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## How does increased palaeosurface reconstruction contribute to understanding of the Arctic? - Developing a deep time palaeoclimate field laboratory in Svalbard.

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A complex tectonic history and global climate change has influenced the land masses bordering the Arctic ocean. On land tectonic movement affects runoff patterns, local hydrology such as increased precipitation and local surface elevation, which again affects landform development, coastline distribution, discharge routing and vegetation distribution. Land- atmosphere- biosphere links and feedback loop with the ocean are continuously refined for use in earth system models for the youngest part of geological history. With access to large data sets, improved technology and new knowledge and methodologies it is now increasingly possible to also reconstruct direct surface response to tectonic movement in deep time.

The Paleogene Central Tertiary Basin, Svalbard, Norway formed in response to the complex opening and collision at the entrance to the Arctic Ocean, causing uplift in the west and basin formation and fill in the Central Spitsbergen area. Well exposed outcrops and extensive work in the area for decades provides a framework of palaeogeographic change within the basin. The basin deposits range from continental to deep marine with changing coastline positions largely caused by tectonic activity. The timing of the basin development coincides with the time period immediately before and after the PETM and thus provides an example of a terrestrial system in a warm Arctic. Syndepositional volcanic eruptions in the Arctic area are reflected in tephra layers, which also provide opportunity for correlation and absolute time estimates (Jones et al. 2017).

We use data from two formations deposited within the basin as a field laboratory for surface response to tectonic and climate change in the Arctic. The Paleocene Firkanten Fm, is deposited during the early stages of basin formation and pre-PETM. The Eocene Aspelintoppen Formation, is deposited during late stages of basin filling and is post-PETM. Both formations are characterized by continental to paralic deposits and contain traces of palaeovegetation such as coal seams, palaeosols and fossil leaves. A large amount of exploration drill holes through the Firkanten Fm provide a unique insight into the palaeotopography and depositional trends relative to topography during deposition (Marshall et al., submitted). The presence of coal seams allows for direct reconstruction of vegetation (peat bogs) and interaction between hydrology and deposition. The

Aspelintoppen Formation comprises a thick succession of channel and floodplain deposits and reflects a balance between sediment supply and accommodation. We use virtual outcrops to provide 3D architecture from inaccessible mountain sides to improve the possibilities for quantification of precipitation and discharge parameters from the basin.

References:

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