Hydrology and Earth System Sciences

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Supplement of

Statistical prediction of terrestrial water storage changes in the Amazon Basin using tropical Pacific and North Atlantic sea surface temperature anomalies
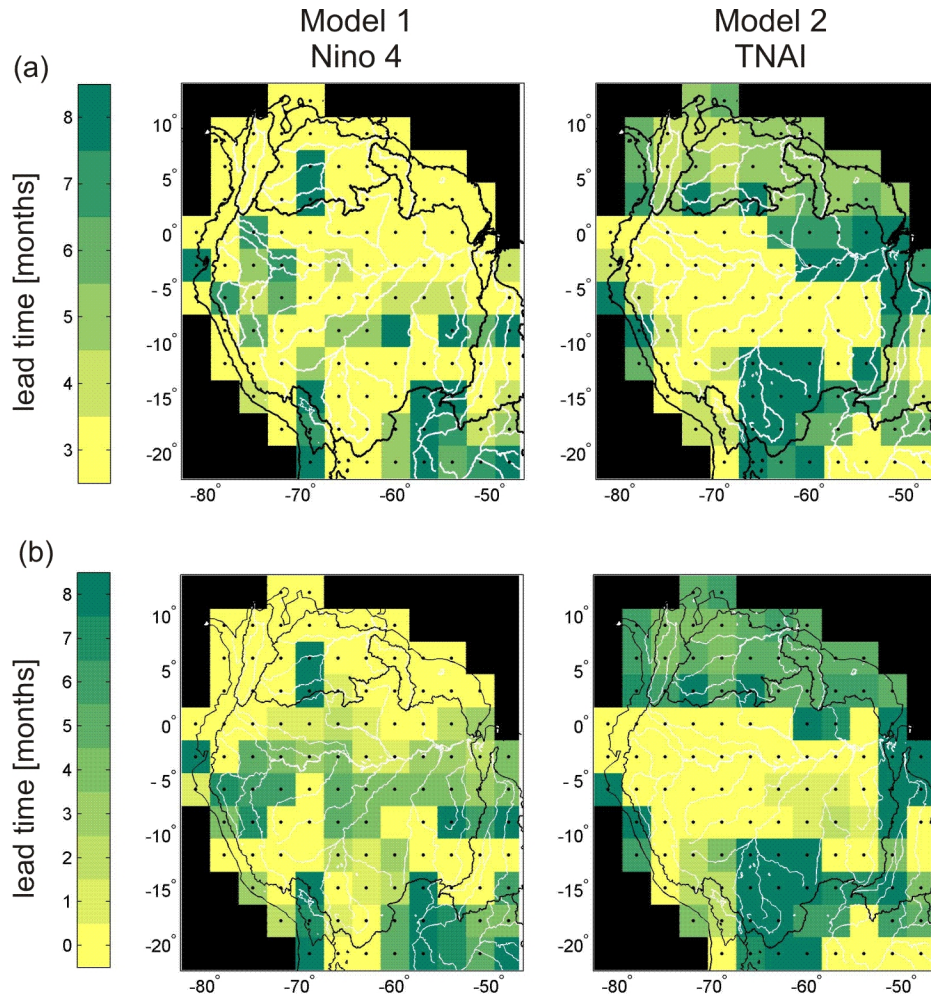
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12   Table S1 Range of parameter values that were evaluated for each model optimization. For a_0, b_0,
13   α, and β parameters, the first term is the minimum of the parameter range, the second term is the
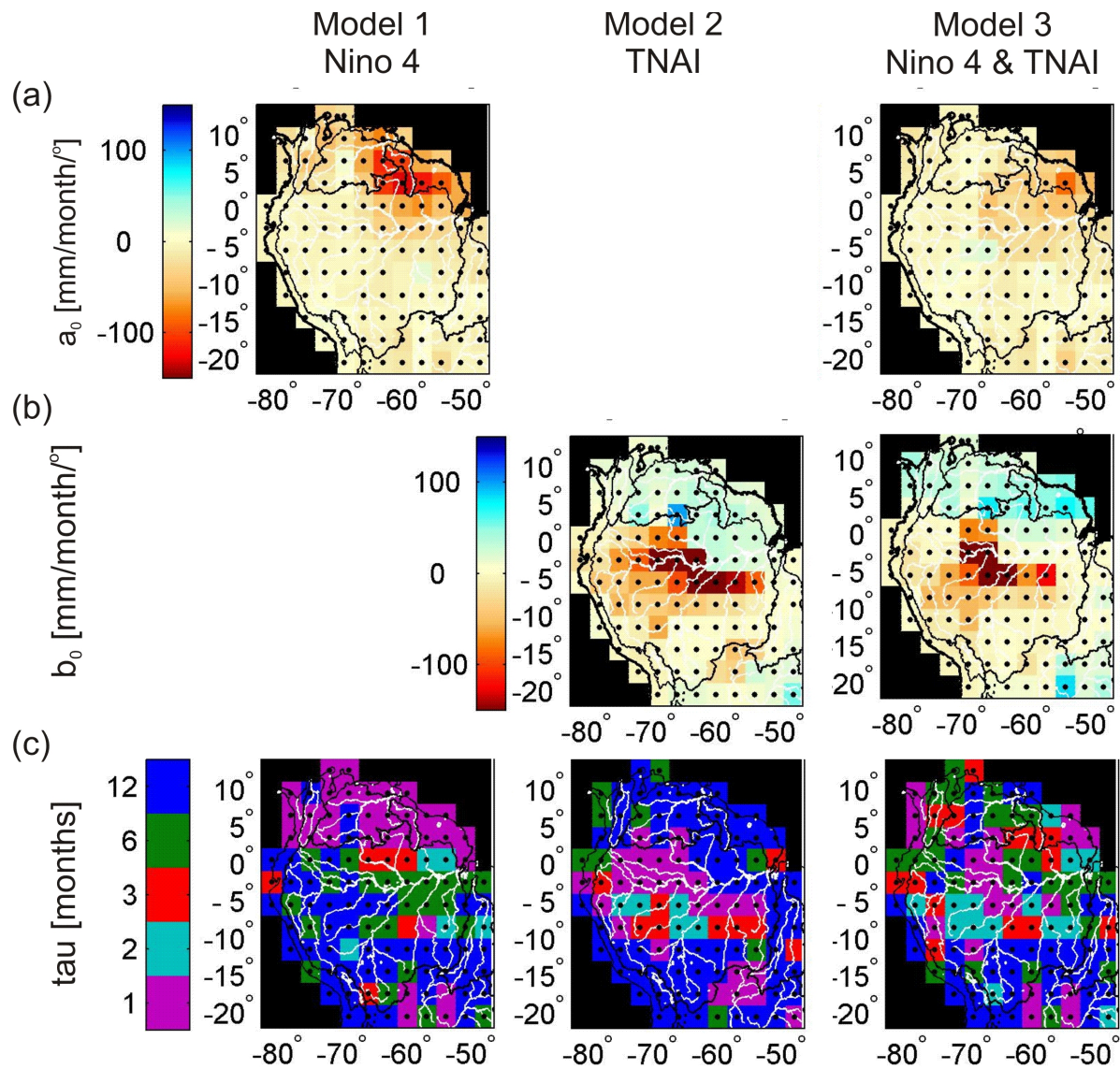14   increment, and the third term is the maximum of the parameter range.

Model #	τ (months)	a_0 (mm/month/°C)	b_0 (mm/month/°C)	α, β (months)	Number of parameter combinations
