Supporting Information for

Decadal biogeochemical predictions for the bottom marine environment of the Northeast U.S. Continental Shelf

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This file includes:
Figs. S1 to S9

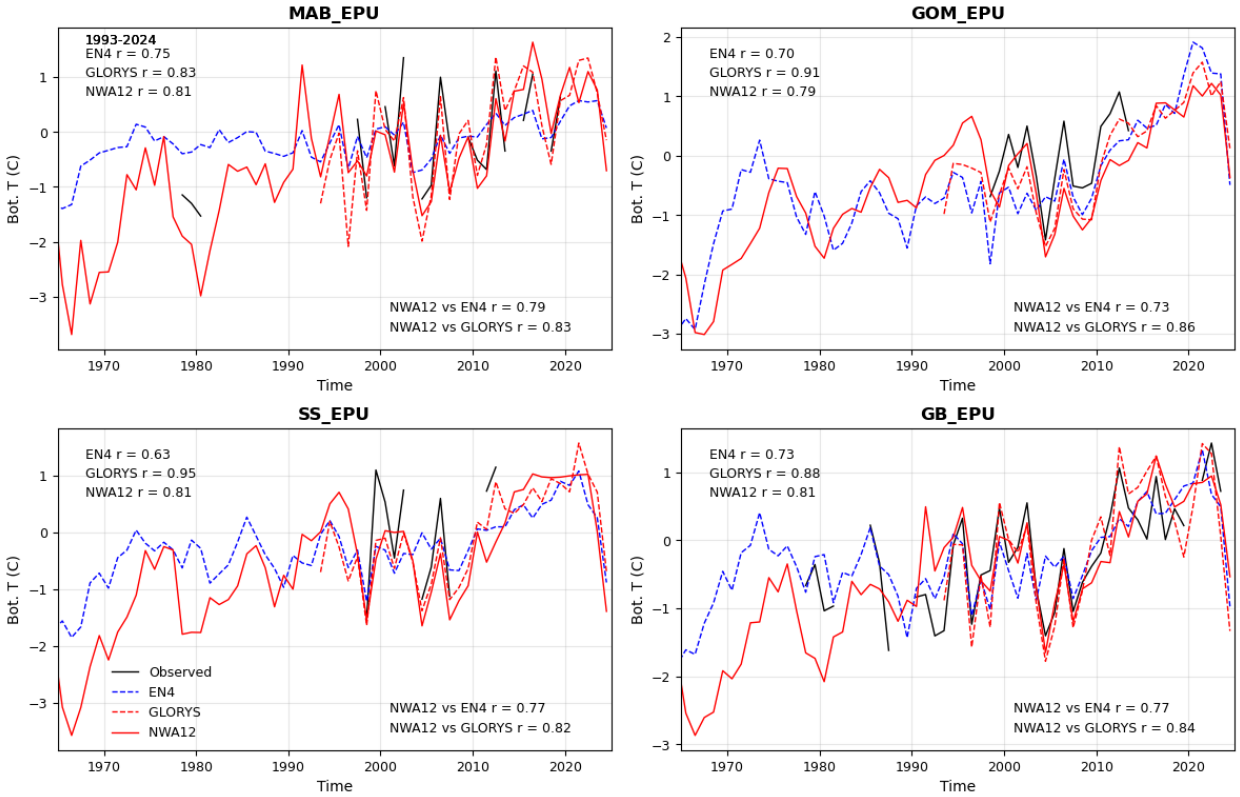

Fig. S1: Comparison of Bottom Temperature. Annual mean temperature anomalies of bottom temperature from the NWA12_EN4_NUDG, GLORYS12 reanalysis, the EN4 dataset and NOAA_SOE observations for the four EPUs—MAB_EPU, GOM_EPU, SS_EPU and GB_EPU. The correlation coefficients between the NOAA-SOE and NWA12/GLORYS12/EN4 datasets, and between the NWA12 and GLORYS12/EN4 datasets for the common 1993-2024 period are also shown.

