

Seasonal forecasting of health-related heat stress indices and its enhancement through teleconnection-based subsampling

SUPPLEMENTARY MATERIAL

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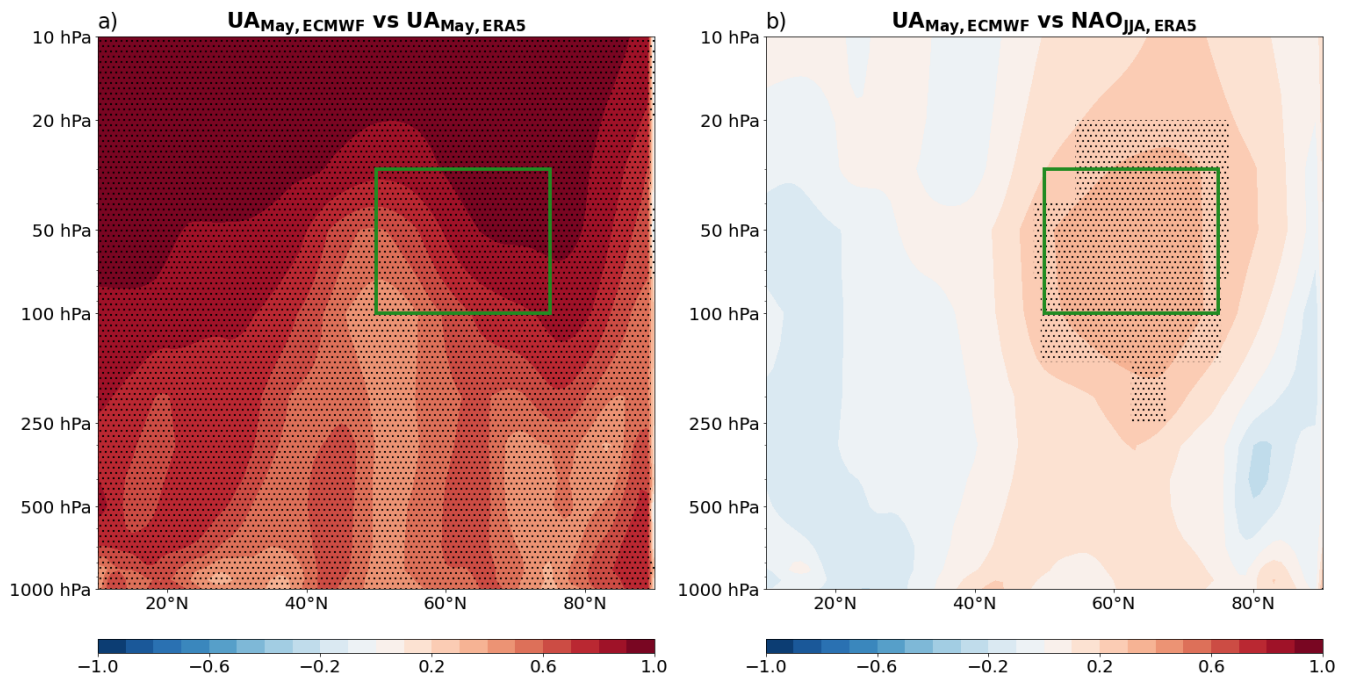


Figure S1. Stratospheric variability in the ECMWF SPS SEAS5 and its relationship with the summer NAO. a) ACCs between the full ECMWF ensemble mean and ERA5 for May zonal wind, zonally averaged over the North Atlantic sector (75°W–15°E) during 1981–2024. b) ACC between the same index in the full ECMWF ensemble and the summer NAO in ERA5 during 1981–2024. In both panels, the green box indicates the area where the zonally averaged zonal wind is averaged to define the stratospheric predictor used for summer NAO prediction. Black dots denote ACC that are statistically significant at the 90% confidence level according to a two-tailed Student's t test.

