3D lithospheric scale thermal modelling of the Transylvanian basin

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The Transylvanian basin is located in the internal part of the Carpathian mountain bend and is characterized by low observed heat flow density values of 35-40 x 10^{-3} Wm^{-2} in the centre and by high values of 80-120 x 10^{-3} Wm^{-2} along the Neogene volcanic chain. We carried out time-dependent 3D thermal modelling of the basin using finite element method. We took into account the paleoclimatic surface temperature changes, the Late Miocene sedimentation and the erosion that has been going on since that time and the Late Miocene thinning of the lower part of the lithospheric mantle. We did not calculated the thermal effect of Neogene volcanism, which affects the lithospheric temperature locally. The upper crustal geometry of the model was taken from seismic interpretation and the deep geometry came from seismological observations. We arrived at the conclusions that the low heat flow density of the basin is the result of the combination of the paleoclimatic changes, the Neogene sedimentation and the heat refraction due to the low thermal conductivity of the Neogene sediments. Any tectonic processes including the Late Miocene thinning of the lower part of the lithosphere do not affect the upper crustal temperature field due to the high thermal time constant of the lithosphere.