Turbidite Systems in Brazil: From Outcrops to Deep Waters

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Reliable depositional models depend on careful observation of rocks, to allow the correct description and interpretation of facies and facies associations and their formative processes. They are of paramount importance to characterize deep water depositional systems, which still are the most important siliciclastic reservoirs for the oil industry. Turbidite sandstone reservoirs are responsible for almost 80% of petroleum produced from Brazilian Basins. A comprehensive characterization of these systems, depicting the main differences in terms of their geometries and facies will be presented. In Brazilian basins most of the turbidites were originated from extremely catastrophic flows, essentially linked to fluvio-deltaic influx that generates very dense hyperpycnal flows. Based on outcrop and subsurface data, two main zones with characteristic geometries and facies associations are commonly identified in turbidite systems: the transference zone and the depositional zone. Erosion and bypass dominate in the transference zone, which frequently occur as submarine canyons and channels. Turbidite channels can contain residual conglomeratic facies and coarser sandstone facies. The depositional area comprises lobes that constitute a major exploratory target because of their greater lateral continuity and the concentration of clean reservoirs. Turbidite lobes can be tabular or lenticular deposits associated with channelized bodies. Taking into account outcrop and subsurface data we can distinguish five main turbidite systems: foredeep turbidite systems, prodelta turbidite systems, mixed turbidite systems, meandering channels turbidite systems and channel-levee turbidite systems. In the Brazilian margin, deep water turbidites and other gravity-flow deposits are commonly associated with bottom current deposits, largely in Tertiary strata. Such bottom current deposits, often called contourites, are also important petroleum reservoirs, commonly mistaken as turbidites. Integration of facies analysis with well logs and seismic data, in association with outcrop analogs, are simple but fundamental tools to guide deep water exploration and production.