

Supplementary Information for: Intercomparison
of initialization methods for Seasonal-to-Decadal
Climate Predictions with the NorCPM
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1 Supplementary material

We have included figures and extra information in tables to provide additional evidence for the topics discussed in the main text. Table 1 displays the global reliability of the reanalysis experiments, and Table 2 shows the analysis period for decadal hindcasts. Figure 1 shows the model error σ_m (reanalysis ensemble spread) for the reanalysis, Figure 2 the seasonal hindcast correlation at lead month 1, Figure 3 displays the time series of reanalysis (full signal and detrended) of HC500 in the Iceland Sea basin. For Niño 3.4 SST hindcast skill, we have included seasonal decomposition of RMSE_u and ACCs, in Figures 4 and 5. Similarly, for ATL3 SST hindcast skill, we have included seasonal decomposition in Figures 6 and 7. The Figures 8 and 9 display the lead-time SST hindcast skill, using confidence intervals, for the Niño 3.4 and ATL3 regions. Finally, the Figure 10 shows the differences of average HC500 ACC at lead years 2-5 relative to Free hindcast.

Table 1 Reanalysis reliability^a.

Configuration	SST	T2M	HC500	SC500
Free	1.09	1.03	1.67	1.21
NudF-UVT	2.11	15.25	6.90	4.88
NudA-UVT	2.14	14.50	6.39	3.76
NudA-UV	2.37	7.65	5.59	3.77
NudA-UV (EF)	2.35	7.55	5.58	3.78
ODA	1.10	1.07	2.49	1.87
ODA+NudA-UV	2.39	13.22	11.03	8.25

^a RMSE_u/σ , see equation (14) in main text.

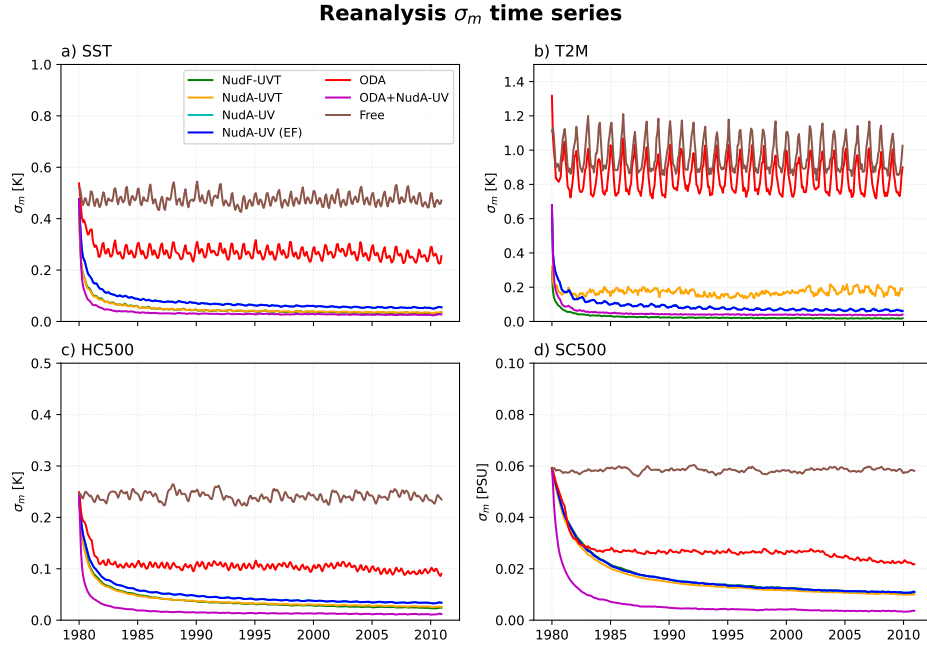


Fig. 1 Model error σ_m reanalysis time series for a) SST, b) T2M, c) HC500 and d) SC500. Line color green corresponds to NudF-UVT, orange to NudA-UVT, cyan to NudA-UV, blue to NudA-UV (EF), red to ODA, magenta to ODA+NudA-UV, and brown to Free.

