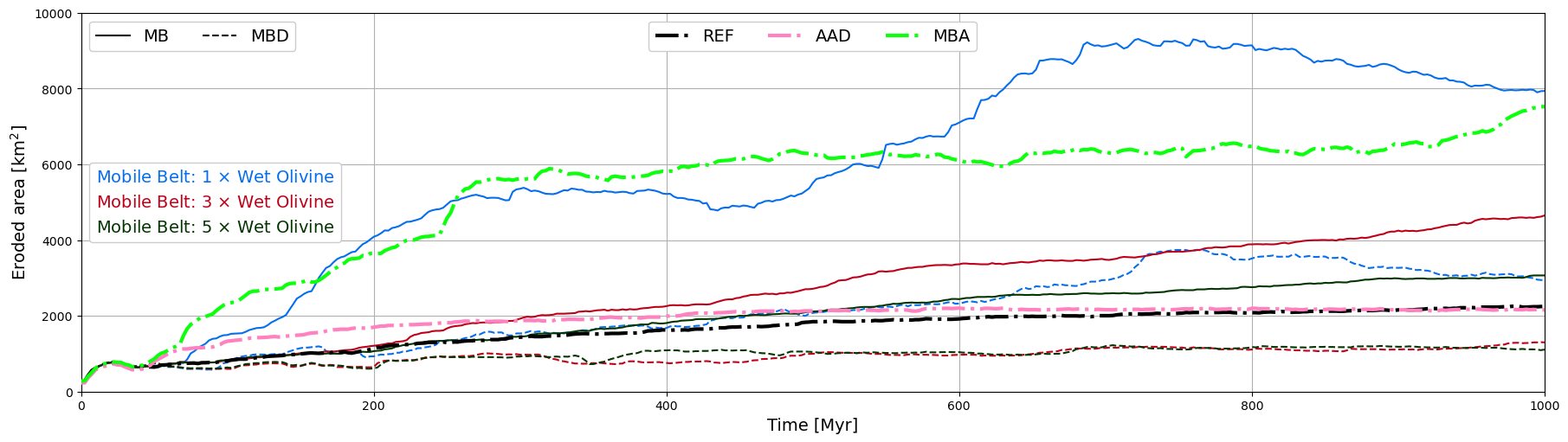
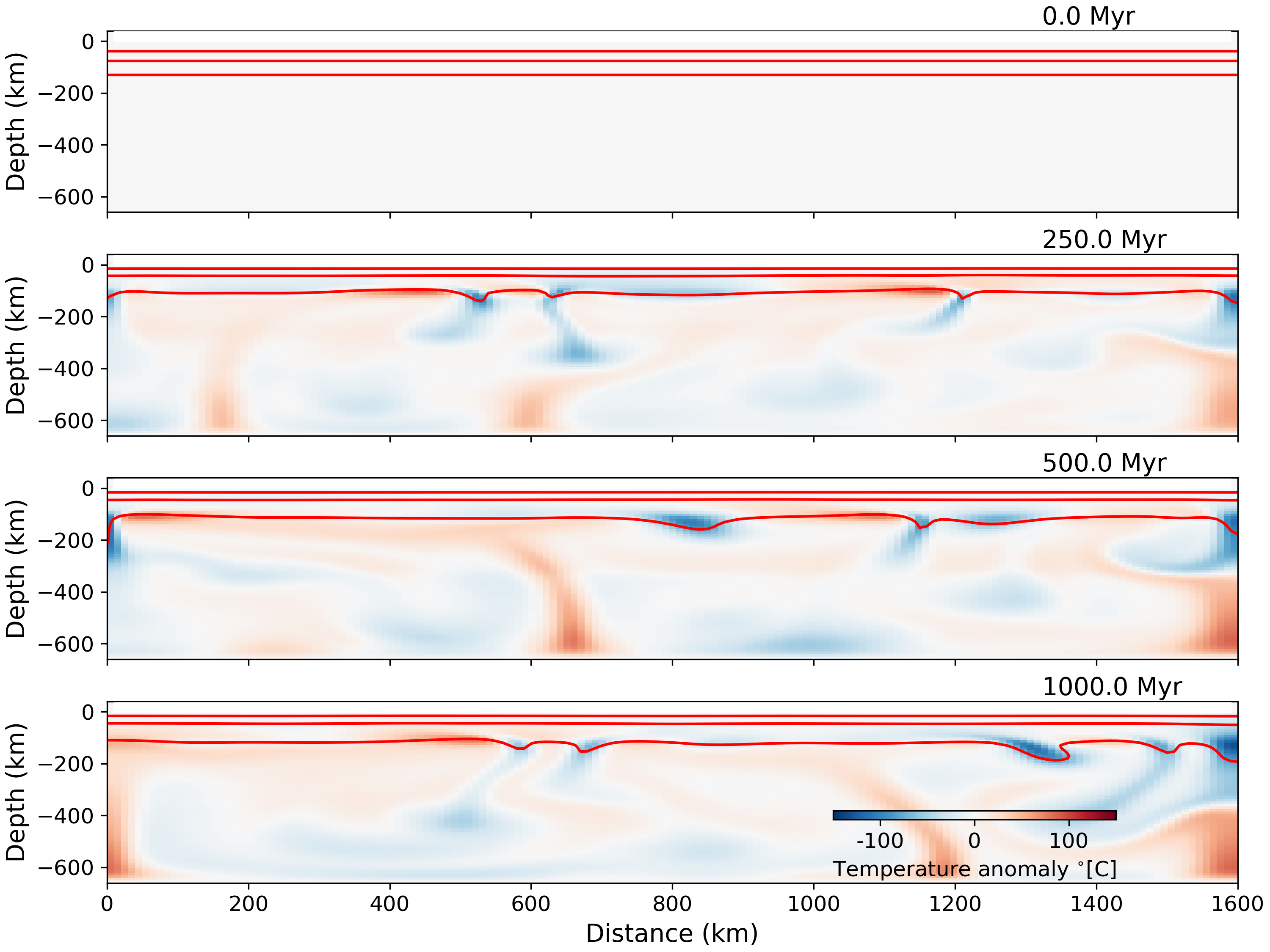
**Rheological and topographic implications of thermal insulation created by supercontinents**