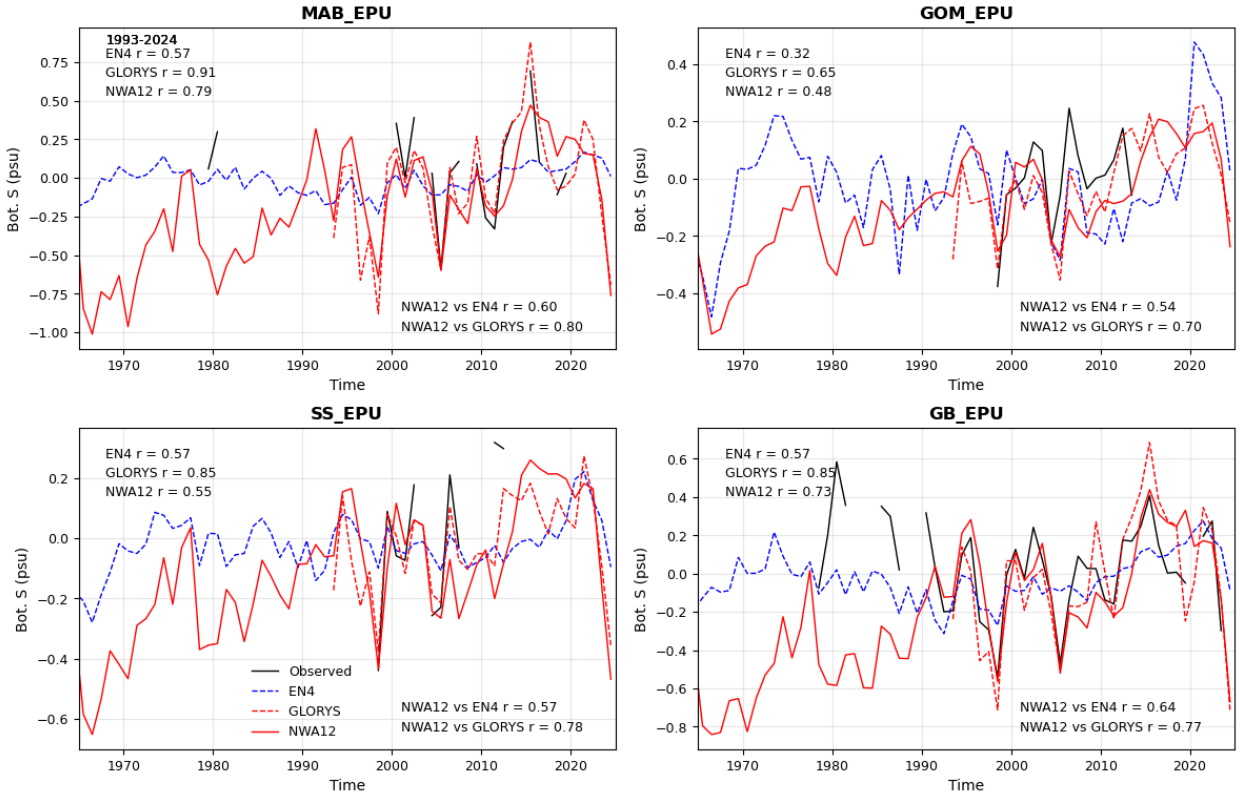

Fig. S2: Comparison of Bottom Salinity. Same as Fig. S1 but for bottom salinity.