1	1, 2, 3, 6, 12	-200:5:70	-	3:1:8	1650
2	1, 2, 3, 6, 12	-	-250:5:150	3:1:8	2430
3	1, 2, 3, 6, 12	-150:5:50	-200:5:120	prescribed	13325

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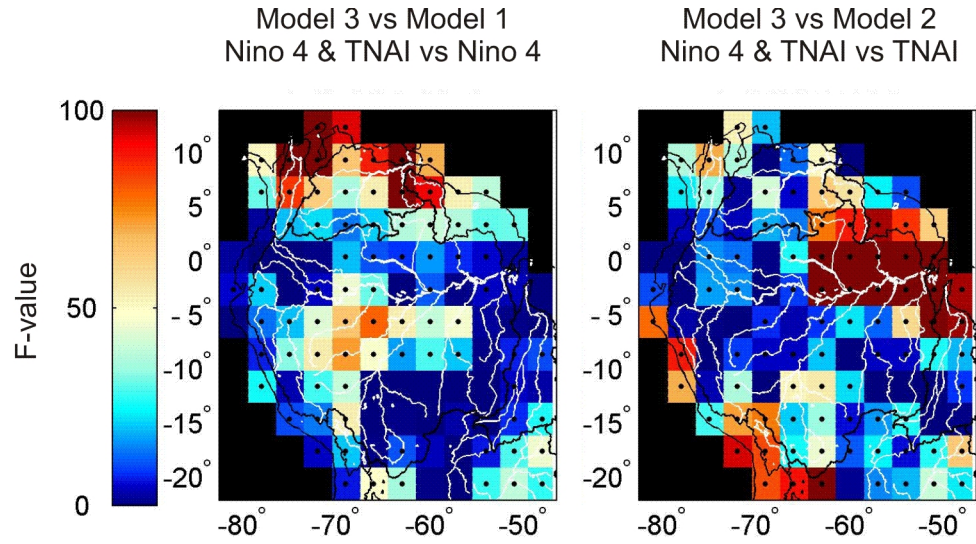
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Figure S1 Optimized lead times between climate indices and TWSA predictions *α* (left) and *β* (right) for models 1 (Niño 4) and 2 (TNAI), respectively, obtained using a prescribed minimum value of 3 months (a) and 0 month (b). Note the color scale difference between (a) and (b). The values obtained in Fig. S1 also were used as the prescribed lead times in model 3 (i.e., the combined model using both Niño 4 & TNAI).
