

Supplement to

”Statistical-Dynamical Forecasting of Sub-Seasonal North Atlantic Tropical Cyclone Occurrence”

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Figures S1 and S2 show the results of the sequential predictor selection applied to the statistical-dynamical and purely statistical approaches, respectively. Note that, a priori, the optimized climatological seasonal cycle was kept fixed as the first predictor.

Statistical-dynamical approach:

From the pool of 25 predictors provided to the statistical-dynamical approach, 15, 11, 10, 6, and 6 predictors were selected in the Gulf of Mexico for forecast week 1, 2, 3, 4, and 5, respectively (Fig. S1a). In analogy, the optimal subsets identified for the Central MDR are comprised by 12, 6, 6, 7, and 8 predictors (Fig. S1b), thus using less predictors for the first three forecast weeks. In addition to the climatological seasonal cycle, predictors selected at all forecast weeks are *850-hPa absolute vorticity (mean)* in both subregions, and *200-850-hPa vertical wind shear (mean)* in the Central MDR. In contrast, predictors that were not picked at all are *low-frequency modes (stddev)*, *MJO modes (mean)*, *MRG/TD waves (stddev)*, and *Nino12 SST (mean)* for both subregions, as well as *low-frequency modes (mean)*, *ER waves (stddev)*, *200-500-hPa potential vorticity (stddev)*, *MDR SST (stddev)*, and *Nino12 SST (mean)* in the Central MDR.

A comparison of the subsets over lead time reveals for the Gulf of Mexico that the majority of tropical wave, GPI, and extratropical predictors is primarily selected up to forecast week three, but no longer beyond (Fig. S1a), except for *Kelvin waves (stddev)*, *850-hPa absolute vorticity (stddev)* and *700-hPa relative humidity (mean & stddev)*. In

the Central MDR, a striking transition is found within the oceanic predictor group between forecast week two and three (Fig. S1b). *MDR SST (mean)* is chosen as the second predictor from week three on, whereas the *local SST (mean & stddev)* were used on the medium range. Furthermore, a shift from higher-frequency (Kelvin & MRG/TD) to lower-frequency tropical wave modes (MJO & ER) occurs with increasing leadtime for the selected subsets in the Central MDR.

Purely statistical approach:

In contrast to the statistical-dynamical approach, the optimal subsets for the purely statistical approach in the Central MDR are comprised by an equal or higher number of predictors compared to the Gulf of Mexico. From the pool of 13 predictors provided, 6, 4, 2, 3, and 3 (8, 4, 4, 4, and 3) predictors were selected in the Gulf of Mexico (Central MDR) for forecast week 1, 2, 3, 4, and 5, respectively (Fig. S2a,b). Except for the climatological seasonal cycle, there was no predictor selected at all five forecast weeks in either subregion. However, an consistency over leadtime appears by the non-consideration of all oceanic predictors and the *Kelvin waves* in the Gulf of Mexico, and of the *ER waves* and *700-hPa relative humidity* predictors in the Central MDR. When comparing results over the forecast week, only tropical wave predictors were chosen in the Gulf of Mexico beyond week three, whereas GPI and oceanic predictors are still included in the Central MDR at week four and five, respectively.