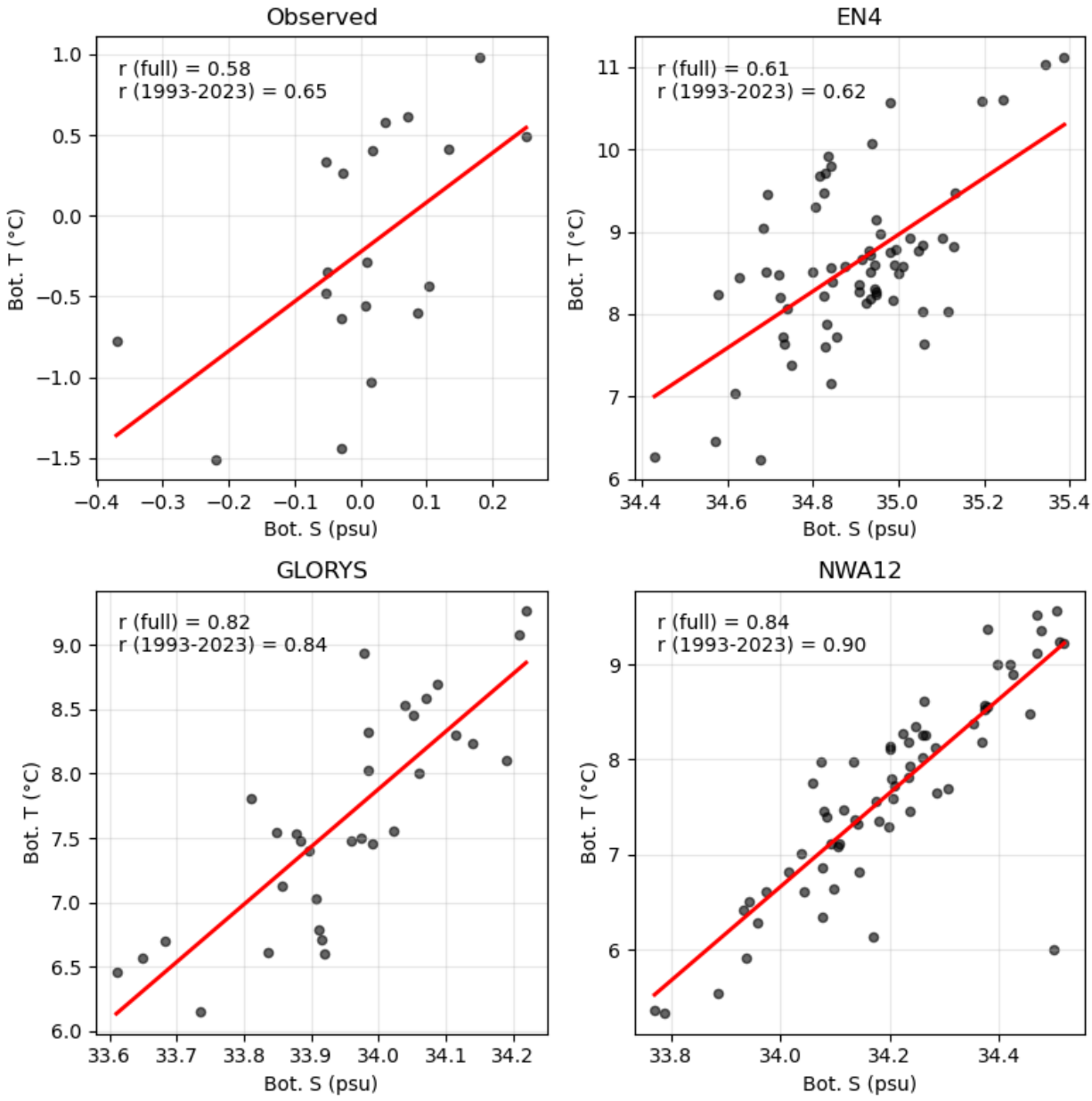

Fig. S3: Bottom temperature and bottom salinity in the GOM Correlation between bottom temperature and bottom salinity in the GOM_EPU for NOAA_SOE observations, EN4 dataset, GLORYS12 reanalysis and the regional downscaled model (NWA12_EN4_NUDG). Correlation values are shown for the common (1993-2023) and full period of the respective dataset.