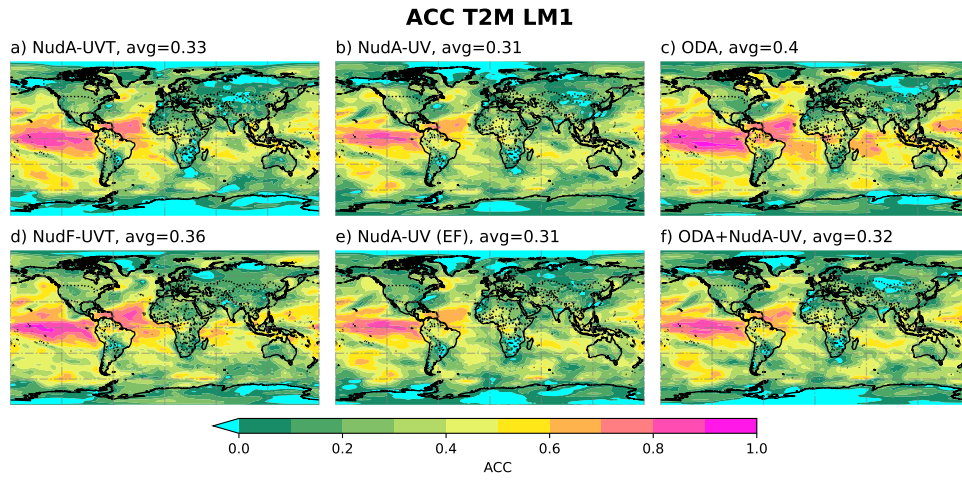


Fig. 2 Seasonal hindcast 1 lead-month T2M ACC for a) NudA-UVT, b) NudA-UV, c) ODA, d) NudF-UVT, e) NudA-UV (EF) and f) ODA+NudA-UV. Green-to-magenta colors indicate positive ACCs and cyan colour indicates all negative ACCs. The global average avg is also included in the left corner of each panel.

