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Modern sedimentation patterns in Potter Cove, King George Island, Antarctica

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IMCOAST among a number of other initiatives investigates the modern and the late Holocene environmental development of south King George Island with a strong emphasis on Maxwell Bay and its tributary fjord Potter Cove (maximum water depth: about 200 m). In this part of the project we aim at reconstructing the modern sediment distribution in the inner part of Potter Cove using an acoustic ground discrimination system (RoxAnn) and more than136 ground-truth samples. Over the past 20 years the air temperatures in the immediate working area increased by more than 0.6 K (Schloss et al. 2012) which is less than in other parts of the West Antarctic Peninsula (WAP) but it is still in the range of the recovery of temperatures from the Little Ice Age maximum to the beginning of the 20th century. Potter Cove is a small fjord characterized by a series of moraine ridges produced by a tidewater glacier (Fourcade Glacier). Presumably, the farthest moraine is not much older than about 500 years (LIA maximum), hence the sediment cover is rather thin as evidenced by high resolution seismic data. Since a few years at least the better part of the tidewater glacier retreated onto the island's mainland. It is suggested that such a fundamental change in the fjord's physiography has also changed sedimentation patterns in the area. Potter Cove is characterized by silty-clayey sediments in the deeper inner parts of the cove. Sediments are coarser (fine to coarse sands and boulders) in the shallower areas; they also coarsen from the innermost basin to the mouth of the fjord. Textural structures follow the seabed morphology, i.e. small v-shaped passages through the moraine ridges. The glacier still produces large amounts of turbid melt waters that enter the cove at various places. We presume that very fine-grained sediments fall out from the meltwater plumes and are distributed by mid-depth or even bottom currents, thus suggesting an anti-estuarine circulation pattern. Older sediments that are more distal to the glacier front and sediments in shallower places (e.g. on top of the moraine ridges) become increasingly overprinted by coarser sediments from the shallow areas of the fjord. These areas are prone to wave induced winnowing effects as well as disturbances by ploughing icebergs. It can be concluded that coarsening of the fjord sediments will continue while the supply of fine-grained meltwater sediments might cease due to exhaustion of the reservoirs.