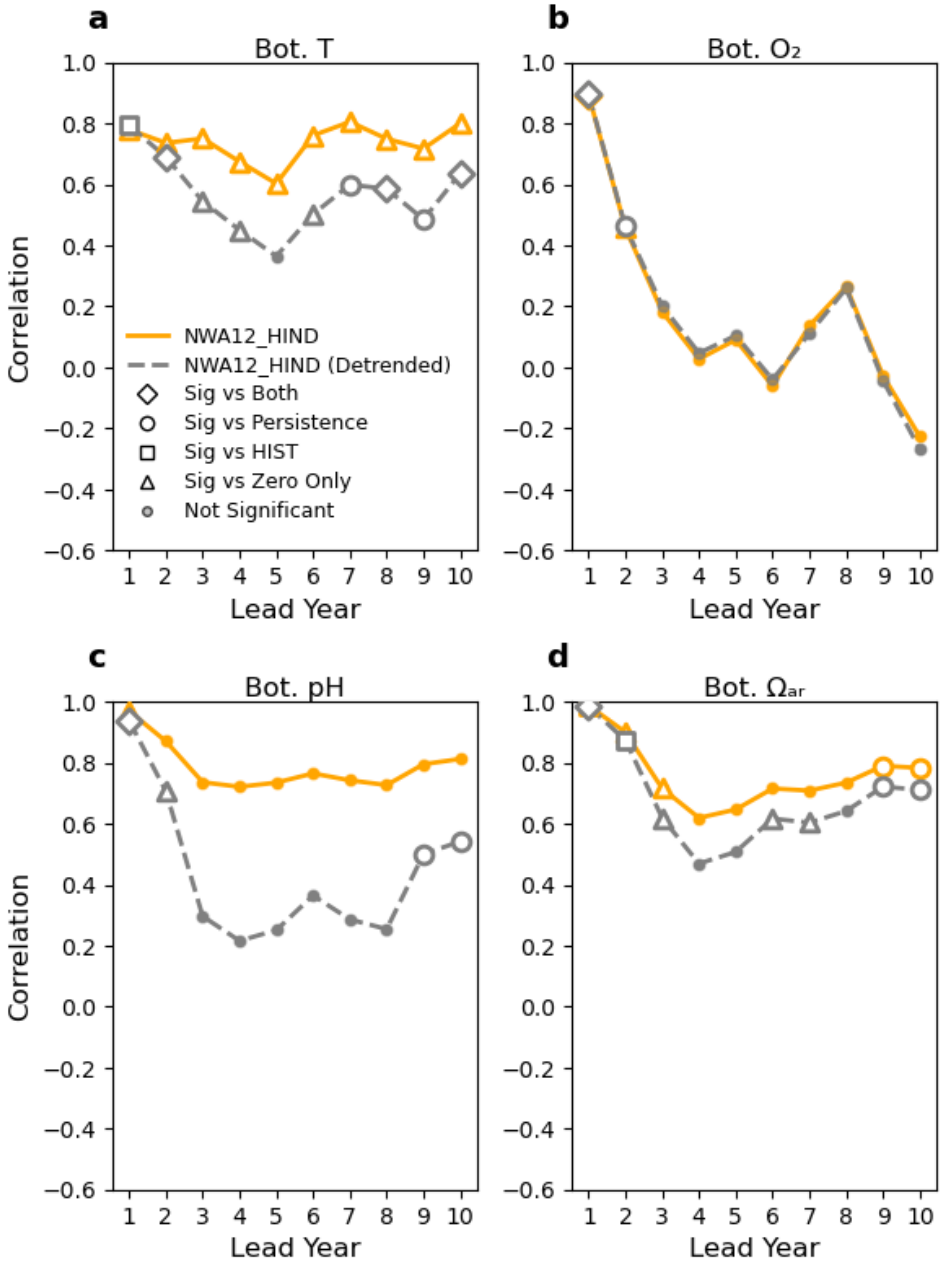

Fig. S4: Decadal prediction skill. Same as Fig 3 in the main text but for correlation skill verified against GLORYS12 reanalysis for (a) bottom temperature and against the regional downscaled simulation (NWA12_EN4_NUDG) for (b) bottom O_2, (c) bottom pH and (d) bottom Ω_{ar} all computed over the period 1993-2024.

