

## **Igneous Intrusion and its Impact on Petroleum Play of Lower Goru Formation in Jati Blok, Southern Indus Basin, Pakistan**

**Rai Hamood Inam<sup>1</sup>, Akbar Ali Asif<sup>1</sup>, Khalid Shoaib<sup>1</sup>, Abdul Ghafoor Anjum<sup>1</sup>, and Muhammad Faizan<sup>1</sup>**

<sup>1</sup> Kuwait Foreign Petroleum Exploration Company, Pakistan

### **Abstract**

Intrusion of magmatic bodies into sedimentary basins is the subject of intense investigation from several decades. Constraining the deformation, uplift and heating associated with these bodies is essential in prospect ranking and reducing exploration risk. The present study utilized 2D and 3D seismic reflection and borehole data from the Southern Indus Basin of Pakistan (Jati Block) to document the seismic expressions of magmatic body and risk associated with it on prospective reservoir quality.

Seismic data indicate northwest to southeast directed intrusive sill which is up to 200 m thick, 30 km wide and covering more than 1050 km<sup>2</sup> map-view area. It emerged from southeast into lower Goru Formation and gradually shallows towards northwest into upper Goru and finally terminates against Khadro. The sill exhibit excellent saucers like geometric characteristics i.e., circular to sub-circular 3D view, horizontal to sub-horizontal concordant inner sheet, discordant inclined sheet of more than 200 meters high and well defined outer sills. These outer sills and extend up to 1000 meters and terminate against Khadro Formation. The termination of outer sills suggests that the sill intrusion is contemporaneous to the emplacement of Khadro Formation/Volcanics directly above and further southeast located Deccan trap volcanoes. The intrusion causes force folding in overlying strata that may act as a potential Hydrocarbon traps. However their consistently lesser amplitude relative to sill thickness is due to fluidisation and ductile flow of overlying sediments. Furthermore sill emplacement related hydrothermal circulation of fluid and heating effect cause mineralization, backing effect respectively, on surrounding sands of Goru Formation. The porosity and permeability of Goru Sands may reduce adjacent to sill path. However, the presence of sill may not have an impact on vertical migration (from source to reservoir) of hydrocarbon fluids, because normal faults in the area may have access to deeply buried source rock.