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Glacial landscape evolution at the Tres Lagunas, NW-Argentina: a potential calibration site for surface exposure dating

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The Tres Lagunas are small (∼1 ha) seasonally desiccating lakes at 4350 m altitude, which formed after deglaciation in the currently ice-free Cordillera de Santa Victoria, NW-Argentina. Moraines once dammed the lakes, but the regional glacial chronology is subject to controversial discussions. Located at the transition zone between the humid slopes of the Eastern Cordillera influenced by the South American Summer Monsoon and the semiarid high-altitude plateau of the Puna, glaciers in our research area were not only temperature- but also precipitation-sensitive. Important information concerning the paleoclimate, particularly changes in tropical temperatures and in the intensity of the southern hemispheric monsoon, should therefore be recorded in the glacial deposits of the Central Andes. Up to now, the current systematic uncertainties of surface exposure dating (up to 30% at high altitudes) prevent sound paleoclimatic implications.

Exposure dating of the moraines surrounding the Tres Lagunas is currently in progress, and we hope to obtain independent age control as well as additional paleoclimatic information from the lake sediments of the Tres Lagunas. A first sediment core of 8 m depth was already recovered and analysed geochemically and sedimentologically. The upper 4.8 m of sediments are partly laminated lake sediments that yield stratigraphically consistent radiocarbon ages between ∼15 cal ka BP (1.8 m) and ∼17.5 cal ka BP (4.8 m). Below, from 4.8 – 7.6 m depth, several radiocarbon ages between ∼15 and 18 cal ka BP could be obtained from coarse, TOC-poor sediments

that we interpret to be till of the last glacier covering the Tres Lagunas. We speculate that the radiocarbon ages from the TOC-poor till might be slightly too young due to post-depositional contamination with soluble organic material. Maximum radiocarbon ages of the respective glacial advance could be obtained from laminated lake sediments that underlie the till (7.6 – 8 m). They yield consistent ages of ∼19 and 20 cal ka BP.

Locally, glaciers thus seem to have reached a maximum position between ∼17.5 and 19 cal ka BP. The close bracketing radiocarbon ages of the glacial advance at the Tres Lagunas might make the location a highly valuable high-altitude calibration site for surface exposure dating. Additional sediment cores, combined with geo-radar, geo-electric and geo-magnetic investigations are scheduled, as well as further geochemical and palynological analysis of the lake sediments.