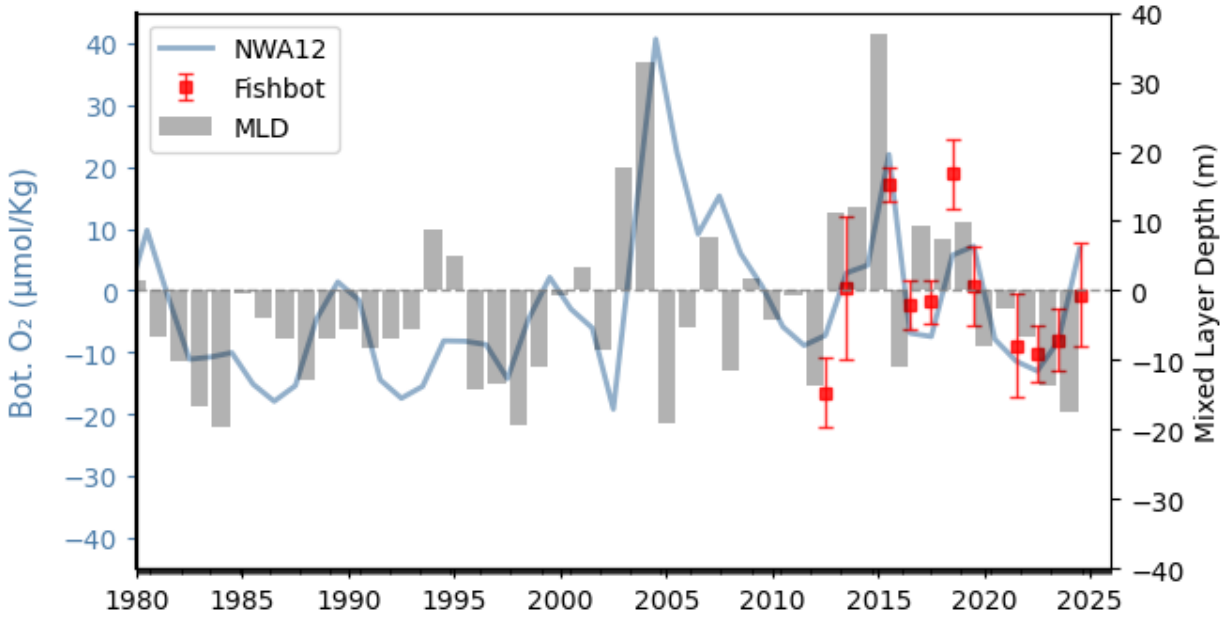

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Fig. S5: Winter Mixed Layer Depth and Bottom Oxygen. Winter (JFM mean) mixed layer depth (m) anomalies in the GOM_EPU (grey bars) and annual mean bottom oxygen anomalies (blue line) from the regional downscaled simulation (NWA12_EN4_NUDG) and the Fisbot observations (red). The anomalies are shown with respect to the 1994-2023 mean.

