



Waste Containment in Permafrost

11B - Contaminant Behaviour and Nuclear Waste Safety in Transitional Climates

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Cryogenic processes play a crucial role in the safety assessments of long-term nuclear waste repositories and the transport of other contaminants. Within the timespan for which a safe enclosure of the waste must be ensured, which depending on the regulations, could be more than one million years, numerous climate cooling and warming cycles must be considered. The presence, aggradation, and degradation of permafrost and ice sheets can exert extensive pressure gradients and changes in pathways that impact the transport of radionuclides and other contaminants from the geosphere into the biosphere. Present-day permafrost regions currently serve as analogues for repository sites in a future cold climate, where processes that influence the migration of contaminants can be studied. Numerical modelling approaches of freezing and thawing of soil and rocks are constantly being improved, as the interplay between different processes and parameters becomes better understood.

In this session, we invite studies on any cold region processes that may impact contaminant transport, including but not limited to the context of long-term safety of nuclear waste repositories. We welcome contributions from numerical modelling, laboratory, field experiments, case studies and assessments in areas including (1) contaminant pathways between glacial, subglacial, and periglacial groundwater systems and surface systems; (2) impact of climatic transitions on contaminant transport; (3) links to ecological systems and biogeochemical transport processes; (4) effects of freezing and thawing of porous and fractured media (e.g. volume changes, cryosuction); (5) fault zone hydrogeology and the role of permafrost formation and thaw; (6) talik forming under freezing and thawing conditions.

Keywords: Nuclear Waste, Cryo-Hydrogeology, Climate Transition, Permafrost Transition

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