ECMWF - NAO_{JJA} pattern and variance

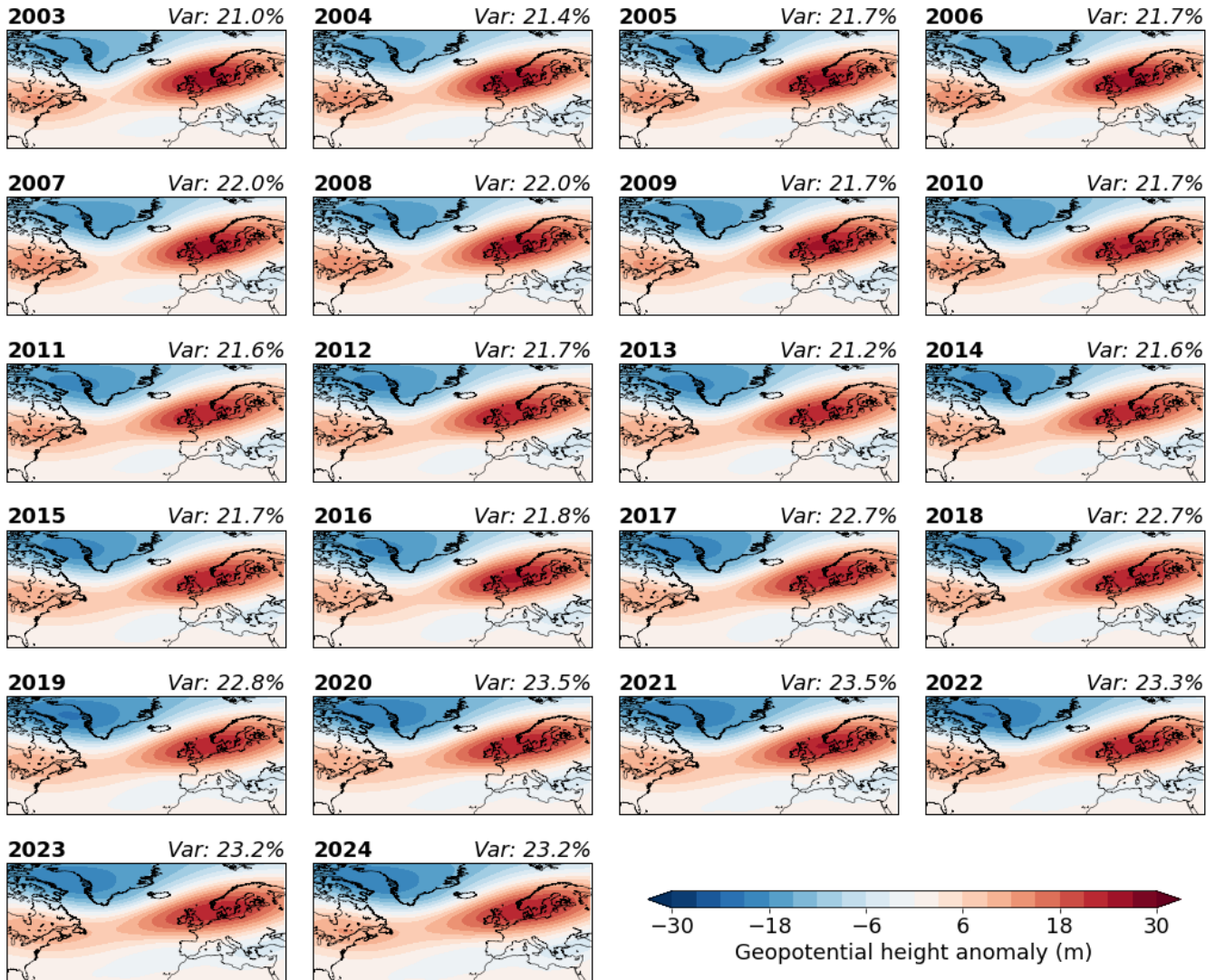


Figure S2. Summer NAO pattern and variance in the ECMWF SPS SEAS5 for each forecast year. The variance of the summer low-frequency variability explained by the NAO is shown at the top right of each panel. The summer NAO is defined as the leading EOF of summer Z500 anomalies over the North Atlantic sector (25°–80°N, 90°W–40°E). For each forecast year, the pattern is estimated using only the preceding 22 years, and then used to project that year's Z500 anomalies to compute the NAO index.