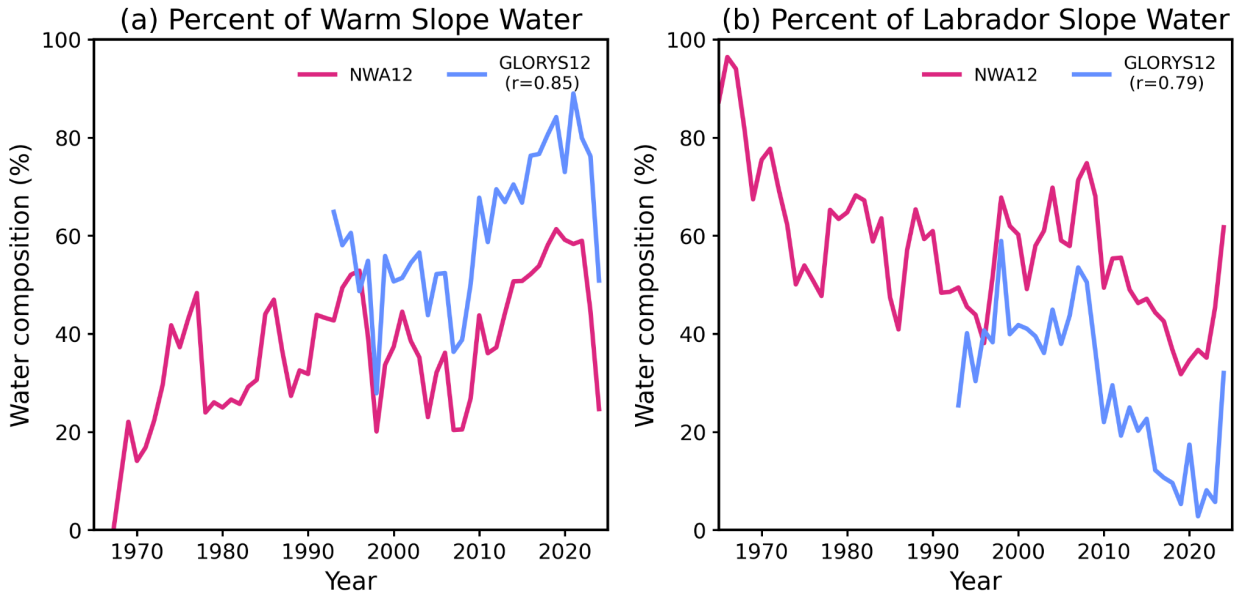

Fig. S6: Water masses in the Northeast Channel. Proportion (%) of the (a) Labrador Slope Water and (b) the Warm Slope Water in the Northeast Channel from the regional downscaled model and GLORYS12 reanalysis.

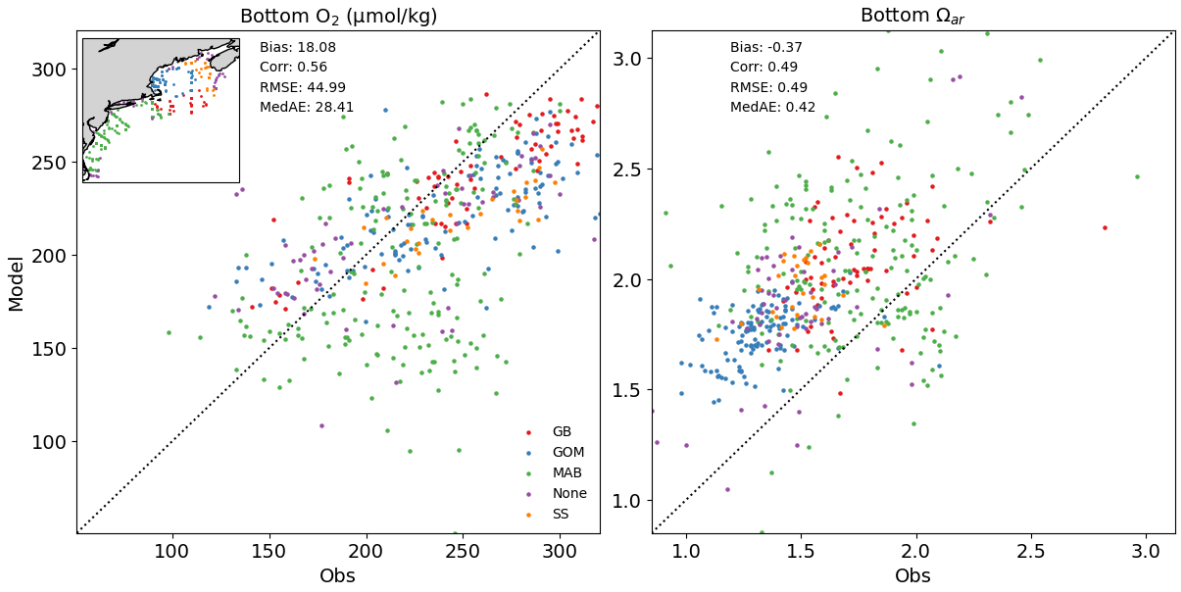

Fig. S7: Comparison with Point Observations. Pointwise comparison of bottom O_2 and bottom Ω_{ar} from the regional downscaled model with NOAA_OBS in the various Ecological Processing Units (EPUs)—GOM_EPU, MAB_EPU, GB_EPU and SS_EPU.

