

PLANKTONIC DIATOM EVIDENCE FOR HOLOCENE CHANGES IN WIND-DRIVEN MIXING REGIME AND HUMAN IMPACTS IN LAKE VILLARRICA, SOUTH CENTRAL CHILE

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Temperate Southern Hemisphere regions are influenced by climate fluctuations such as ENSO and changes in the strength and position of the Southern Westerlies. These processes can alter physical lake properties like water-column mixing which is an important factor for governing algal abundance and community dynamics. Here we present a low-resolution Holocene diatom stratigraphy of a 14 m long sediment core from Lago Villarrica (39°15'S, 72°02'W), which was combined with sedimentological proxies in order to infer paleolimnological and paleoclimate changes in Northern Patagonia. The reconstruction of past changes in wind-driven mixing regime was aided by a newly developed diatom training set based on standing populations and surface sediment data from 27 Chilean lakes (39°-43°S). Differences in planktonic diatom community structure were mainly related to gradients in euphotic depth and mixing regime.

Between 9369 and 5900 cal yr BP, overall high diatom productivity and high relative abundances of *Discostella stelligera*, *D. cf. mascarenica* and *Urosolenia eriensis* point to the occurrence of thermally stable water conditions likely related to the Early Holocene warm period. During the Mid- and Late-Holocene, enhanced seasonality with longer and more stable lake water stratification during summer and more intense winter mixing could be inferred based upon the notable co-occurrence and high abundances of *Aulacoseira granulata*, *A. granulata* var. *angustissima* and *U. eriensis*. During the last 3000 years enhanced ENSO frequency and intensity could be inferred based on the absolute abundance pattern of *U. eriensis* and the occurrence of lahar laminae in the lake sediment core. These patterns match remarkably well with the ENSO record from Laguna Pallcacocha (Ecuador, 2°S). The most recent period is characterized by a marked shift in the diatom community composition, with a sudden increase of *Asterionella formosa* and *Fragilaria crotonensis*, indicating increased nutrient levels likely related to human activities in the lake and its catchment area.