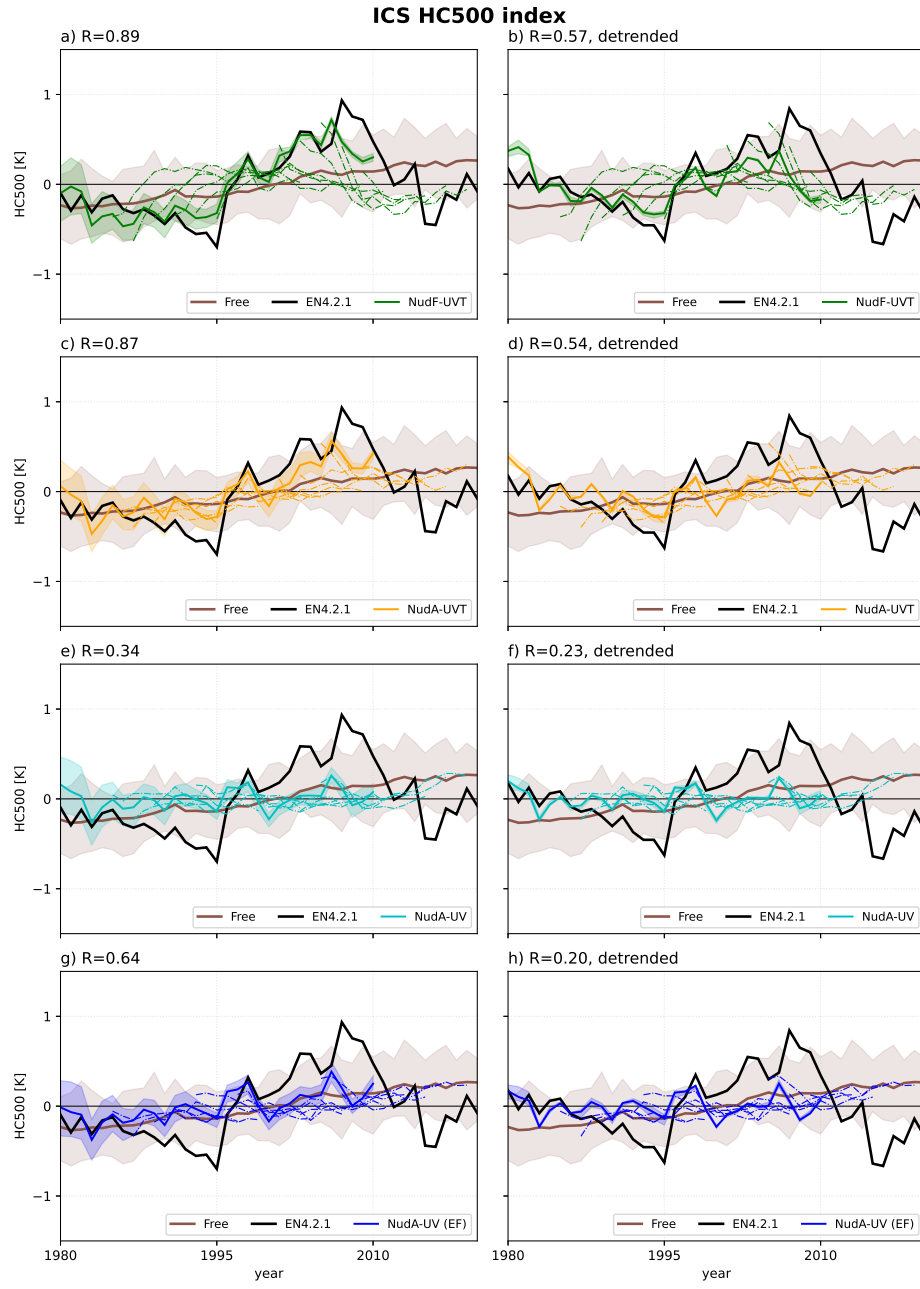


Fig. 3 HC500 in the Iceland Sea basin box for NudF-UVT (a,b), NudA-UVT (c,d), NudA-UV (e,f) and NudA-UV EF (g,h). Panels on the left are with the trend and panels on the right are detrended. The correlation coefficient with EN4 objective analysis estimate is included.

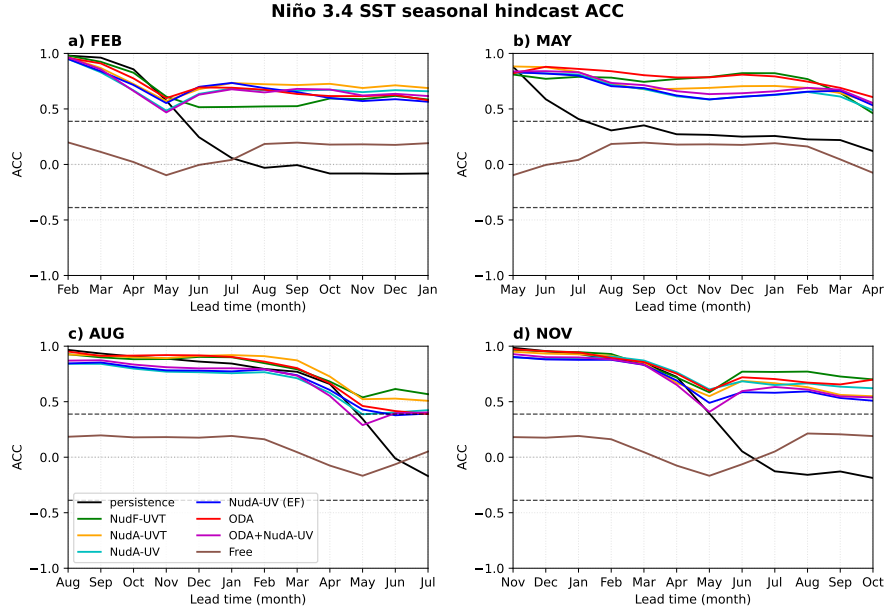


Fig. 4 ACC of Niño 3.4 SST with lead-month computed against HadISST2 decomposed by starting month of the hindcasts. Dotted line marks zero ACC.

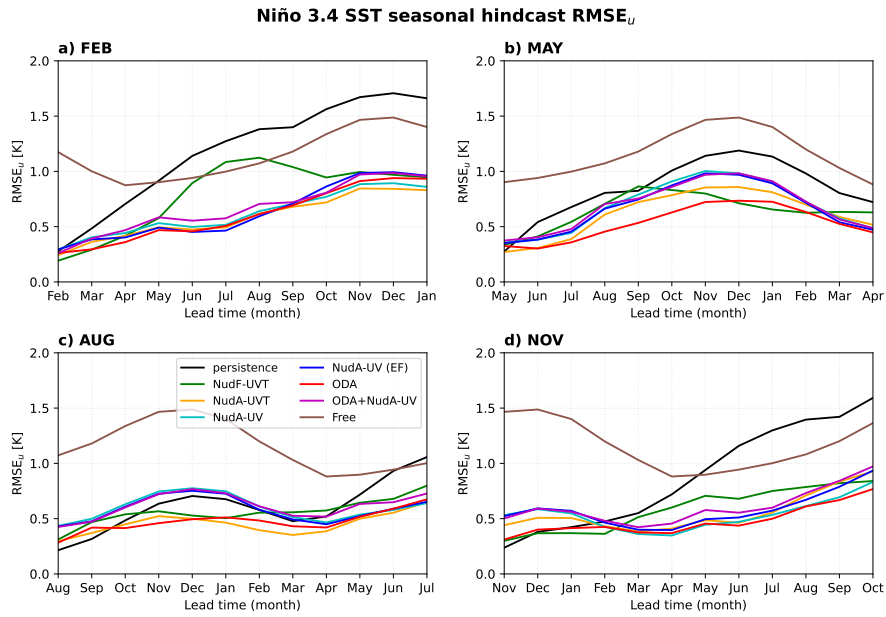


Fig. 5 RMSE of Niño 3.4 SST with lead-month computed against HadISST2 and decomposed by starting month of the hindcasts.