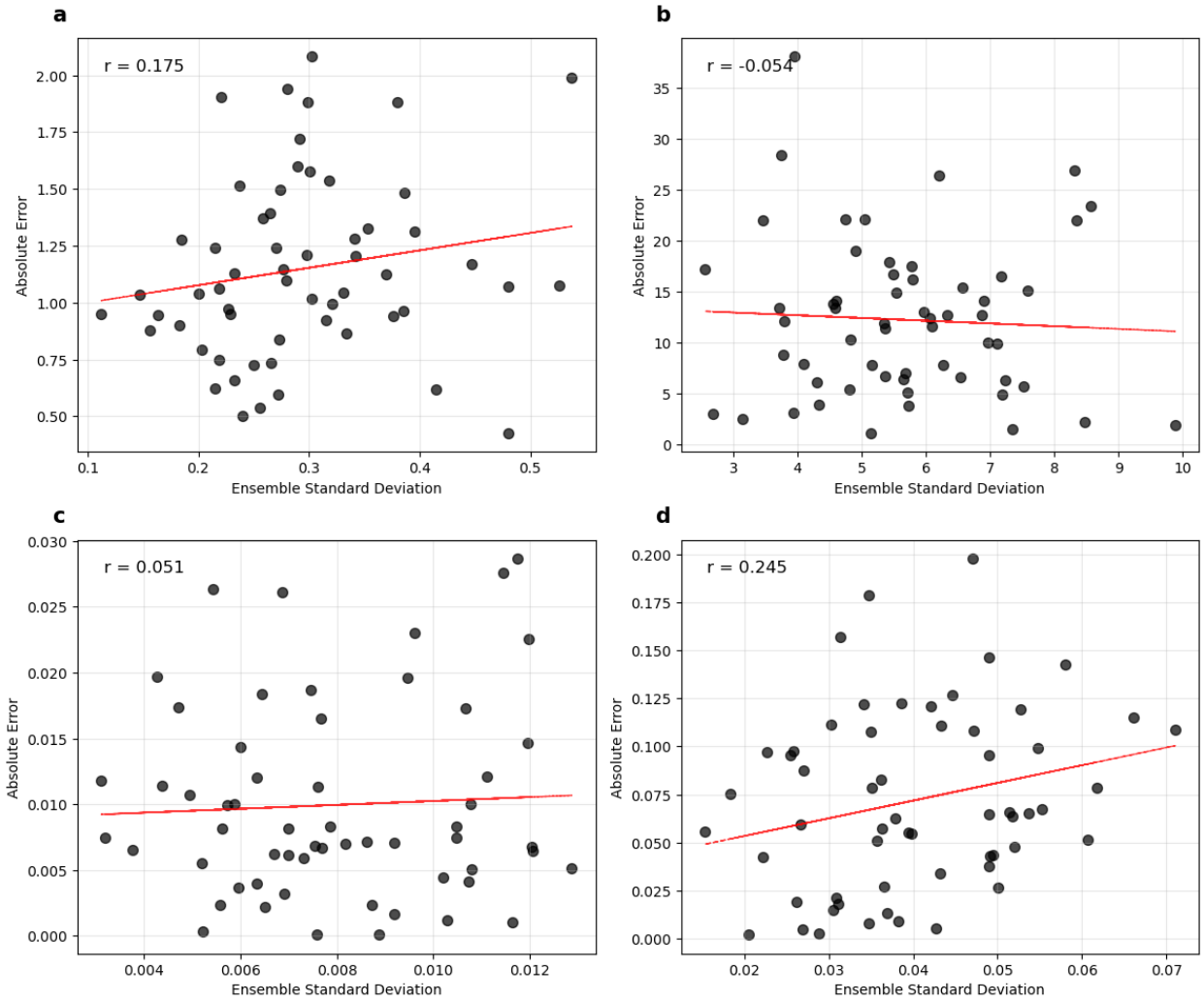

Fig. S8: Lead 1-3 Mean Ensemble Standard Deviation vs. Absolute Error. Ensemble standard deviation plotted against the absolute error of the ensemble mean (averaged over lead years 1-3) for bottom (a) temperature, (b) O_2, (c) pH and (d) Ω_{ar}. Red lines represent the best fit lines, and the correlation coefficients (r) quantify the strength of the relationship between the ensemble standard deviation and the absolute error.

