Transient Buried Landscapes as Manifestations of Icelandic Plume Activity

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We present a suite of four ancient buried landscapes that occur beneath the southeastern flank of the Faroe-Shetland basin on the fringes of the North Atlantic Ocean. These landscapes have been mapped on a calibrated three-dimensional seismic reflection survey. They are manifest as regional unconformities, representing repeated transient sub-aerial exposure events during Early Paleogene times. Once flattened, decompacted and depth converted, these landscapes equate to minimum transient uplifts of $O(200)$ m. Buried ephemeral landscapes are excellent natural experiments that develop over geological time on large spatial scales with known lithologies, exposure times and initial topographies. Dendritic drainage patterns recovered from these landscapes are highly disequilibrated and contain multiple knickpoints that are systematically arranged within catchment areas. Applying the stream power law, longitudinal rivers profiles are inverted to calculate spatially and temporally varying uplift histories. These unique landscapes are attributed to laterally advecting pulses of hot material that travel away from the Icelandic plume. They provide valuable insights into the dynamics of flow within an asthenospheric channel associated with a mantle plume. Diachronous V-shaped ridges straddling the Reykjanes Ridge independently record advecting thermal pulses of the Icelandic plume. We combine histories of vertical motions with a compilation of independent observations, including V-shaped ridges, to present a semi-continuous thermal history of Icelandic plume pulses.