Paleoceanography and Paleoclimatology

Supporting Information for

Machine learning solutions to regional surface ocean $\delta^{18}O$ – salinity relationships for paleoclimatic reconstruction

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Introduction

Here we provide a visualization of the $\delta^{18}O_{sw}$ and salinity difference between our interpolation and LeGrande and Schmidt (2006) and OISSS Aquarius V5.0 data (Melnichenko et al., 2016). We also show two figures comparing modeled data and observations, which are indicators of model fit.

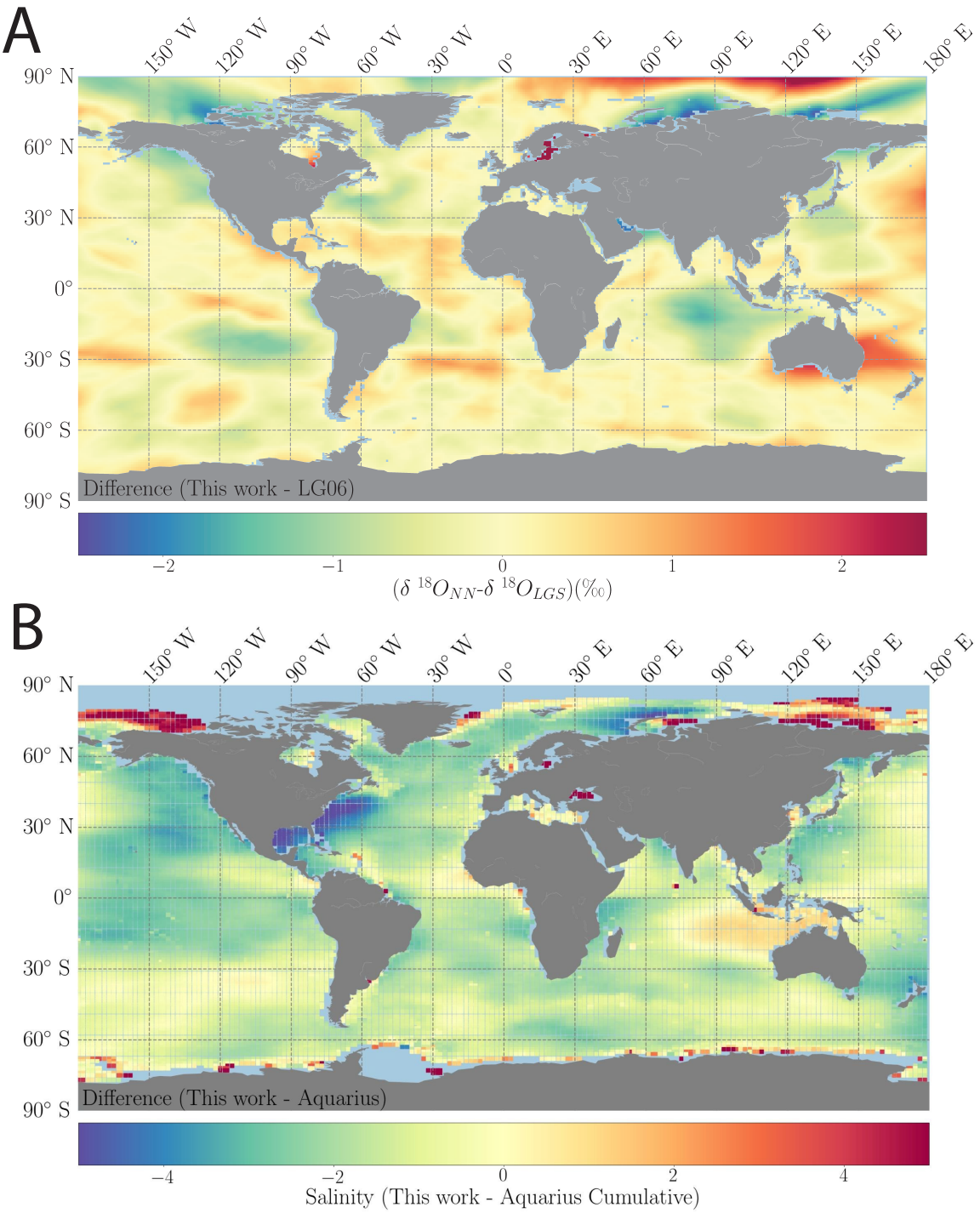

Figure S1. a) Difference between the $\delta^{18}O_{sw}$ interpolation in this work and LeGrande and Schmidt (2006). Scalebar is limited to +/- 2 ‰ to emphasize areas of greatest disparity. LeGrande and Schmidt, (2006) latitude and longitude data was shifted by 0.5° x 0.5° to have direct spatial overlap of the datasets. b) Difference between the salinity interpolation from