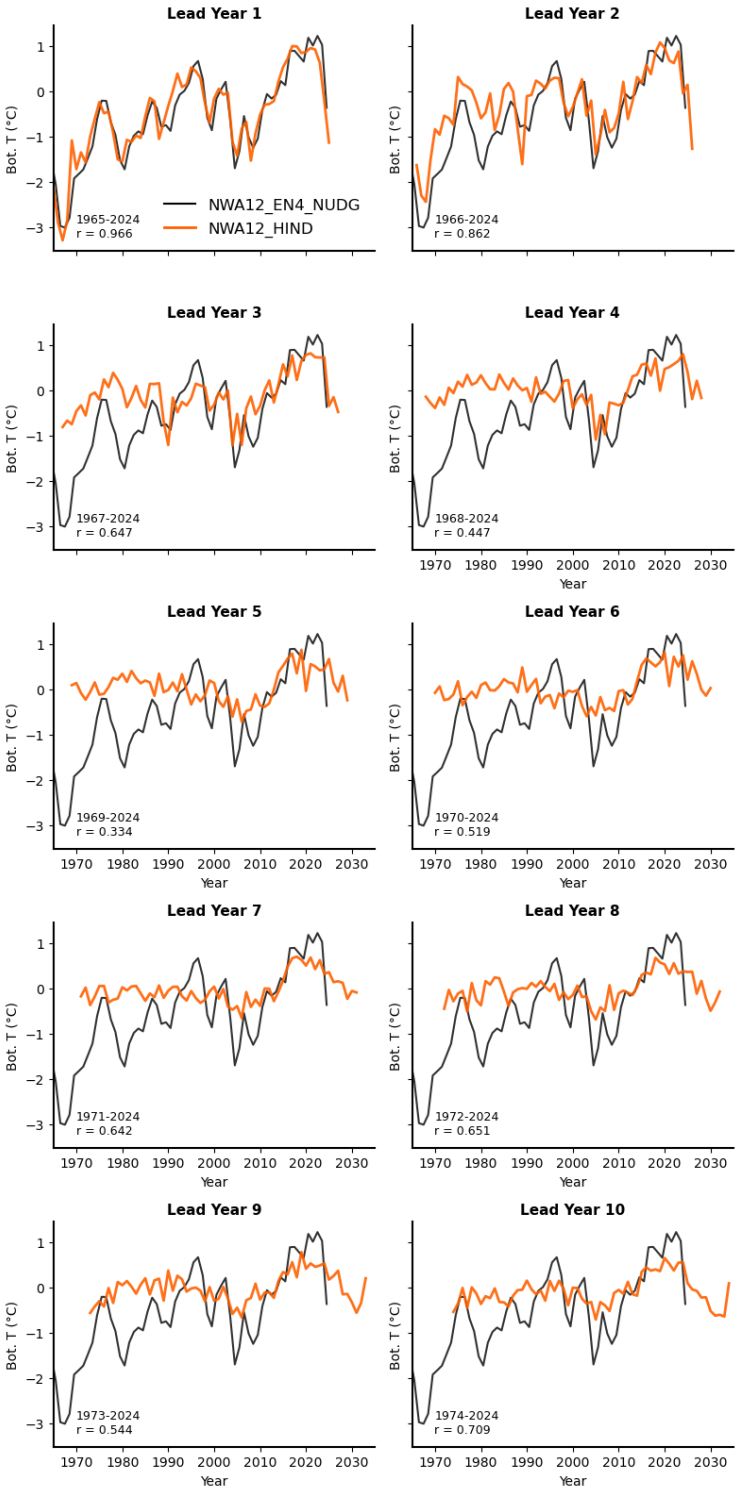

Fig. S9: Lead Year Predictions. Ensemble mean anomalies of predicted annual bottom temperature in the Gulf of Maine from the NWA12_HIND at each lead year (orange) and from the regional downscaled simulation (NWA12_EN4_NUDG, black). The time period of each lead year time series and its respective correlation with NWA12_EN4_NUDG is also shown.