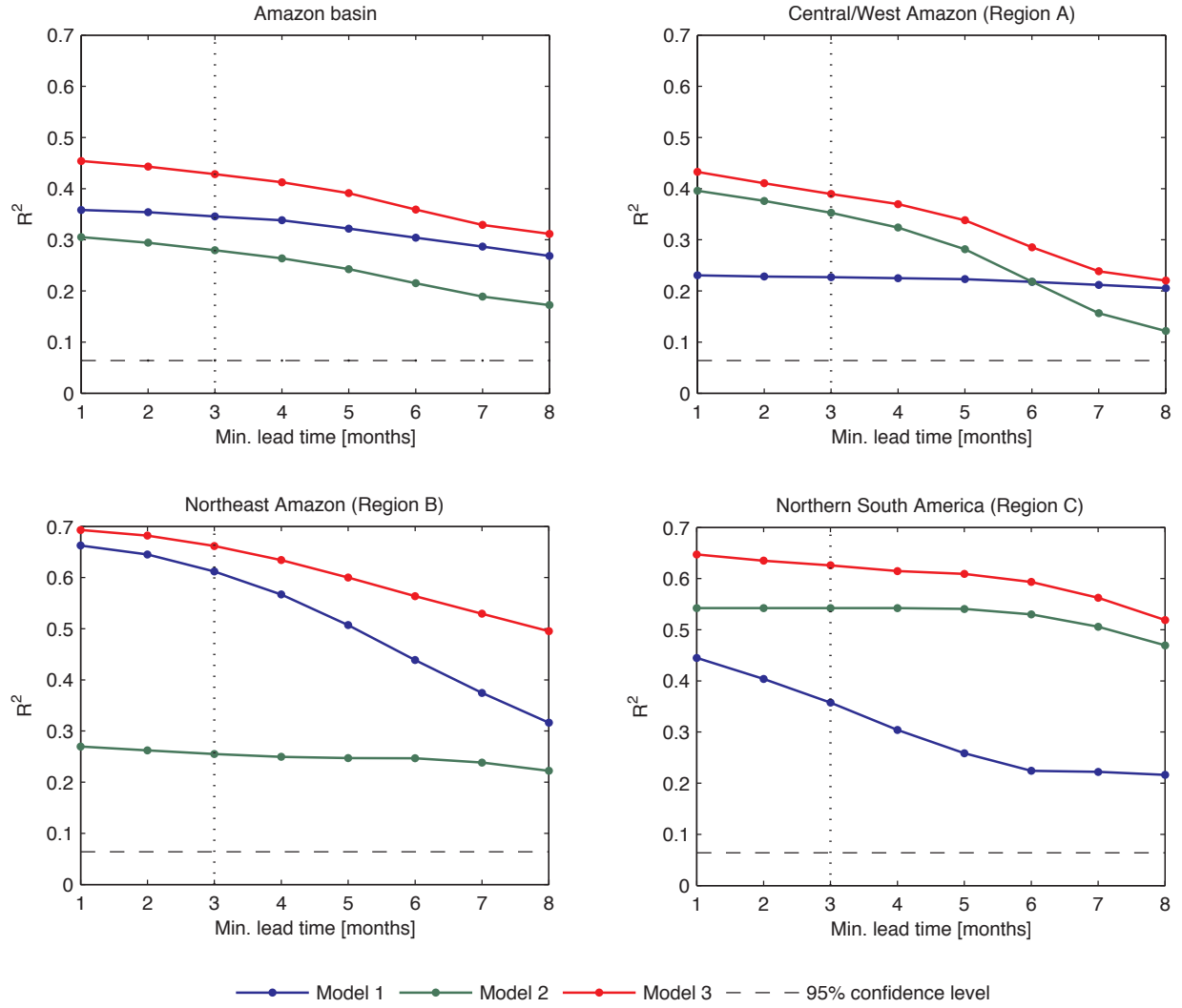
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Figure S2 Spatial maps of the parameters for the different models: sensitivity to the Niño 4 (a) and TNAI (b) forcing terms and the relaxation time τ (c). Cells where the linear fit passed the F-test with $p<0.05$ are marked with a black dot.

