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Thermal Structure Across Archaean Crustal Section of Dharwar Craton, South India

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The south Indian Precambrian shield is a mosaic of Archaean and Proterozoic terrains. The Archaean blocks are comprised of the granite-greenstone Dharwar Craton (DC) and the Southern Granulite Terrain (SGT). The SGT is dominantly composed of late-Archaean granulites in the northern part whilst Proterozoic granulites in the southern part. These two major geological blocks are separated by ortho-pyroxene isograd. The DC is divided by Closepet granite (CG) into two main blocks, namely, the western Dharwar craton (WDC) (3400-2700 Ma) and the eastern Dharwar craton (EDC) (2700 Ma). Both, the WDC and EDC gradually underwent some metamorphic events resulting in formation of greenschist, amphibolite, metasomatized granulite and depleted granulite facies rocks, exposed from north to south, as upper-, middle-, and lower continental crust. In this region 1023 radiogenic heat production values of surface rocks are available which shows decrease in the value of crustal radiogenic heat production from north to south. But, surprisingly, the observed surface heat flow values are not decreasing in the same faction. The present work deals with the crustal thermal structure along two N-S tending profiles. The profile I of 450 km length starts from near Gadag in WDC and extends upto the Bhavani shear zone in the northern block of SGT. Profile II also of 450 km length starts from near Pattikonda in EDC and extends near to the Elanagar in the northern block of SGT. A 2-D numerical simulation of the heat conduction was used to calculate the temperature field along these two profiles. The calculated surface heat flow values vary between 29 – 32 mW/m2 along Profile I and 25-44 mW/m^2 along Profile II. Out of which the crustal contribution varies between 18-23 mW/m^2 along profile I and 7-24 mW/m^2 along Profile II. The calculated surface heat flow values are in good agreement with observed values. These results suggest that the mantle heat flow value along Profile I varies between 7 to 12 mW/m^2 whereas the mantle heat flow value along Profile II varies between 11-29 mW/m^2. The Moho (depth 40-60 km) temperature along Profile I varies between 320 - 600^{0}C while along profile II (Moho depth 34-44 km) it varies between 300 - 600^{0}C. These results may find application in the interpretation of geological processes associated with the evolution of this region.