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Fluvial stream dynamics and morphology on Byers Peninsula (Livingston Island, Antarctic Peninsula region): a model of landscape evolution in deglaciated areas

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Surface fluvial systems are very scarce in Antarctica and they are located in ice-free areas linked to deglaciation processes. In areas with recent deglaciation, the fluvial network development is connected with glacial retreat as well as other factors such as climatic conditions (precipitation distribution and amount; temperature and wind speed, among others). Ice and snow accumulation and thaw are closely controlled by temperature and reinforced by changes in wind speed and direction as well as direct rainfall on snow masses. As a result of local climatic conditions (high rainfall rates and exposition to winds), a considerable number of fluvial streams have developed in recent times on Byers Peninsula, due to the presence of more water to form channels. The typical Byers Peninsula stream system shows three parts: (1) upper reach with shallow slopes, diffuse drainage pattern due to high rates of water coming from the melting of ice and snow patches, low lying deep lakes and open braided channels; (2) gentle canyons in some cases covered by snow where water flows in snow/ice tunnels and (3) open channels where streams flow in a braiding way, controlled by several raised beaches that sometimes force the water into straight incised channels. We studied the relation between channel size and watershed area, size of fans and deltas and other morphological variables. Now and again, instantaneous events and catastrophic changes occur due to the collapse of ice-dams. As a result of such processes, new fans, small hummocky structures and stream channels take on a new morphology. Sometimes the landscape evolution does not explain the formation of stream channels and they remain in a misfit state. We determined the stream morphology (channel width, depth, wet section, longitudinal slope, basin area) in the following main groups of fluvial basins: streams draining to the South Beaches, to the North Beaches (President Beaches) and to the western coast (Robbery Beaches). Preliminary results show differences in streams morphology and the state of evolution among the three mentioned drainage groups which we think are probably due to differences in the deglaciation process. In addition, we also have noted differences among streams in the same drainage group that we interpret as linked to the speed and acceleration/stabilization of the deglaciation process.

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