

The Youngest Coasts on Earth – How Accelerated Post-Little Ice Age Deglaciation Reshaped Coastal Landscapes of Arctic and Subarctic Regions

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Abstract

The rapid retreat of most Northern Hemisphere marine-terminating glaciers since the post-Little Ice Age (LIA) is a direct consequence of escalating climate warming. Today, the dominant form of ice loss is calving, where massive chunks of ice break off from glacier fronts, significantly contributing to global sea-level rise. Despite extensive global research on glacier retreat and mass balance changes, the crucial impacts of deglaciation on adjoining coastal geomorphology are often overlooked. Once exposed, these paraglacial coastal environments are sculpted by a complex interplay of nearshore marine, coastal, and terrestrial geomorphic processes. These forces rework glacial sediments, leading to the emergence of novel coastal paraglacial systems. In this study, we provide a comprehensive review of the paraglacial processes, landforms, and landscapes that have formed in front of the Northern Hemisphere's most rapidly retreating glaciers. Our particular attention is given to juvenile beaches, deltas, and lagoons. Furthermore, we assess the profound influence of extreme waves, including tsunamis caused by landslides, calving waves, and iceberg roll waves, on the ongoing reshaping of these young, recently ice-abandoned coastlines. This review is dedicated exclusively to Svalbard and Greenland, with illustrative examples also drawn from Iceland, Alaska, and the Canadian Arctic Archipelago. We characterize these nascent coasts based on their rock type, current climatic conditions, and geographical location, with a specific emphasis on the permafrost zone. These environmental variables are critical in driving the evolution of newly initiated paraglacial coasts and allow us to pinpoint areas with anticipated dynamic coastal geomorphological changes.

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