our smaller surface salinity dataset (which only uses the same N as available $\delta^{18}O_{sw}$) and Aquarius OISSS V5.0 mean monthly sea surface salinity.

(http://apdrc.soest.hawaii.edu/datadoc/oisss.php). Largest differences (e.g., Gulf of Mexico, western coast of South America, & southeast African coast) in a) tend to occur in regions with no observational data (see Figure 1, main text). This comparison reveals the limitations of the sparse, paired $\delta^{18}O_{sw}$ - salinity data relative to the more robustly observed salinity data.

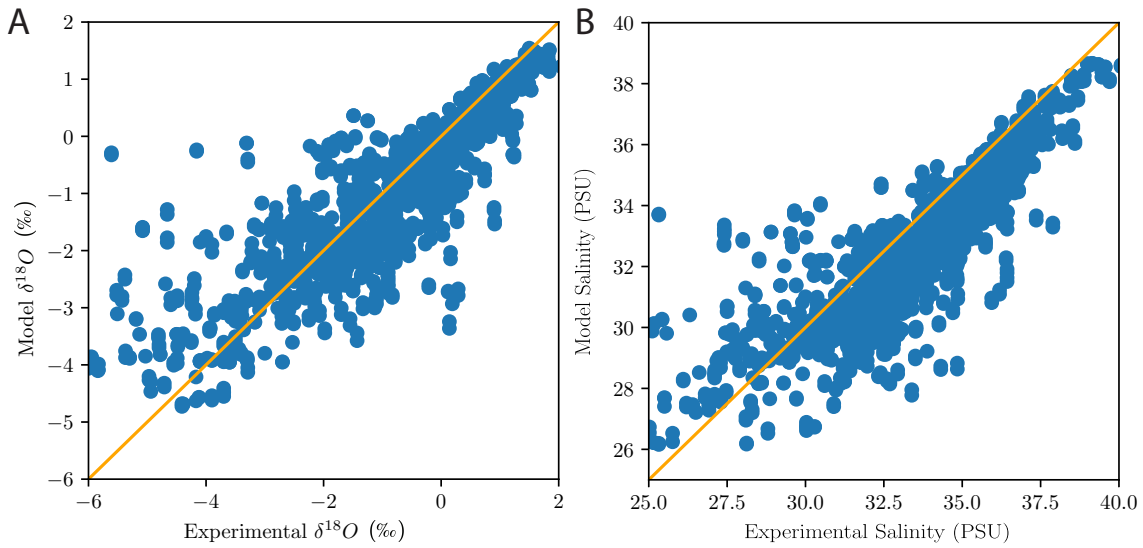

Figure S2. Comparison between the neural network interpolated a) $\delta^{18}O_{sw}$ and the experimental $\delta^{18}O_{sw}$ and b) interpolated salinity and the experimental salinity. The ideal linear model (y=x) is plotted in orange. The interpolation explains most of the variance of the experimental data. The standard error for $\delta^{18}O_{sw}$ is 0.631‰ and SSS is 1.427 PSU.

