Thermal signature of the lithosphere below sedimentary basins in extensional, compressive and transform settings

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The configuration of the lithosphere below sedimentary basins varies in response to the basin-forming mechanism, the lifetime of the causative stress fields and the lithological heterogeneity inherited from pre-basin tectonic events. Accordingly, the deep thermal configuration is a function of the tectonic setting, the time since the thermal disturbance occurred and the internal heat sources within the lithosphere. We compare deep thermal configurations in different settings based on data-constrained 3D lithosphere-scale thermal models that consider both geological and geophysical observations and physical processes of heat transfer. The results presented come from a varied range of tectonic settings including: (1) the extensional settings of the Upper Rhine Graben and the East African Rift System, where we show that rifts can be hot for different reasons; (2) the North and South Atlantic passive margins, demonstrating that magma-rich passive margins can be comparatively hot or cold depending on the thermo-tectonic age; (3) the Alps, where we find that foreland basins are influenced by the conductive properties and heat-producing units of the adjacent orogen; and (4) the Sea of Marmara, along the westernmost sector of the North Anatolian Fault Zone, that suggest strike-slip basins may be thermally segmented.