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Paraglacial processes during rapid deglaciation: a question of time and space

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The paraglacial period is characterized by high rates of sediment delivery from slopes and into fluvial systems. This period of rapid response is triggered by the instability of unconsolidated glacigenic sediments and over steepened rock slopes, which have been debuttressed. In theory, the paraglacial period ends once sediment yields drop to rates typical of unglaciated catchments.
Due to rapid climatic change, paraglacial processes occurred at a short time scale interval in glaciated margin areas all around the world, but especially in Arctic environments. Based on our own researches in Svalbard and Iceland and on literature review, we propose a lecture of two main paraglacial processes occurred during rapid deglaciation in previously glaciated areas: paraglacial denudation and paraglacial redistribution processes.

(i) Paraglacial denudation processes are responsible of rock slope failures (such as sackungs, rock avalanches and various other landslide types…). Examples from north Iceland mass movements could be enlighten this question for the last deglaciation period and the beginning of the Holocene.
(ii) Paraglacial of sediment redistribution processes could explain alluvial fans, terraces, valley-train deposits, outwash plains or "sandurs" with outburst floods or "jökulhlaups", coastal deposits… Examples from Svalbard and Iceland could be illustrated the question of time and space scales (i) gullying on freshly exposed moraines; (ii) sediments fluxes from source (glacier margin) to sink (fjord) and progradation of sandy coasts.

Finally, the question of time scale for paraglacial processes depend of several internal and external parameters. First at all, paraglacial processes were controlled by ice melting and were dependent upon the presence of ice and, at another scale, upon the temporary abundance of glacially formed debris. In a time scale point of view, paraglacial processes were only a temporary condition and, paraglacial features themselves were temporary features, which pass through a series of developmental stages. At a spatial scale point of view, several environments underwent paraglacial period during a not restricted time closing phases of glaciation but may extend into the ensuing nonglacial interval, because any other processes could modify the landscapes assemblage set up during this short paraglacial adjustment.