1 Supplementary material for

2 Forecasting terrestrial water storage changes in the Amazon

- **basin using Atlantic and Pacific sea surface temperatures**
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11 Table S1 Range of parameter values that were evaluated for each model inversion. For a_0 , b_0 , α , 12 and β parameters, the first term is the minimum of the parameter range, the second term is the

Model	τ	a_0	b_0	α, β	Number of
#	(months)	(mm/month/°C)	(mm/month/°C)	(months)	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

13 increment, and the third term is the maximum of the parameter range.

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Figure S1 SST lead times α (left) and β (right) for models 1 (Niño 4) and 2 (TNAI), respectively, obtained using a prescribed minimum value of 3 months. These values also were used as the 17

prescribed SST lead times in model 3 (Niño 4 & TNAI). 18



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 Ftest with *p*<0.05 are marked with a black dot.



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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.



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Figure S4 Same as Fig. 6 but for the R^2 between the model estimates and GRACE time series, averaged for all the grid cells within each region.