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Variable preservation of tephra from the 1991 eruption of Volcán Hudson in small lakes: implications for reconstructing past eruption parameters

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Volcanic ash (tephra) deposits are used to reconstruct past eruption parameters. The ways in which tephra deposits are modified between deposition and their long-term preservation in the stratigraphic archive are poorly understood. In particular, we don't know if tephra layers preserved in lake sediments from small lakes accurately reflect the initial tephra fallout. We address this by re-surveying tephra deposits from the 1991 eruption of Volcán Hudson, Chile. We measured tephra thickness, mass-loading and grain-size distribution of tephra from multiple cores in six small (<0.2 km²) lakes at locations 76-110 km from the volcano and in areas of contrasting land cover and climate. We also measured tephra preservation in terrestrial sites within each lake catchment. These data were compared with measurements taken shortly (days to weeks) after the eruption to determine how the tephra deposits have changed in the 29 years since the eruption. Preservation is variable within and between lakes, and also varies with the vegetation cover at terrestrial sites adjacent to the lakes. Tephra thicknesses are broadly comparable to the original fallout, but the degree of similarity varied notably and is sensitive to preservation environment. These findings have implications for reconstructing eruption parameters from tephra deposits in small lakes, and where the fallout area crosses large environmental gradients and contrasting vegetation regimes.