Geophysical Research Abstracts
Vol. 21, EGU2019-10768, 2019
EGU General Assembly 2019

Exploring the relation between meteorological, physiographic and hydrological similarities through catchment classification

Nicolas Vasquez (1), Javier Cepeda (2), Tomas Gomez (2), Pablo Mendoza (2), Camila Alvarez (3,4), Miguel Lagos (5), and Ximena Vargas (2)

(1) Department of Civil Engineering, Universidad de Chile, Santiago de Chile, Chile (nvasquez.plac@gmail.com), (2) Department of Civil Engineering, Universidad de Chile, Santiago de Chile, Chile, (3) Center for Climate and Resilience Research, Universidad de Chile, Santiago de Chile, (4) Universidad Austral, Valdivia, Chile, (5) Advanced Mining Technology Center, Universidad de Chile, Santiago de Chile, Chile.

Over the past decades, the research community has made several efforts to infer hydrological information on ungauged basins by using similarity concepts. An ongoing challenge within this field is to elucidate the relation between physical, climatic and hydrologic similarities to improve process understanding, and to use that knowledge to extrapolate information from gauged to ungauged basins. We address this challenge in the context of water resources in Chile, where multi-institutional efforts have been oriented to characterize the water balance across the country under historical and future climatic conditions. Within this project, we perform catchment classification over 82 Chilean basins in natural regime, using a Bayesian clustering algorithm. Basins information is collected from satellite products and the CAMELS-CL dataset, which provides catchment-scale hydrometeorological time series and physiographic attributes for continental Chile.
To explore overlaps between the different types of similarities, we apply several classification schemes: (i) physiographic (P, using land cover type and elevation), (ii) climatic (C, using aridity index, precipitation seasonality and fraction of precipitation falling as snow), (iii) hydrological (H, using a suite of selected signatures) and (iv) combinations of the above (P+C and P+C+H). Classifications solely based on P, C or H attributes, result in three, five and three clusters, respectively. The application of P+C and P+C+H schemes results in 12 and 11 clusters, respectively. Moreover, we assess the ability of the various classification schemes (e.g., C clusters) to group catchments according to the rest of predictors (i.e. P and H). Our results show that P and C classifications are able to group hydrologically different catchments (i.e. signatures). Conversely, an H classification has discriminatory power over C attributes, but not over P descriptors. Additionally, C and P+C classifications generate more classes than P clustering, allowing a finer representation of hydrological attributes (specially P+C). Overall, our results suggest that hydrological behaviour is mostly explained by P+C attributes, with predominance of C over P descriptors.