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Controls and variability of solute and sedimentary fluxes in Antarctic and sub-Antarctic Environments

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The currently prepared SEDIBUD Book on "Source-to-Sink Fluxes in Undisturbed Cold Environments" (edited by Achim A. Beylich, John C. Dixon and Zbigniew Zwolinski and published by Cambridge University Press) is summarizing and synthesizing the achievements of the International Association of Geomorphologists' (I.A.G./A.I.G.) Working Group SEDIBUD (Sediment Budgets in Cold Environments), which has been active since 2005 (http://www.geomorph.org/wg/wgsb.html). The book comprises five parts. One of them is part about sub-Antarctic and Antarctic Environments.

This part "Sub-Antarctic and Antarctic Environments" describes two different environments, namely oceanic and continental ones. Each part contains results of research on environmental drivers and rates of contemporary solute and sedimentary fluxes in selected sites. Apart from describing the environmental conditions of the whole continent of Antarctica and sub-Antarctic islands (Zb.Zwolinski, M.Kejna, A.N.Lastochkin, A.Zhirov, S.Boltramovich) this part of the book characterizes terrestrial polar oases free from multi-year ice and snow covers (Zb.Zwolinski). The detailed results of geoecological and sedimentological research come from different parts of Antarctica. Antarctic continental shelf (E.Isla) is an example of sub-Antarctic oceanic environment. South Shetlands, especially King George Island (Zb.Zwolinski, M.Kejna, G.Rachlewicz, I.Sobota, J.Szpikowski), is an example of sub-Antarctic terrestrial environment. Antarctic Peninsula (G.Vieira, M.Francelino, J.C.Fernandes) and surroundings of McMurdo Dry Valleys (W.B.Lyons, K.A.Welch, J.Levy, A.Fountain, D.McKnight) are examples of Antarctic continental environments.

The key goals of the Antarctic and sub-Antarctic book chapters are following: (i) identify the main environmental drivers and rates of contemporary solute and sedimentary fluxes, and (ii) model possible effects of projected climate change on solute and sedimentary fluxes in cold climate environments. Solute and sediment transport in the streams of analyzed environments are constrained by the relatively short water runoff season that typically lasts from a few weeks to maximum of four months during the austral summer, for Antarctic and sub-Antarctic regions respectively. Because of high intensity of mechanical and chemical weathering processes solute and sediment transport are rather high within Antarctic environments. Weathering rates on slopes and magnitude of fluvial transport in relatively short streams control the intensity of denudational processes. Both mechanical and chemical denudation varies highly through sub-Antarctic and Antarctic environments.

To generate accurate predictions of fluvial and denudational processes we must fully understand the actual geoecological processes, which in some places are under rapid change, e.g., the Antarctic Peninsula and sub-Antarctic islands.