Maturation and thermal histories of Tertiary basins in the border region between Eastern Alps, Southern Alps, Dinarides, Pannonian Basin

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Coalification patterns of Paleogene and Neogene sediments and numeric modelling techniques are used to estimate paleo-heat flows in Tertiary basins in Slovenia and adjacent areas.

Paleogene sediments occur in Slovenia mainly south of the Periadriatic Lineament. Their coalification increases towards the Periadriatic Lineament from 0.3 to 1.5 %Rr. A clear spatial relationship between the coalification maximum and the center of Egerian (Smrekovec) volcanism suggests, that magmatic activity was the main heat source. Egerian/Eggenburgian heat flow in the eastern Sava Folds was in the order of 125 mW/m. Probably, the Egerian volcanism is also responsible for high (pre-Karpatian) coalification of Eocene coals located between the Periadriatic Lineament and the Donat Line. Small remnants of Paleogene sediments located at the southern margin of the Pohorje (Zrece) matured in pre-Karpatian time, probably due to the emplacement of the Oligocene Pohorje tonalite.

The area north and east of the Pohorje (Murska Sobota High, Radgona Depression, Styrian Basin) was characterized by Karpatian heat flows up to 400 mW/m. Apatite fission track ages prove that the thermal overprint ended at the early/middle Badenian transition. At least partly, high heat flow was a result of Karpatian magmatic activity (western Pohorje, eastern Styrian Basin). Perhaps advective heat transport due to rapid exhumation of basement units also increased surface heat flows.

The SW–NE striking Ljutomer Fault forms the westernmost part of the Mid-Hungarian Line. It separates the deep Ljutomer trough to the north from the Boc–Ormoz–Selnica Anticline to the south. The latter formed during Pliocene/Quaternary times. The Ljutomer trough is characterized by low coalification gradients and moderate Neogene heat flows (70 mW/m). Pontian to present-day heat flow in the Ormoz–Selnica Anticline is 80 to 90 mW/m. Possible explanations for higher present-day heat flows in the Ormoz–Selnica Anticline include thermal effects due to young and rapid erosion and convective heat transport. Coalification data indicate, that the eastern Ormoz–Selnica Anticline was locally affected by a Badenian heating event (145 mW/m). Badenian magmatism in northern Croatia represents a possible heat source.

Post-Pontian erosion in the eastern Ormoz–Selnica Anticline is in the order of 600 to 900 m. Vitrinite reflectance patterns from wells and outcrops indicate post-early Pannonian uplift of the (pre-Mesozoic) Boc region in the order of 4.5 to 5 km!