Hydroclimate and ENSO Variability Recorded by Oxygen Isotopes From Tree Rings in the South American Altiplano

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Summary

We measured stable oxygen isotopes of tree-ring cellulose ($\delta^{18}O_{TR}$) from *Polylepis tarapacana* (Fig. 1, Fig. 2). We found negative correlations between $\delta^{18}O_{TR}$ and precipitation accross all study sites (Fig. 3), indicating more depleted $\delta^{18}O_{TR}$ during intense precipitation in the **current** growing season, coincident with the pick of the South American Summer Monsoon (SASM). We also found significant correlations with Sea Surface Temperature (SST) at interannual and interdecadal timescales (Fig. 4). Our results report a strong potential of $\delta^{18}O_{TR}$ for SASM and ENSO reconstructions. $\delta^{18}O_{TR}$ is complementary to ring width since the latter is mostly sensitive to prior year aridity.

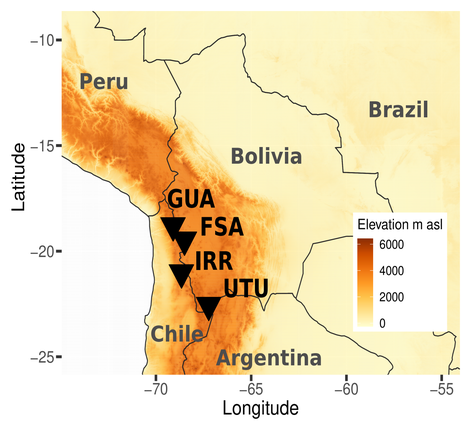


Figure 1: Location of study sites in the South American Altiplano

Figure 2: *Polylepis tarapacana* $\delta^{18}O_{TR}$ chronologies

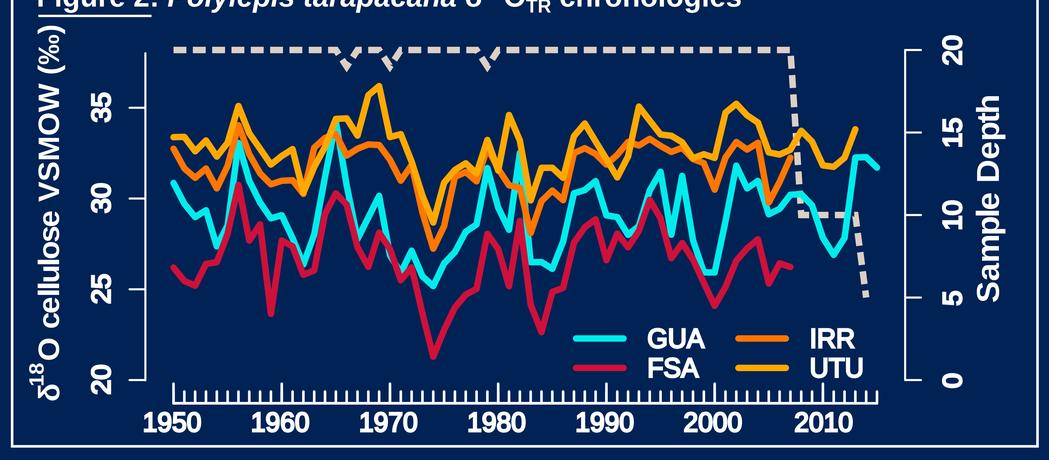


Figure 3: (A) This figure shows significant (continuous lines) negative correlations between $\delta^{18}O_{TR}$ and precipitation data from meteorological stations, especially during current growing season January, February and March (JFM). Note inverted left y axis. (B) Field correlations between d18OTR and Climate Research Unit (CRU) for total JFM precipitation, only significant gridds are coloured. All correlations are computed for 1950-2008.

