Geophysical Research Abstracts
Vol. 16, EGU2014-1488, 2014
EGU General Assembly 2014

Heat flow and thermal regime of Tarim basin, NW China: insights from static temperature logging

Shaowen Liu (1,2), Xiao Lei (1), and Changge Feng (1)

(1) School of Geographic and Oceanographic Sciences, Nanjing University, Nanjing, China (shaowliu@nju.edu.cn), (2) Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY, USA

Heat flow and geothermal regime of sedimentary basins are vital for understanding basin (de)formation process, hydrocarbon generation and resource potential assessment. Located at a Precambrian cratonic block, Tarim basin is the largest intermountain basin in China, which is also the ongoing target of oil and gas exploration. Previous knowledge of thermal regime of this basin is based on formation testing temperature data from limited oil exploration boreholes; the inherent non-equilibrium of data of this type makes accurate understanding of its thermal regime challenging. Here we report our latest static temperature logging results in this basin and analyze its thermal regime as well.

In this study, 10 temperature loggings are conducted in the northern Tarim basin. All the temperature logging boreholes are non-production wells and have been shut in at least more than 2$\sim$3 years, ensuring the temperature equilibrium after drilling. The derived geothermal gradient varies from 20.2 to 26.1°/km, with a mean of 22.0°/km. We also found that high geothermal gradient anomalies usually are observed in the discovered oil and gas fields and the gradients of the gas fields are larger than those in other oil fields. Upward migration of hot fluid along fault conduit is speculated as the possible mechanism for this high geothermal anomaly in the oil and gas fields.

Combined with measured thermal conductivity data, 10 new heat flow values are also achieved. Measured heat flow ranges between 38mW/m^2 and 52mW/m^2, with a mean of 43 mW/m^2, indicating a thermal regime typical of Precambrian cratonic basins. This average heat flow is only one half of that in the Tibet Plateau. Since lithospheric strength is related to thermal structure that the basin lithosphere is too cold and strong to deform under nearly the same compressive forces that resulting in a doubling of crustal thickness in Tibet Plateau. In addition, the mantle heat flow in this basin is estimated to be low as 10 mW/m^2, so that crustal radioactive heat accounts for most of the observed surface heat flow.

This study is supported by NSFC (No.41272143)and MOE project (NCET-12-0263).