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Investigating tectonic geomorphology of three half-graben basins onshore the NE Atlantic margin

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Tectonic controls on landscape evolution are well documented globally. In actively extending areas, tectonic geomorphology is typically represented by uplifted footwalls, downthrown hanging walls, distinct bounding escarpments, and characteristic drainage patterns.

In onshore parts of the NE Atlantic margin, several studies suggest that some present-day landforms are inherited from rifting and margin formation in the Late Paleozoic, Mesozoic and Early Cenozoic. Such inheritance can be difficult to recognize because much of the pre-existing landscapes are obscured by erosional features related to post-rift Cenozoic uplift and repeated glaciations during the Quaternary. Interpretations of these landscapes vary considerably; some have suggested the preservation of vast Mesozoic erosion surfaces, whereas others argue that most present-day landforms are Quaternary in origin with little pre-Quaternary inheritance. However, some remnants of Late Paleozoic and Mesozoic rifting are demonstrably preserved directly inboard of the NE Atlantic margin, in the form of sedimentary basins.

In this study we use structural and geomorphological field observations and DTM (Digital Terrain Model) analyses to investigate the landscape surrounding three half-graben basins. Detailed landscape classification and analysis is used to systematically review present-day landscape distribution and bounding faults in and around the remnant basins, in order to distinguish extensional tectonic landforms from other geomorphological features. The half-grabens considered in this study are the Carboniferous Billefjorden half-graben on central Spitsbergen, Svalbard; the Jurassic Sortlandsundet half-graben in Vesterålen, northern Norway; and the Jurassic Beitstadfjorden half-graben in Trøndelag, mainland Norway.

Preliminary results reveal major topographic contrasts between footwall and hanging wall in all three half-grabens, with generally higher topographical elevations and deeper incision in the footwalls compared to the hanging walls. Additionally, the three study areas have very distinct landscape signatures, suggesting a difference in the post-rift landscape evolution. These differences appear to be dependent on a number of factors related to unique post-rift events. The inherited half-grabens display profoundly different degrees of erosional exploitation of pre-rift structures, glacial incision, and possible late-Cretaceous or younger reactivation of the basin-bounding normal faults. This study will provide insight into the relationships between inherited,

tectonically controlled landforms, and incising Cenozoic and Quaternary landforms.