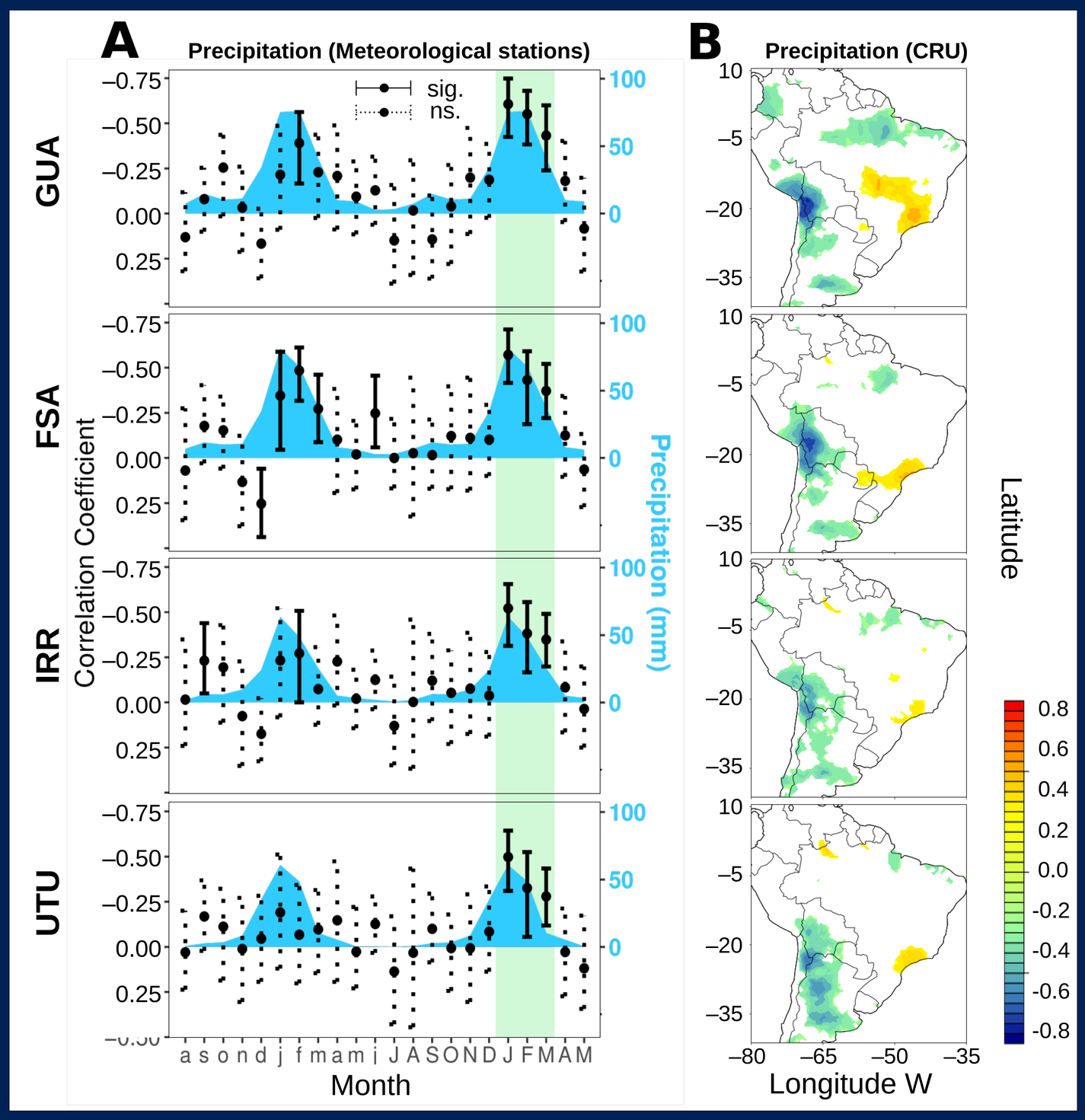
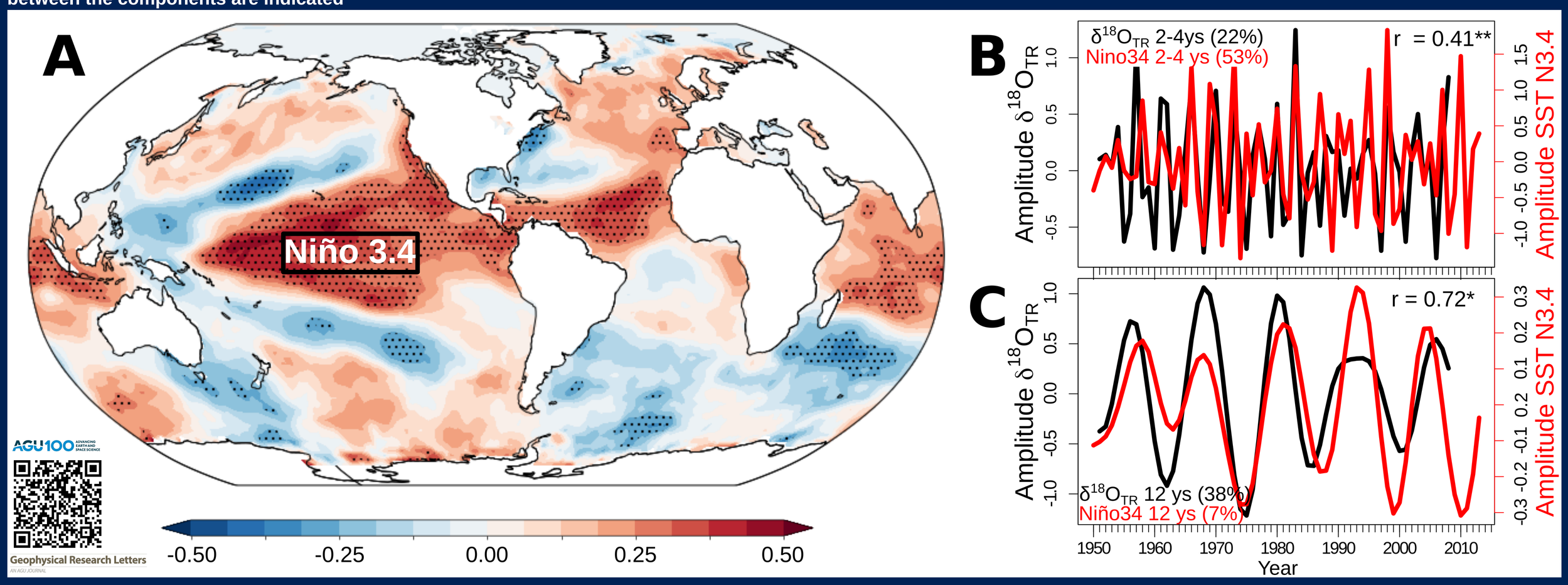


Figure 4: El Niño-Southern Oscillation signal in $\delta^{18}O_{TR}$. (A) Field correlations between the composite $\delta^{18}O_{TR}$ chronology and JFM SSTs for 1950–2007. Dotted areas indicate significant correlations (alpha<0.05). (B) Interannual and (C) decadal frequency components of the $\delta^{18}O_{TR}$ and JFM SST. Variance explained by each component and correlations coefficients between the components are indicated



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