ERA5 - NAO_{JJA} pattern and variance

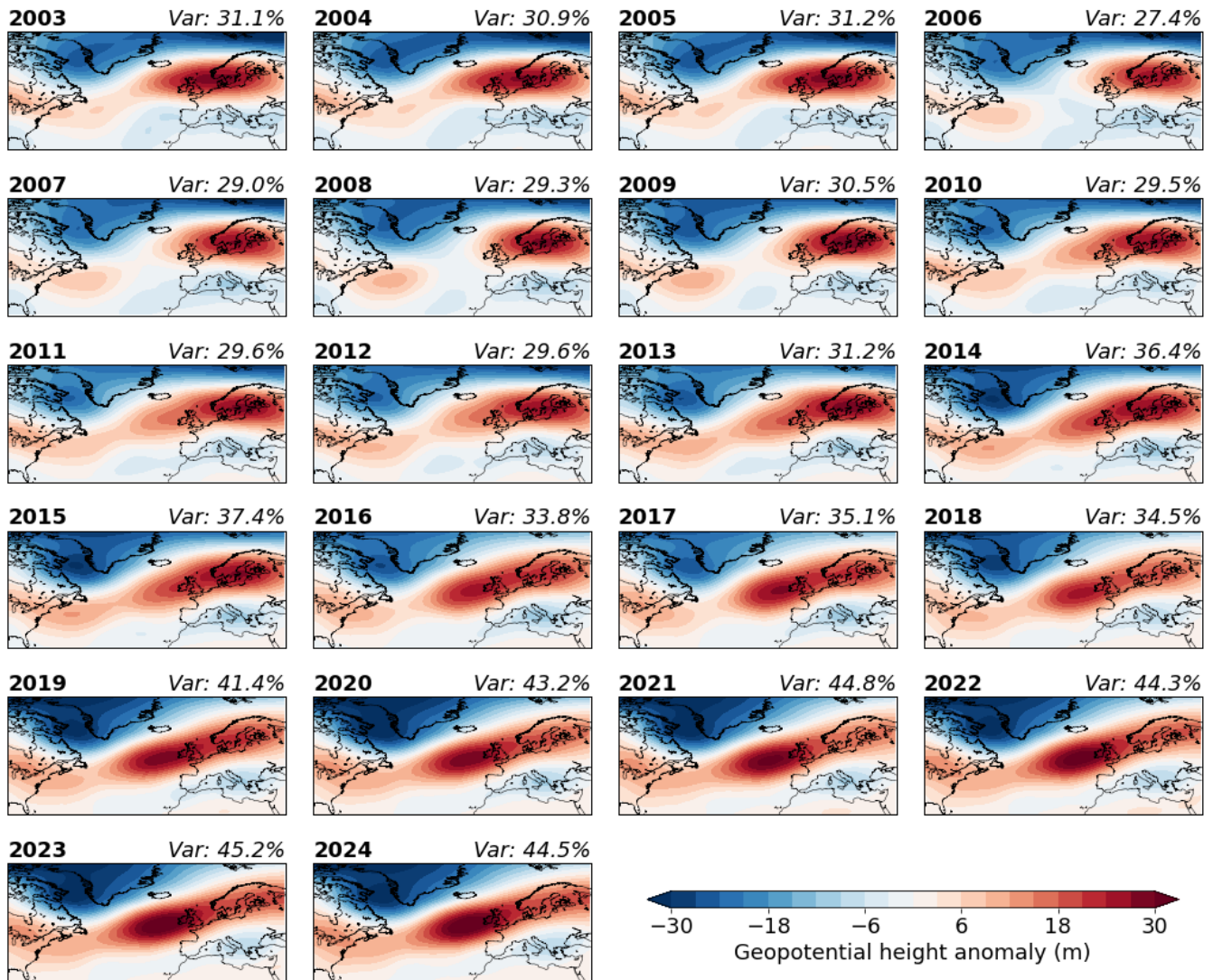


Figure S3. Summer NAO pattern and variance in the ERA5 for each forecast year. Same as Figure S2 but for ERA5.

