Geophysical Research Abstracts
Vol. 12, EGU2010-9732, 2010
EGU General Assembly 2010


# On the determination of thermal conductivity of sedimentary rocks and the significance for basin temperature history

willy fjeldskaar (1), Olav Christie (2), Kirsti Midttømme (3), Niels Jensen (4), and Arild Lohne (4)
(1) (wf@tectonor.com), (2) Information Strategies, Norway, (3) NGI, Norway, (4) IRIS, Norway

Thermal history is an important control on generation of gas and oil in source rocks. Therefore, a realistic treatment of thermal conductivity in rocks is essential to hydrocarbon generation modelling in sedimentary basins. We present two different techniques for thermal conductivity estimation: (1) upscaling, based on arithmetic, geometric and harmonic mean values of averaged conductivity from anticipated mineral composition, (2) infometric regression of thermal conductivity and anisotropy from measurements in rocks of known porosity and mineral composition.
The accuracy of the estimate depends on the technique, and we expect that the most precise way to predict thermal conductivity of sedimentary rocks leads to considerable improvement in the accuracy of basin modelling and hydrocarbon prospect identification.
Various thermal conductivity models based on porosity and lithology are used for modelling temperature history for sensitivity purposes. Models where matrix conductivity is determined from measured thermal conductivities based on the mineralogy give considerably lower strata temperatures than models where geometrically averaged matrix conductivity are determined from mineralogy. This is assumed to be caused by deficiency in the mixing laws not taking into account the texture effect of the sediments. The temperature histories estimated by the three mixing law models, namely arithmetic, geometric and harmonic mean, are considerably different. We show that the mixing law models give temperature history and predicted hydrocarbon maturation far off even if we have temperature measurement at the same location. For example the harmonic model predicts the onset of the maturation of the Jurassic formations 20 million years later than for the model based on measured conductivities.