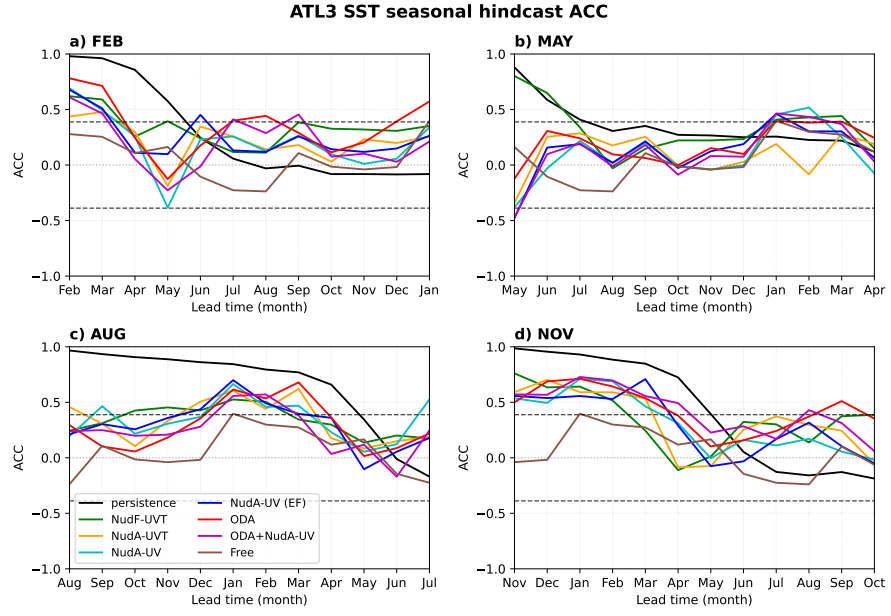


Fig. 6 Same as Fig. 4, but for ATL3 SST.

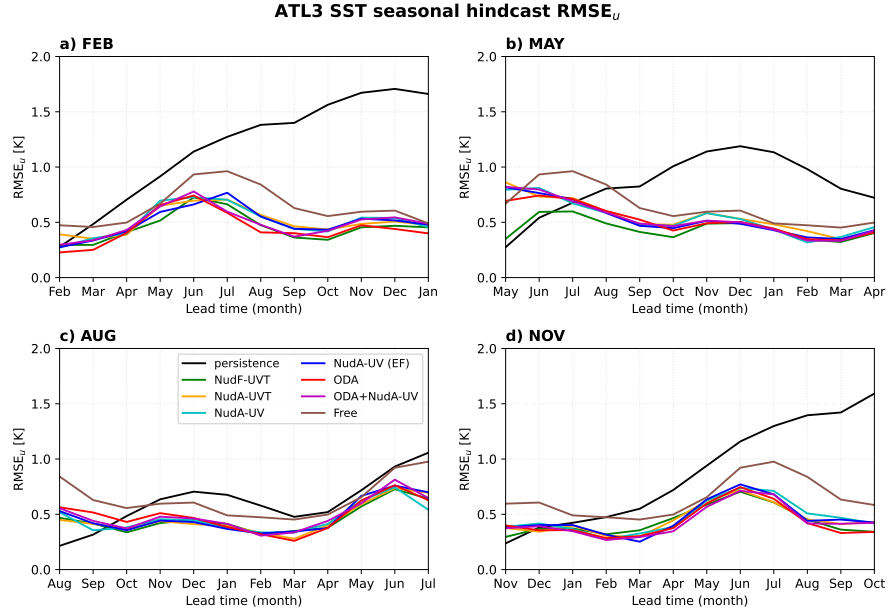


Fig. 7 Same as Fig. 5, but for ATL3 SST.

