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Joint thermal and stratigraphic reconstruction of rifting in the Northern Viking Graben: implications for hydrocarbon generation

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Basin reconstruction models help to better understand the tectonic and thermal evolution of rift systems. Here we present the result of a reconstruction case study for the Northern Viking Graben. In this study we (1) demonstrate the potential of joint thermal and stratigraphic basin inversion and (2) show how basin scale models can be used to predict hydrocarbon occurrences and better constrain smaller scale reservoir processes. We chose the Viking Graben as a target area because its rifting and sedimentation history has been well studied and data from many industrial and geologic surveys is available. This large amount data makes the Viking Graben an ideal place to benchmark basin models and test if known hydrocarbon occurrences can be reliable predicted. For this case study we use the basin reconstruction model Tecmod. It uses a forward model, which input parameters are automatically refined by an inverse scheme, to solve for stretching, sedimentation, subsidence, temperature and thermal maturity along a 2-D transect. The results of the basin reconstruction are then used to make predictions on the timing of (1) hydrocarbon reservoir formation (source and reservoir layer deposition and seal formation) and (2) hydrocarbon generation (thermal maturity). Our findings show that joint inversion of stratigraphic and thermal data is possible and that lithosphere scale basin models can be used to better constrain processes occurring on a reservoir scale.