Suppression of lateral collapses at glaciated volcanoes in the South Sandwich arc by high rates of erosion and formation of sediment wave fields on the lower slopes of edifices.

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Flank instability producing landslides of various types is common in almost all volcanic island arcs. These landslides range from small, thin-skinned events comparable to non-volcanic landslides; through larger events at the edges of platforms around islands; to large (1 to > 10 cubic kilometres) and deep-seated (thicknesses of 100s of metres) lateral collapses. In some island arcs, such as the Bismarck arc in Papua New Guinea, a majority of the volcanoes show evidence for recent occurrences of even these largest and least common lateral collapse landslides, in the form of collapse scars and offshore debris avalanche deposits. In strong contrast, recent British Antarctic Survey mapping cruises around the South Sandwich arc have shown that lateral collapse debris avalanche deposits from the active subaerial volcanoes of this arc are extremely rare. Only one, relatively small, subaerial lateral collapse structure is known (on Zavodovskii Island), whereas the several seamounts also mapped do show a number of lateral collapse features and deposits. The subaerial islands are subject to small-scale thin-skinned landslides and the margins of the submerged platforms on which they stand show scallop-shaped scars from platform margin landslides.

The slopes below these platform margins are formed by unusually large and well-developed sediment wave fields, which extend up to several tens of kilometers and contain sediment waves up to 200 m high. Such large sediment wave fields are only found around caldera volcanoes in other island arcs. We propose that the suppression of large scale, deep seated lateral collapses in the South Sandwich arc is linked to rapid coastal and glacial erosion of the glaciated subaerial volcanoes that, coupled with subglacial phreatomagmatic eruptions and ice-melt floods, generates large fluxes of coarse sediment to feed the sediment wave fields. The rapid removal of material from the summits and upper slopes of the volcanoes, and its deposition on the lower flanks, appears to have stabilized the edifices against occurrence of the large-scale flank collapses found in other arcs. The contrast in patterns of flank instability between the South Sandwich arc and other arcs may provide insights into the underlying mechanisms of, and controls upon, lateral collapse occurrence.