Niño 3.4 SST index seasonal hindcast skill

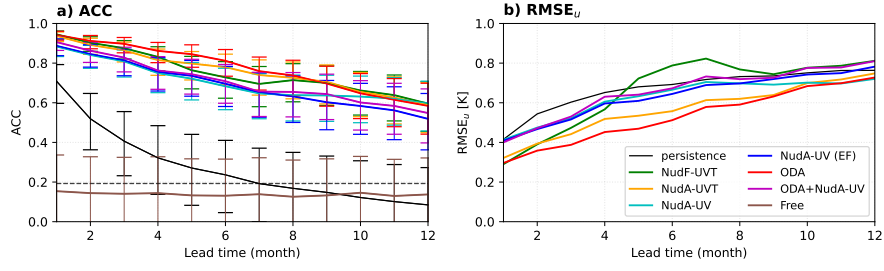


Fig. 8 a) ACC of Niño 3.4 SST as a function of the lead month and b) is the same for $RMSE_u$ in K. Line color green corresponds to NudF-UVT, orange to NudA-UVT, cyan to NudA-UV, blue to NudA-UV (EF), red to ODA, magenta to ODA+NudA-UV, brown to Free, and persistence is the solid black line. The dashed black line represents the 95 % significance level for ACC, while the error bars indicate the 95 % confidence interval.

ATL3 SST seasonal hindcast skill

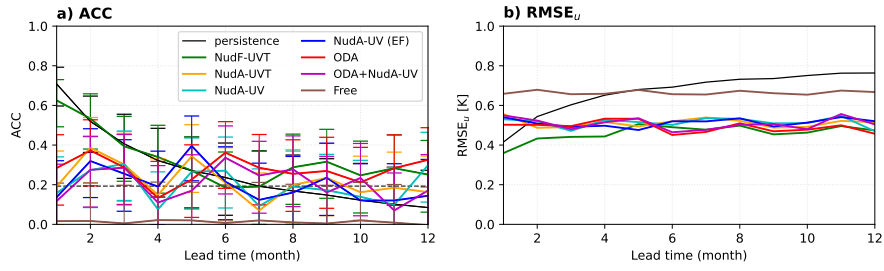


Fig. 9 Same as Fig. 8, but for ATL3 SST.

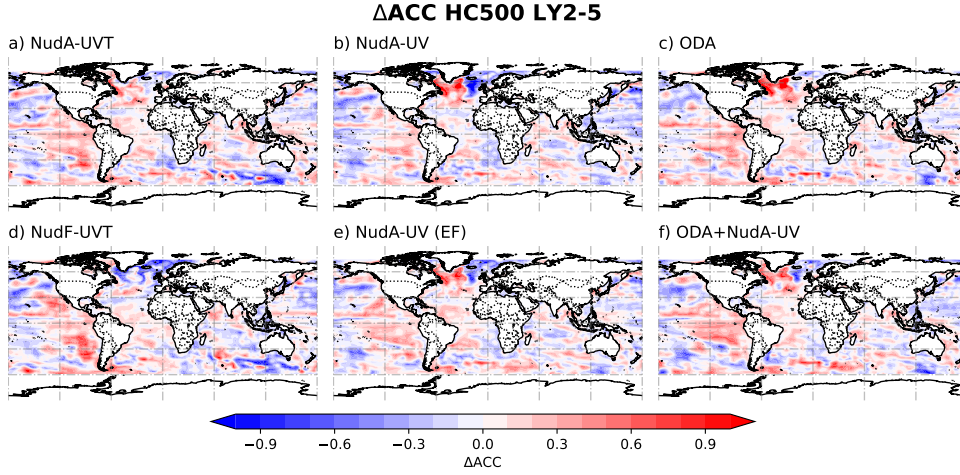


Fig. 10 Difference of ACC with respect to Free ΔACC for the decadal hindcast at lead year 2-5 of HC500 a) NudA-UVT, b) NudA-UV, c) ODA, d) NudF-UVT, e) NudA-UV (EF) and f) ODA+NudA-UV. The ACCs are computed against EN4 objective analysis. The red color indicates improvement, while the blue color indicates degradation of ACCs.

Table 2 Decadal hindcasts initial years (LY0) with corresponding lead years 1 to 10 (LY1-LY10)

LY0	1985	1987	1989	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009
LY1	1986	1988	1990	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010
LY2	1987	1989	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
LY3	1988	1990	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012
LY4	1989	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011	2013
LY5	1990	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014
LY6	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011	2013	2015
LY7	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016
LY8	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011	2013	2015	2017
LY9	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018
LY10	1995	1997	1999	2001	2003	2005	2007	2009	2011	2013	2015	2017	2019