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Classification of Chilean gravel-bed rivers: a proposal

Andrés Iroumé (1), Gastón Vergara (2), Luca Mao (3), and Víctor Sandoval (4)

(1) Universidad Austral de Chile, Instituto de Conservacion, Biodiversidad y Territorio, Valdivia, Chile (airoume@uach.cl), (2) Universidad Austral de Chile, Instituto de Estadística, Valdivia, Chile (gastonvergara@uach.cl) , (3) Pontificia Universidad Católica de Chile, Departamento de Ecosistemas y Medio Ambiente. Santiago, Chile (lmao@uc.cl), (4) Universidad Austral de Chile, Instituto de Bosques y Sociedad. Valdivia, Chile (vsandova@uach.cl)

Investigations on fluvial morphodynamics in Chilean rivers are still scarce, and up to date very little attempts have been made in order to generate a classification scheme. However, the latitudinal variation in vegetation and climatic conditions and the geography of the country offer an almost unique opportunity to study gravel-bed river variations with both latitude and extreme geophysical events. We studied channel reaches of twenty Chilean gravel-bed rivers from semi-arid Mediterranean to rainy temperate conditions (latitudinal range from 30º19' to 39º56'S) to generate a classification based on geomorphic indicators. Reaches were selected to measure 20 times the width of the active channel, and morphologic features within the active channels were identified through a direct interpretation of aerial photos and remotely sensed images and the use of GIS. Also, river basin topographic conditions were derived from existing digital elevation models and discharge was obtained from national data bases. We used normalized active channel width (W*) and slope (S*), mean elevation, percentage of active channel occupied by islands and number of islands per km, catchment mean slope, and the 2-year return period flood (Q2) as indicators. By means of a hierarchical clustering analysis method and using the squared Euclidean distance metric we classified the study channels in five types. Type I comprises the two northernmost reaches and presents by far the lowest Q2; Type II groups only one reach noticeably different than all the other types, and located just south and with smaller W* but higher S* than Type I channels; Type III includes two channels with higher Q2 than Types I and II, and compared with all other types they feature very low percentage of active channel occupied by islands and number of islands per km and relatively high S*; Type IV includes 12 channels in the latitudinal range from 34º36' to 39º56'S; and finally, the three channels of Type V differ from Type IV although sharing their same latitudinal range. The study is expected to provide important new information on Chilean river systems, and will support the development of scientific-based river management strategies. This research is being developed within the framework of Project FONDECYT 1141064.