



Mechanisms of overburden deformation associated with the emplacement of the Tulipan sill, mid-Norwegian Margin

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Accounting for igneous intrusions into sedimentary basins is important as they provide additional volume into the basin as well as a relatively rapid heat pulse. This is of particular importance to the petroleum industry because magmatism deforms the host rock and affects the thermal evolution of a basin, thereby influencing the potential hydrocarbon source and reservoir rocks (i.e. hydrocarbon generation, migration, and accumulation). Presently, numerous mechanisms concerning the syn-emplacement (i.e. elastic bending related active uplift/forced folding and aureole induced volume reduction) and post-emplacement (i.e. differential compaction) deformation of the host rock have been suggested. In this study, we investigate the relevance of the different existing syn- or post-emplacement related mechanical models of dome growth accommodating the emplacement of igneous sills. We use high-quality 3D seismic located in the western part of the Møre Basin (mid-Norwegian margin) to analyse the deformation of Cretaceous – Paleogene overburden associated with the emplacement of the Tulipan saucer-shaped sill. The sill is further constrained due to available well data drilled in the sill overburden and its emplacement is timing in between 55.8 and 54.9 Ma. Horizon interpretations and various thickness and attribute maps show a clear correlation between the saucer-shaped Tulipan sill and an observed overlying domed structure. Additionally, we observe in the shallow parts of the dome structure hydrothermal vent complexes connected by fractures only along the periphery of the underlying sill. We show that the Tulipan sill is responsible for the dome structure in the overburden of the study area. At the same time we demonstrate that not solely one of the different mechanisms of overburden deformation (e.g. elastic bending/forced folding, shear failure, differential compaction, etc.) can be responsible for the observed dome structure, but a combination of them.