**Supplementary Material**

Figure S1: Evolution of the erosion of lithospheric base for MB (solid lines) and MB*D* (dashed lines) according to the scale factor of mobile belt rheology: 5 (green), 3 (red) and 1 (blue). Black, pink and light green dashed dotted lines corresponds to Reference (REF), Alternating Asthenospheric Drag (AAD) and Mobile Belt with Alternating *D*rag (MBA) scenarios, respectively.

Figure S2: Evolution of temperature anomaly for the preliminary scenario (PS) used to build the cratonic keel scenarios. Red lines shows the 500, 800, 1300 °C isotherms.

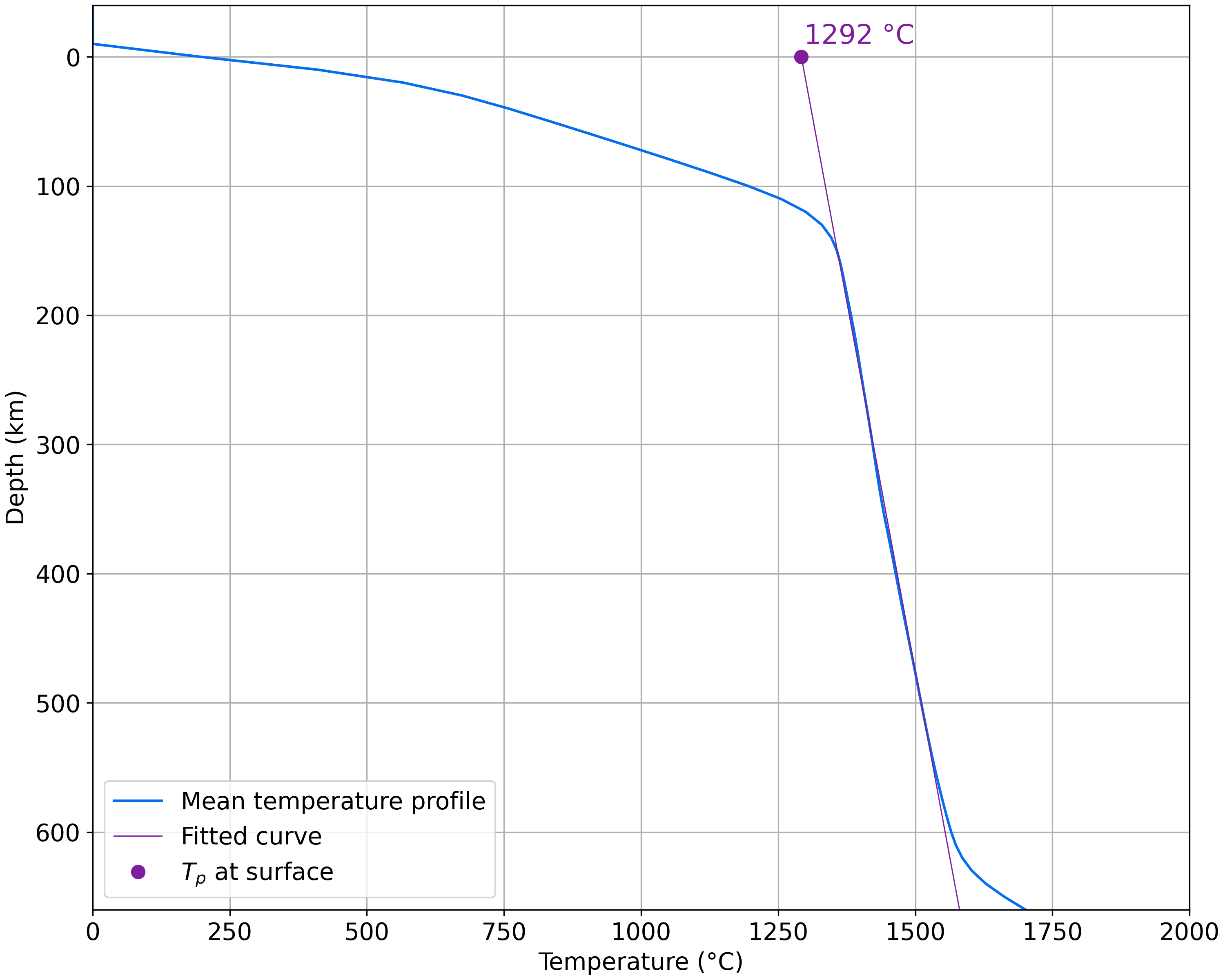
Figure S3: Final mean thermal profile for preliminary scenario (blue line) with fitted curve (purple line) used to estimate the mantle potential temperature of 1292 °C (purple filled circle).

Table S1: Comparison of topographic features scales.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Plate Tectonics | Dynamic Topography | Thermal Insulation  (this study) |
| Wavelength [km] | <1000 km | 500 – 10,000 km [2] | 100 – 1000 km |
| Amplitude [km] | -11 - 8 km | +/- 1 [2] | +/- 1 |
| Rate [m/Myr] | 10² – 10³ | 4x10¹ - 5x10² [1, 2] | 10⁻¹-10⁰ |
| Duration [Myr] | <200 | ~3 [2] | 1000 |

