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Flow Transformation in Co-Genetic Turbidite Deposits in the Helgeland Basin, offshore mid Norway

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Sediment transport towards the ocean floor is mainly by sediment gravity flows, either dominated by one flow process such as slide, slump, debris flow and turbidity current, or more complex flows combining e.g. debris flows and turbidity currents (hybrid flows). However, the expected product of a single gravity flow is not straightforward due to the possibility of flow transformation, which allows change of the original flow into a new type. Such flow transformation can take place in flows dominated by one or more flow processes, as is looked at here.

This research studies the Upper Permian to Lower Triassic turbidites of the Helgeland Basin, offshore mid Norway. Two cores, 6611/09-U-01 and 6611/09-U-02, were drilled through these deposits. Previous work by Bugge et al. (2002) divided the succession into two units: (1) lower turbidite unit and (2) upper turbidite unit. Their boundary is the Permian-Triassic boundary. The objective of this work is to study the depositional processes of the turbidite deposits, in terms of flow transformation stages and hybrid events. Lithofacies and facies association were determined through detailed description of the cored succession and thin section microscopy.

Based on the observations, 13 main lithofacies were defined according to grain size, texture, and sedimentary structures. The lithofacies were combined into facies associations, showing that the succession comprises of hybrid event beds, slides, slumps, debrites, mudflow deposits, sandy and muddy turbidites. In addition, sand injectites as secondary process were also identified. Hybrid event deposits include couplets of: (1) Slump-Debrite; (2) Debrite-High Density Turbidite; and (3) Turbidite-Debrite-Turbidite. Different flow transformation stages were observed in the hybrid beds, debris flows, and turbidites.