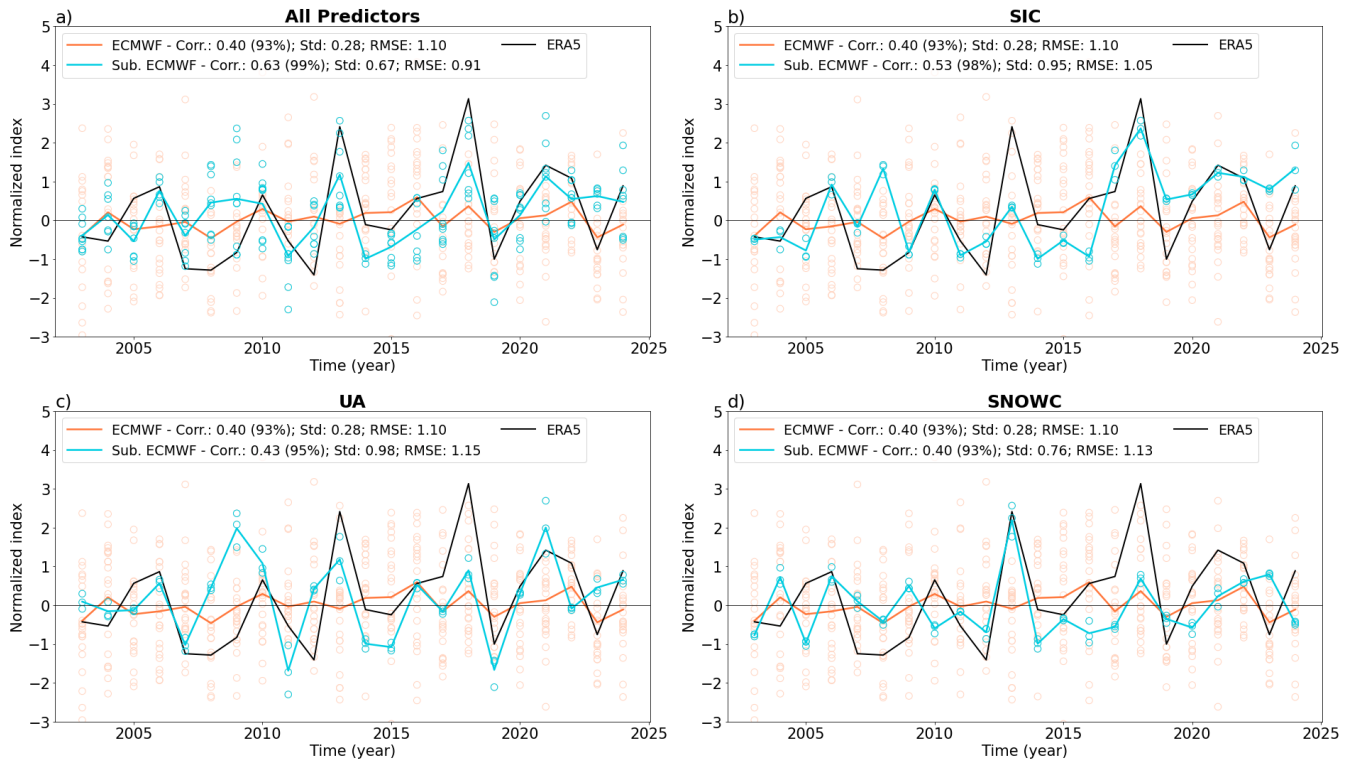


Figure S4. ECMWF SPS SEAS5 prediction skill for summer NAO through teleconnection-based subsampling. a) The summer NAO index in ERA5 (black), full ECMWF ensemble (orange), and subsampled ECMWF ensemble (cyan). The orange (cyan) circles represent each member of the full (subsampled) ensemble. The orange (cyan) solid line represents the ensemble mean of the full (subsampled) ensemble. The subsampling is performed using all NAO predictors and selecting 3 members for every predictor. The correlation between the summer NAO index in ERA5 and the corresponding index as ensemble mean of the full and subsampled ECMWF ensemble is presented in the legend, along with its confidence level in parentheses. The variability of the summer NAO index as ensemble mean of the full and subsampled ensemble is also shown in the legend as standard deviation (Std). Finally, the RMSE for the full and subsampled ensemble is provided. b) Same as a) but using only Arctic SIC predictor to subsample the ECMWF ensemble. c) Same as a) but using only stratospheric predictor to subsample the ECMWF ensemble. d) Same as a) but using only Northern Hemisphere SNOWC predictor to subsample the ECMWF ensemble.