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Establishing a relationship between S-wave velocity, thermal gradient and thermal conductivity for the Iberian Peninsula and surrounding areas

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Thermal conductivity determine the rate of heat transport by conduction from the lithosphere to the surface. Heat flow in the surface is related to the thermal gradient and thermal conductivity by the Fourier Law,

$$(q = -kdT/dy),$$

where *k* denotes thermal conductivity and *dT/dy* denotes thermal gradient. When modelling thermal data, *k* is usually given as a fixed value in the range of (2.5 to 5 W m^{-1} K^{-1}), where 2.5 W m^{-1} K^{-1} and 3.2 W m^{-1} K^{-1} are the typical values assigned to the crust and mantle respectively. Measurements of *k* are restricted to shallow layers of the crust, are discrete, and often do not illustrate correctly its depth distribution. Here we present a new methodology to estimate a bulk average *k* from 3D S-wave velocity models (V_s) and thermal gradient maps. We found linear relationships between V_s and thermal gradient that are used along with known mean heat flux values to depict *k* values, as V_s are strongly influenced by temperature. The methodology is capable of discriminate between different tectonic settings and is sensitive to inclusion of upper mantle in calculations. Furthermore, it is clearly sensitive to areas where thermal stability has not been achieved. From the estimated *k* values and the geothermal gradient map we have derived a full regional heat flow map for the Iberian Peninsula and surrounding offshore areas. Our results provide a new tool to calculate *k* and heat flow at regional scales, and open a new window for more accurate lithospheric thermal modelling.

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