Geophysical Research Abstracts, Vol. 7, 02579, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02579


# New aspects about the thermal history of the southwestern Lower Saxony Basin

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Since more than about 30 years the maturity and geophysical anomalies within the Lower Saxony Basin (LSB) were interpreted as a result of a deep lying igneous intrusion called “Bramsche Massif”. Based on the lignite/subbituminous coal stage of Upper Campanian rocks overlying the Lower Cretaceous units, a late Early Cretaceous or early Late Cretaceous age was concluded for the time of intrusion.

However, vitrinite reflectances for the central and southern part of the LSB confirm a low reflectance increase with depth which is more likely caused by deep burial of the Jurassic to Carboniferous sequence at only moderate heat flows than by an igneous intrusion.

The regional pattern of FT ages is dominated by a decrease in zircon FT ages towards the basin centre. Mixed zircon FT ages of the basin margins are at about 300 Ma. A young age of 130 Ma in the basin centre indicates that highest temperatures were already reached in the Lower Cretaceous. Apatite FT ages show a south to north decrease within the basin. However, this decrease of FT ages is not gradual. Instead, an abrupt change occurs which coincides with the position of a main flexure-zone. Thus, the flexure may represent a structure with significant influence on temperature history and coalification pattern. Moreover, these findings would ask for much higher sedimentation rates during Upper Jurassic and earliest Cretaceous times than previously assumed.

Due to inversion tectonics in the Coniacian/Santonian, the LSB developed to the Lower Saxony Tectogene. During this inversion, the basin fill was uplifted and overthrusted on the surrounding swells. Contemporaneous huge erosion occurred and uncovered Triassic up to Paleozoic sediments in the basin. Estimations of maximum burial depths and thicknesses of now eroded sedimentary rocks range from about 3500 to 8000 m. The highest former overburdens were deduced for the centre of the basin and mostly for Jurassic and Cretaceous sequences. Towards the basin margins erosion thicknesses decrease.

An explanation for the differences of eroded thicknesses as well as for the regional pattern of FT ages might be variable synsedimentary subsidence within the LSB during late Jurassic and early Cretaceous times due to rift and wrench tectonics. Due to the extension graben and secondary halfgraben systems were formed. In the course of the compressional phase during the inversion period these areas became those with strongest uplift.