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## Structural control on tunnel-valley incision: Fact or fiction?

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Tunnel valleys are impressive glacial erosional landforms that may attain depths of more than 500 m, for example in the North German Basin. Characteristic features of tunnel valleys include undulating basal profiles, abrupt terminations and steep flanks, all indicative of subglacial formation by pressurised meltwater discharge. Tunnel-valley fills represent important archives of past glaciations and may provide economically important reservoirs for groundwater or hydrocarbons. Furthermore, tunnel-valley incision beneath potential future ice sheets is regarded as a major challenge for the long-term safety of radioactive waste repositories, as the incision may reach depths under consideration for such repositories. Therefore, an understanding of the controlling factors of tunnel-valley formation is an important contribution to long-term safety assessments. The distribution and orientations of buried Pleistocene tunnel valleys in northern Germany are compared to regional structural features such as the basin geometry, faults and salt structures. The deepest tunnel valleys occur along the basin axis, where thick erodible deposits occur. The relationship between tunnel valley, fault and salt-structure orientations is ambiguous. We observe that the correlation between the orientation of tunnel valleys and the regional fault trend is strong, if the inferred main palaeo-ice-advance direction is parallel to the fault trends. Overall, a correlation between the trends of tunnel valleys and neotectonically active faults is regarded. It is postulated that neotectonic faulting may have increased erosion susceptibility and thus created preferential areas of subglacial incision. No clear correlation between the orientations of tunnel valleys and elongated salt structures can be identified in this dataset. In summary, the presence and orientation of faults and salt structures do not provide reliable indicators for future tunnel-valley incision with regard to long-term safety assessments.

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