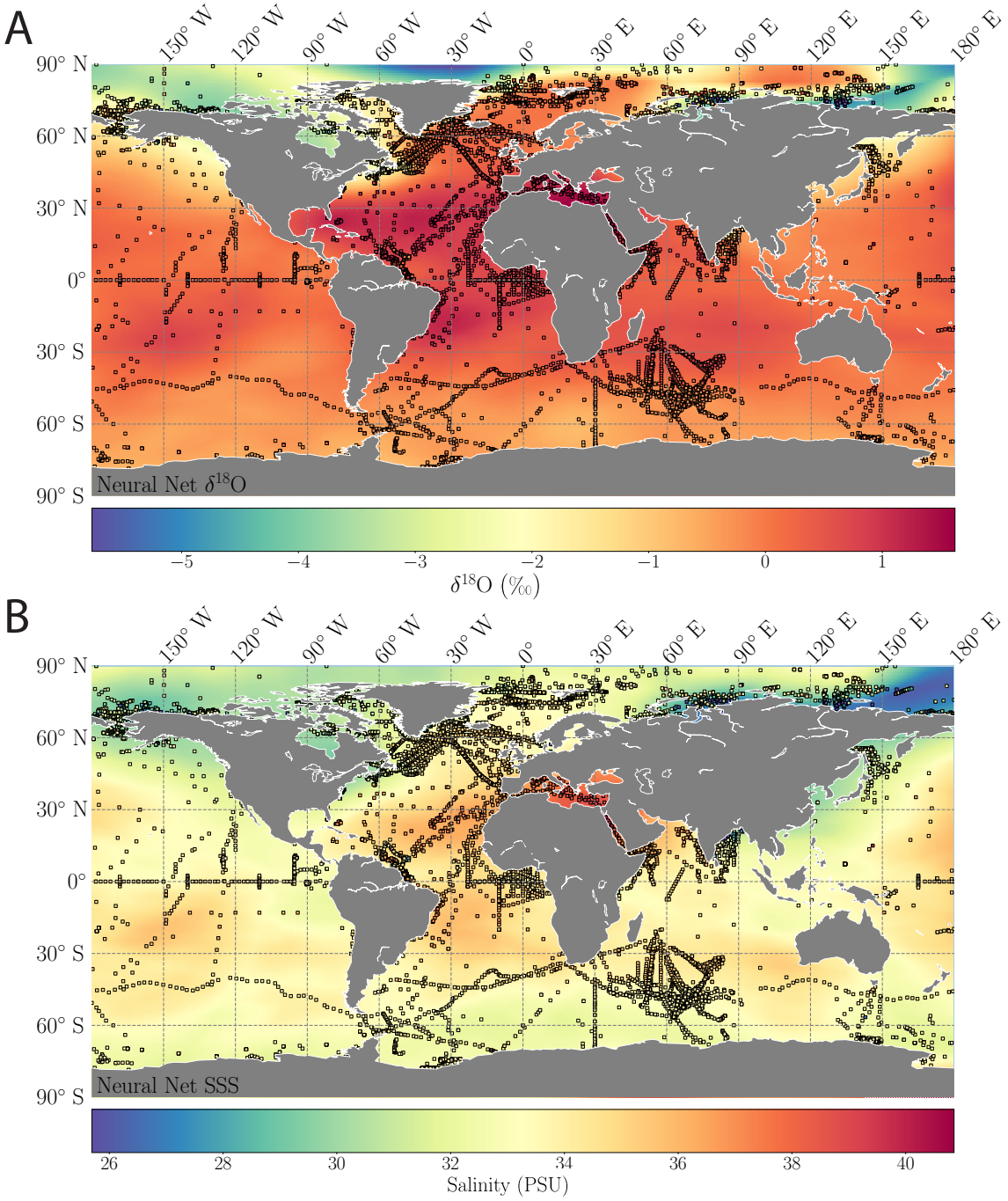

Figure S3. A) Neural network $\delta^{18}O_{sw}$ plotted in space with the experimental values represented by squares. Color match between squares and backdrop color indicates good fits to the data. Areas with rapid transitions between regions, coastal regions and the Bay of Bengal, contribute the most to the error of the model. B) Same as in A with sea surface salinity.