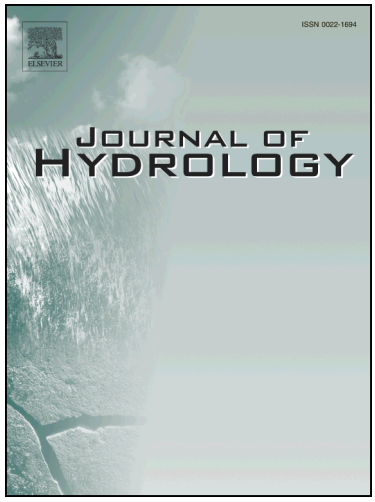

Research papers

Multi-decadal 40- to 60-year cycles of precipitation variability in Chile (South America) and their relationship to the AMO and PDO signals

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Multi-decadal 40- to 60-year cycles of precipitation variability in Chile (South America) and their relationship to the AMO and PDO signals

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ABSTRACT

High-frequency components of precipitation variability have been an important focus of study during the last few decades in Chile. Low-frequency variations, on the other hand, have received less attention, especially in association with multi-decadal cycles that can affect variability trends of precipitation in the long term. This study analyzes these low-frequency patterns of precipitation in Chile (> 30 years), and their relationship to global Sea Surface Temperatures (SSTs), with special focus on associations with the Pacific Decadal Oscillation (PDO) and the Atlantic Multi-decadal Oscillation (AMO) indices. Singular Spectrum Analysis (SSA) and its Multi-Channel version (MSSA) techniques were applied to a dataset containing long instrumental records of monthly precipitation aggregated yearly and seasonally. The relationships between the low-frequency variability of precipitation and the PDO are significant to the north of the country, whereas connections with the AMO are significant to the north and also to the south. This is also evident from the global spatial correlation analysis of low-frequency precipitation modes and SSTs, where the southernmost station shows a strong relationship with the Atlantic Ocean. We conclude that a significant multi-decadal precipitation cycle between 40 and 60 years is evident at the rain gauges located in the subtropical and extratropical regions of Chile. This low-frequency variability seems to be largely linked to PDO and AMO modulation.

Keywords: Precipitation variability, SSA, MSSA, climate oscillations, PDO, AMO.

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