

The lithosphere thermal structure of the Southeast Asia: constrained by Vs data

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The Southeast Asia, located in the southeastern part of the Eurasian Plate, comprises a complex collage of continental fragments, volcanic arcs, suture zones and marginal oceanic basins, and is surrounded by tectonically active margins which exhibit intense seismicity and volcanism. As we all know, the tectonic evolution is closely related to the deep thermal structure state. Therefore, an accurate estimation of lithosphere thermal structure and lithosphere thickness is important in extracting information on tectonics and geodynamics. Though the thermal regime could be calculated with the observed surface heat flow, there are many uncertainties in the calculated deep thermal state. In this study, we calculated the deep lithosphere thermal structure of Southeast Asia regions by employing an empirical relationship between Vs and temperature, from the calculated temperature-depth profiles, we can identify the base of the thermal lithosphere. The results show that the temperature contours at 80km depth is about 200-300°C higher in the rifted basins and oceanic basins such as Andaman Sea, Thailand Bay, Thailand Rift Basin, South China Sea than in the plateaus and subduction zones such as Khorat Plateau, Sumatra Island and Philippine Trench regions. Generally, the thermal state indicated by the temperature contours at 80 km depth is in agreement with those suggested by the observed surface heat flow. The temperature at 100 km and 200 km depth in Southeast Asia regions is 1450-1500°C and 1650-1780°C which suggest that the study regions might have a higher thermal state than other regions. Our results also show that the estimated thickness of the lithosphere are 85-95 km in the regions of Subduction and collision regions surrounding the study area such as Java trench system, Sumatra trench system, Indo-Asian collision suture zone, Taiwan orogenic belt, Luzon Island, Celebes Island and Northeast of Borneo and becomes smaller toward the South China Sea. In the South China Sea and its adjacent rifted basins, the thermal lithosphere thickness is about 65-70 km. The estimated lithosphere thicknesses show a good correlation with their tectonic settings.