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琼东南盆地长昌凹陷火成岩侵入体对温度场及烃源岩成熟度的影响

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Influence of igneous intrusions on the temperature field and organic maturity of the Changchang Sag, Qiongdongnan Basin, South China Sea

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摘要

最新地震资料显示,琼东南盆地深水区长昌凹陷内部分布着多个火成岩侵入体,单个侵入体的面积可超过300 km^2,高(厚)度约为10 km.本文基于有限元方法的二维剖面地温场模拟,分析了研究区位于同一条地震测线上的三个不同规模侵入体对温度场的影响,并结合热史恢复方法及Easy%*Ro*模型,定量评价了侵入体对距其2 km及5 km处人工井崖城组烃源岩有机质成熟度*Ro*的影响.结果表明,凹陷内火成岩侵入体对温度场有显著影响的时限不超过1 Ma,5 Ma以后影响非常微弱,10 Ma以后侵入体温度与围岩温度基本一致;侵入体对烃源岩有机质成熟度的影响随侵入体的规模、距侵入体的距离不同而不同,规模最大侵入体对距其2 km处崖城组烃源岩成熟度*Ro*的影响可达1.6%,而对距其5 km处的烃源岩成熟度影响较小.

关键词 长昌凹陷, 火成岩侵入体, 温度场, 热史, 烃源岩成熟度, 二维有限元方法

Abstract:

The latest seismic interpretation suggests the presence of several igneous intrusions in the Changchang Sag, Qiong dongnan Basin, South China Sea. A 2-D geothermal modeling based on the finite element method (FEM) has been performed to analyze the thermal effect of the three intrusions of different scales distributed in the same seismic line. The organic maturity change for the Yacheng Formation caused by intrusions was demonstrated by artificial wells 2 km and 5 km away from each igneous body in combination with the acquired paleo-geothermal field and the Easy%*Ro* model. The results indicate that the temperature of igneous bodies dropped down rapidly during the first 1 Ma after the intrusion and cooled down to nearly the same temperature as that of the wall rock after 10 Ma. The biggest intrusion caused a theoretical vitrinite reflectance (*Ro*) 1.6% higher than normal for the Yacheng Formation at a distance of 2 km away from it and only 0.4% higher at a distance of 5 km.

Keywords Changchang Sag, Igneous intrusion, Temperature field, Thermal history, Organic maturity, Two-dimensional finite element method

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