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Mesozoic sediments beneath Deccan trap cover for hydrocarbon exploration – Seismic refraction/wide-angle reflection studies

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The surface geology of the central west part of India and Saurashtra peninsula comprise 85% of Deccan trap cover and while Mesozoic sediments are exposed over a small area in the northeast part of Saurashtra, central western part of India and some parts of central India. Deccan trap covered region is believed to hold significant hydrocarbon potential because of the possible presence of thick Mesozoic sediments hidden underneath the traps. Seismic refraction / wide – angle reflection studies were carried out along twenty five profiles each measuring 100 to 150 km and some profiles 200 to 300 km in length over the Deccan trap region covering central part of India, Saurashtra and Kutch areas making a total coverage of more than 3500 line kilometers. Significant travel time skips shadow zone in the first arrival seismic refraction data have been noticed. This is indicative of subtrappean Mesozoic sediments. Seismic refraction and wide angle reflection datasets acquired along these profiles have not only revealed the thickness of the Deccan traps, but also brought out the first time hidden sub-trappean Mesozoic sedimentary basins. The Deccan traps are thin, about 100 m in the northeastern part, gradually thickening to about 2500 m towards the southwest part of central India and decreasing to 1500 m towards the west coast of India. Below Deccan traps, in the Narmada-Tapti region and Jamnagar-Dwaraka of Saurashtra region, hidden Mesozoic basins are mapped in the form of grabens separated by smaller horst. Mesozoic sediments maximum with a thickness of about 1800m to 2500 m are inferred has in the central part of Narmada-Tapti region (near Nandurbar-Sendhwa). Similarly a basin around 2500 m thick Mesozoic basin named as Jamnagar Basin is delineated in the Saurashtra peninsula. This Mesozoic basin was deposited in a larger Mesozoic sea, that extended from Sanawad-Mahan-Sendhwa-Nandurbar region through Saurashtra, Kutch, up to Sind and Salt Range in the form of horseshoe. Another relatively small Gondwana basin of thickness of 500 m separated from this large Mesozoic basin is also demarcated in the eastern part of this region (Multai-Pulgaon) that may be an extension of the Gondwana Godavari graben under a thin cover of the Deccan traps.

Interpretation of these datasets has brought out shallow depth section up to the crystalline basement along these profiles. Isopach contour maps are prepared for 1) Deccan trap, 2) Mesozoic sediments and 3) depth to the crystalline basement. Contour maps show various depocenters between Narayanpur-Sakri and Shirpur-Sendhwa in central India and Jamnagar and Dwarka basins in Saurashtra. These results provide new insights to a better understanding of the geology and sub-surface structure of the central India and Saurashtra regions.