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# Constraints for estimating the future burial depth of host rocks for geological waste disposal: a case study from the Boom Clay, Campine area, Northern Belgium

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An important requirement for geological formations hosting a repository for radioactive waste is sufficient depth to ensure isolation of the waste for a very long time period, up to 1 Ma and beyond. Over such long timescales, the repository depth and the thickness of the overburden may vary significantly due to various geodynamic processes. In Belgium, the Boom Clay in the Campine area (NE-Belgium) is considered as reference host formation for the geological disposal of radioactive waste. First results are presented that illustrate the possible impact of future climate change (based on several scenarios studied in the BIOCLIM project (BIOCLIM, 2001)) and tectonic movements in the Campine area on the thickness of the sediment mass overlying the Boom Clay.

At present, the subcrop area of Boom Clay in the Campine area is relatively flat (between $\sim$ 0 m a.s.l. near the river Scheldt estuary in the west and $\sim$ 60 m a.s.l. on the Campine Plateau in the east) and is occupied by several sub-basins that belong to the rivers Meuse and Scheldt. Future development of the area will heavily depend on the behaviour of these rivers and tributaries throughout the considered timeframe, in response to climatic changes and tectonic movements. The area is characterised by a long burial history, with some minor isolated uplift and erosional events during the last 30 Ma.

In a global warming scenario during a long interglacial ($>$ 50 ka AP), and/or in the case of subsidence, (relative) sea-level may rise such that various parts of the Boom Clay area will be occupied by the marine realm. This is likely to be a minimal erosion scenario because the baseline for landscape evolution will rise in the upstream parts while estuarine and marine deposition may increase the thickness of the overburden in the downstream parts.

In the case of a continuation of Pleistocene glacial cycles, i.e. the alternation between warm interglacials and cold glacials, the area will be exposed to erosion and denudation as occurred before. From a detailed analysis of the geological record described in the literature it is determined that during a future glaciation with significant sea-level fall, the river Scheldt basin will become a tributary of the major river system occupying the North Sea valley. This situation already existed $\sim$ 400 ka BP ago, and was probably responsible for the formation of the Flemish Valley. Today, this valley system is completely filled with sediment, but may be reactivated during next glaciations. Together with extreme uplift rates taken from the Maastricht area, south of the Boom Clay subcrop zone, the total amount of erosion may add up to 100-150 m after 1 Ma, which is regarded as a conservative value.

We conclude that constraints for future burial depths and erosion rates in the Campine area should consider the combined effect of both climate change and internal geodynamics (uplift/subsidence). Such effects can easily be deduced from geological archives in the region, that take into account specific and local circumstances.

References

BIOCLIM (2001). http://www.andra.fr/bioclim/documentation.htm