Figure S3 Significance tests (F-tests) of the RMSE differences between model 3 (combined model) and either model 1 (Niño 4, left) or model 2 (TNAI, right). Cells where F-test was passed ($p<0.05$) are marked with a black dot and the averaged F-values over those cells along with their fraction in different regions are summarized in Table 3.

Figure S4 Same as Fig. 6 in the main text but for the R^2 between the model estimates and GRACE time series, averaged for all the grid cells within each region.
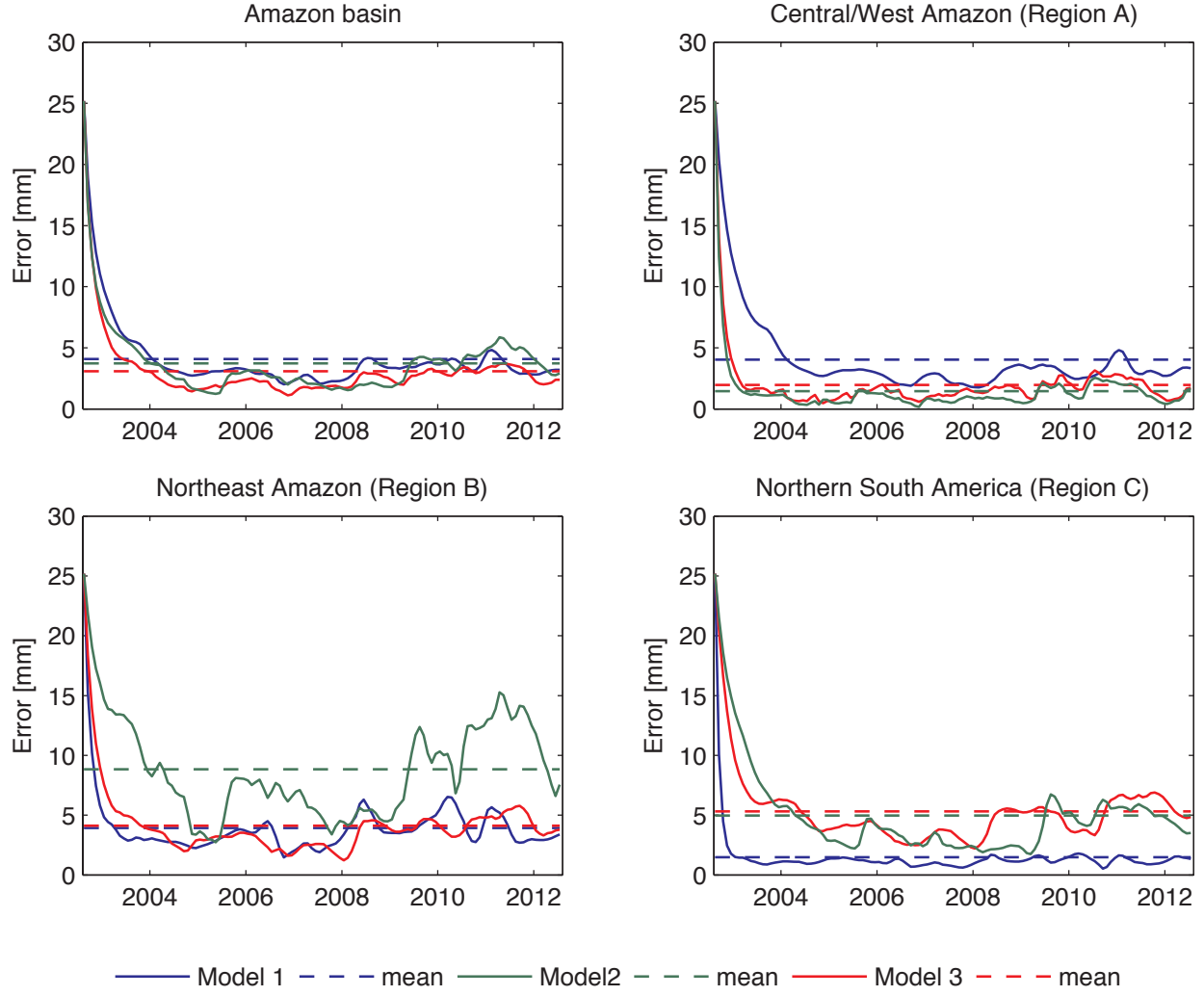
Figure S5 Model error due to the propagation in Eq. 1 of the uncertainty on the initial condition, averaged over each of the three regions analyzed in this study (outlines of these regions are shown in Fig. 1a in the main text), for the three models described in Table 1. The long-term means for the monthly time series shown here (dashed lines) are provided in Table 4.