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3D structural modelling of Brandenburg (NE German Basin) and evaluation of the dominant controlling mechanism for the present-day thermal field

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We use new data of the structural setting and the spatial distribution of thermal properties to develop a refined 3D structural model of the Brandenburg area, located in the Northeast German Basin (NEGB). The structural setting of the area is morphologically differentiated by a thick layer of mobilised salt (Zechstein, Upper Permian). As salt has a considerably higher thermal conductivity than other sediments, it strongly influences heat transport and accordingly temperature distribution in the subsurface.

The crustal-scale model covers an area of about 250 km (E-W) times 210 km (N-S) and has a horizontal resolution of 1 km. It integrates an improved representation of the salt structures and is used for detailed calculations of the 3D conductive thermal field with a FE method.

The modelled temperature-distribution with depth shows strong lateral variations. The lowest temperatures for constant levels occur in the area of the southern basin margin, where a highly conductive crystalline crust comes close to the surface. In general, the highest temperatures are predicted in the north-western part of the model, where rim syncline deposits around the salt domes cause isolating effects. The pattern of temperature distribution changes with depth. Closely beneath the salt, the temperature distribution shows a complementary pattern to the salt cover as cold spots reflect the cooling effect of the thick highly conductive salt structures. The predicted temperatures at depths beneath 8 km suggest that the influence of the salt is not evident any more. Similar to the temperature distribution, the calculated surface heat flow shows strong lateral variations. Also with depth the variations in thermal properties due to lithology-dependent lateral heterogeneities provoke changing pattern of the heat flow.