**Supplementary Movies:**

S1: Reference Scenario – REF

S2: Shifted Cratonic Keel - SCK

S3: Constant Asthenospheric Drag - CAD

S4: Alternating Asthenospheric Drag - AAD

S5: Mobile Belt with viscosity of 5 x wet olivine - MB5

S6: Mobile Belt with viscosity of 3 x wet olivine - MB3

S7: Mobile Belt with viscosity of 1 x wet olivine - MB1

S8: Mobile Belt with viscosity of 5 x wet olivine with Constant Drag - MBD5

S9: Mobile Belt with viscosity of 3 x wet olivine with Constant Drag - MBD3

S10: Mobile Belt with viscosity of 1 x wet olivine with Constant Drag - MBD1

S11: Mobile Belt with viscosity of 1 x wet olivine with Alternating Asthenospheric Drag - MBA

**References:**

[1]: Hoggard, M., Austermann, J., Randel, C., & Stephenson, S. (2021). Observational estimates of dynamic topography through space and time. Mantle convection and surface expressions, 371-411. <https://doi.org/10.1002/9781119528609.ch15>

[2]: Dávila, F. M., Lithgow-Bertelloni, C., Martina, F., Ávila, P., Nóbile, J., Collo, G., ... & Sánchez, F. (2018). Mantle influence on Andean and pre-Andean topography. The Evolution of the Chilean-Argentinean Andes, 363-385. <https://doi.org/10.1007/978-3-319-67774-3_15>