The Link Between Sedimentary Provenance and Reservoir Quality in the Triassic of the Southwest Barents Shelf

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ABSTRACT

Reservoir properties are highly variable for the thick Triassic siliciclastic units deposited on the Barents Shelf. Recent provenance work has divided the succession into two sand types, which produced reservoirs with contrasting characteristics. The Caledonian Sand Type, sourced from northern Fennoscandia, forms reservoirs with favourable properties (average 14% porosity), whereas the Uralian Sand Type, sourced from the Uralian orogen, forms reservoirs with much more variable characteristics and generally poorer properties (average 7% porosity). Both sand types are temporally persistent throughout the Triassic Period but their geographical distribution is variable. The Caledonian Sand Type is restricted to locations proximal to Fennoscandia whereas the Uralian Sand Type is more geographically extensive. This may explain the presence of high porosity reservoirs of the Goliat Field, which is hosted within a Caledonian Sand Type reservoir, compared with poorer reservoirs elsewhere which are largely composed of Uralian Sand Type material. Mixing between the two sand types is seemingly minor until after a major basin reorganisation event in early Norian. The two sand types are delineated by every provenance technique employed to date (petrography, heavy mineral analysis, geochemistry and U-Pb geochronology of heavy minerals). This study builds on pre-existing provenance work by expanding the dataset both in number and in the breadth of provenance techniques employed (QEMSCAN, combined U-Pb geochronology and geochemistry of apatite and rutile and Pb isotopic compositions of K-feldspar). Exploration of this expanded dataset reveals subtle provenance variation during deposition of the Uralian Sand Type. Disentangling the influence of factors independent of sand composition (e.g. depositional, environmental and burial diagenesis) on the reservoir properties is complicated. However, this provenance variation may in part explain the mixed exploration results and help improve future reservoir quality prediction.