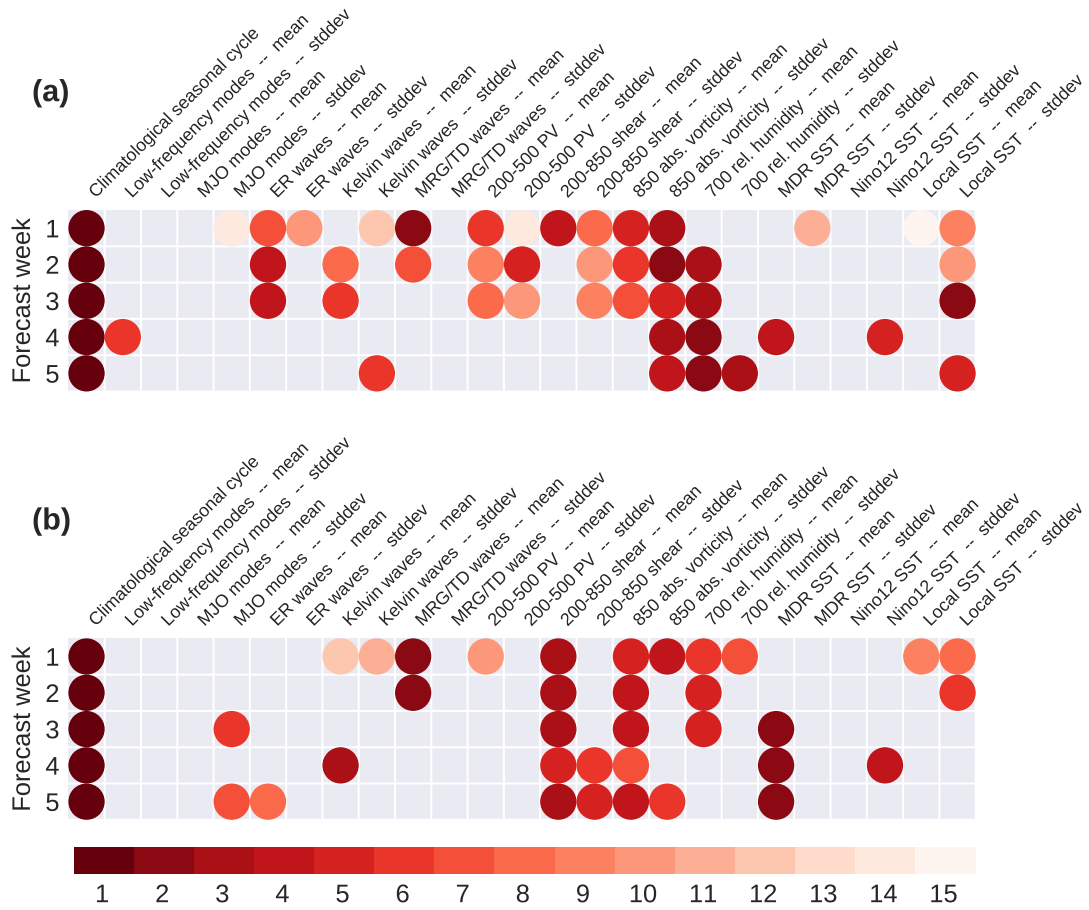


Figure S1: Subsets selected by the sequential predictor selection scheme for the statistical-dynamical approach for week one to five in (a) the Gulf of Mexico, and (b) the Central MDR, respectively. Colors indicate the average rank of the selected predictor over the 20 folds of the cross-validation. If no circle is plotted, the predictor was not chosen.

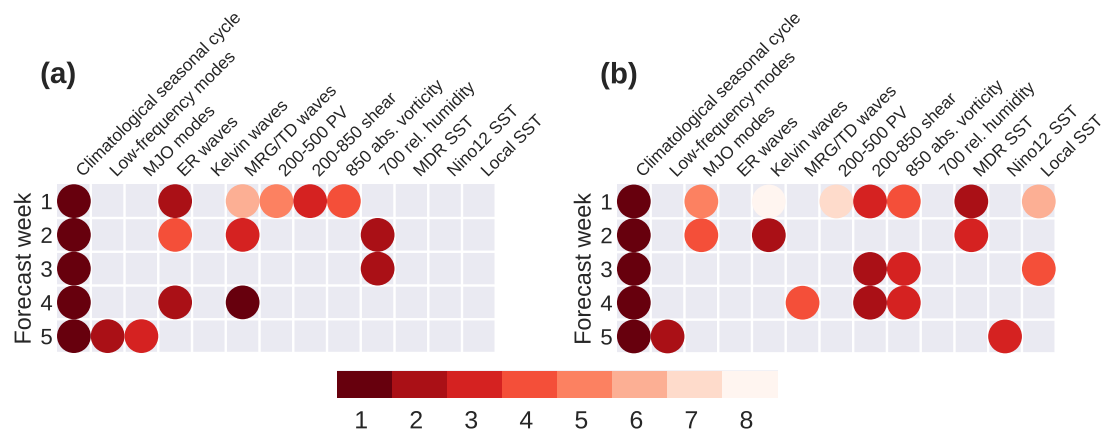


Figure S2: As in Fig. S1, but for the purely statistical approach.