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New insights on the infill process of tunnel valleys based on sediment composition and seismic facies analysis

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Tunnel valleys are one of the most typical landforms associated with ice-sheets environments. They form in subglacial settings, at the ice-sheet termination. Two main genetic models have been proposed for their formation which can be associated either with catastrophic jökulhlaup-like outbursts and glaciohydraulic supercooling or steady state overpressured condition during gradual ice-retreat. Moreover, tunnel valleys can be either completely filled with glacial sediments during or shortly after the formation or, on the other hand, left unfilled and been subsequently filled with sediments associated with different processes and depositional environments.
In this paper we present the preliminary results from the sismostratigraphical and compositional study of a tunnel valley infill in the Dutch Southern North Sea. Similarly to many other tunnel valleys in this area, the well data and 3D seismic from this case show a general fining upward sand-rich composition and a very clear internal architecture dominated by northward dipping large clinoforms. However, the origin of the sedimentary infill, the timing of the infill and the depositional environment developed during the infilling process are yet unknown.
Ongoing analysis of cutting samples from a borehole entering the tunnel valley in its terminal region will help the understanding of the infill process of the tunnel valley. In particular, mineralogical, petrographical, geochemical analysis and, possibly Sr isotope and aminoacid (?) dating will be used to clarify the sediment provenance (i.e. glacially reworked Tertiary bedrock vs. southerly sourced fluvial deposits) and the chronostratigraphy of the sediment succession.
This research will provide unprecedented insights on the model for tunnel valley genetic infill and thus will help us to develop a model for vertical and lateral lithofacies variability within tunnel valley deposits.
Moreover, a detailed mapping of sediment bodies in the terminal region of the tunnel valley infill on 3D seismic data will be attempted and used to constrain the depositional model which will be successively compared with analogue outcrop data from both Pleistocene and late Paleozoic similar systems (Canada and Morocco).