

Supporting Information for “Antarctic sea ice trends across high-resolution coupled model hierarchies”

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Introduction This supporting information contains Supplementary Tables S1–S2 and Supplementary Figures S1–S6.

Table S1. GFDL high-resolution coupled model hierarchy. The columns and rows indicate ocean and atmosphere model grid spacing, respectively, and the values quoted in km indicate nominal grid spacing over the Southern Ocean. The numbers in parentheses indicate the number of ensemble members run with each model.

	1/8° Ocn (8 km SO)	1/4° Ocn (16 km SO)	1/2° Ocn (31 km SO)	1° Ocn (62 km SO)
25 km Atm				SPEAR_HI (10)
50 km Atm	CM4X-p125 (1)	CM4X-p25 (10)		SPEAR_MED (30)
100 km Atm		CM4.0 (3)	ESM4.1 (1)	SPEAR_LO (30)

Table S2. CMIP3, CMIP5 and CMIP6 models considered in this study.

Model Number	CMIP3	CMIP5	CMIP6
1	bccr_bcm2_0	ACCESS1-0	ACCESS-CM2
2	cccma_cgcm3_1	ACCESS1-3	ACCESS-ESM1-5
3	cccma_cgcm3_1_t63	bcc-csm1-1	BCC-CSM2-MR
4	cnrm_cm3	bcc-csm1-1-m	CAMS-CSM1-0
5	csiro_mk3_0	BNU-ESM	CanESM5
6	csiro_mk3_5	CanESM2	CAS-ESM2-0
7	gfdl_cm2_0	CCSM4	CESM2
8	gfdl_cm2_1	CESM1-CAM5	CESM2-WACCM
9	giss_aom	CMCC-CESM	CIESM
10	giss_model_e_r	CMCC-CM	CMCC-CM2-SR5
11	iap_fgoals1_0_g	CMCC-CMS	CMCC-ESM2
12	ingv_echam4	CNRM-CM5	CNRM-CM6-1
13	ipsl_cm4	CSIRO-Mk3-6-0	CNRM-CM6-1-HR
14	miroc3_2_hires	EC-EARTH	CNRM-ESM2-1
15	mpi_echam5	FGOALS-g2	EC-Earth3
16	mri_cgcm2_3_2a	FGOALS-s2	FGOALS-f3-L
17	ukmo_hadcm3	GFDL-CM3	FGOALS-g3
18	ukmo_hadgem1	GFDL-ESM2G	FIO-ESM-2-0
19		GFDL-ESM2M	GFDL-CM4
20		GISS-E2-H-CC	GFDL-ESM4
21		GISS-E2-H	GISS-E2-1-H
22		GISS-E2-R-CC	HadGEM3-GC31-LL
23		GISS-E2-R	HADGEM3-GC31-MM
24		HadGEM2-AO	IPSL-CM6A-LR
25		HadGEM2-CC	MIROC6
26		HadGEM2-ES	MIROC-ES2L
27		inmcm4	MPI-ESM1-2-HR
28		IPSL-CM5A-LR	MPI-ESM1-2-LR
29		IPSL-CM5A-MR	MRI-ESM2-0
30		IPSL-CM5B-LR	NorESM2-LM
31		MIROC5	NorESM2-MM
32		MIROC-ESM-CHEM	TaiESM1
33		MIROC-ESM	UKESM1-0-LL
34		MPI-ESM-LR	
35		MPI-ESM-MR	
36		MRI-CGCM3	
37		MRI-ESM1	
38		NorESM1-ME	
39		NorESM1-M	

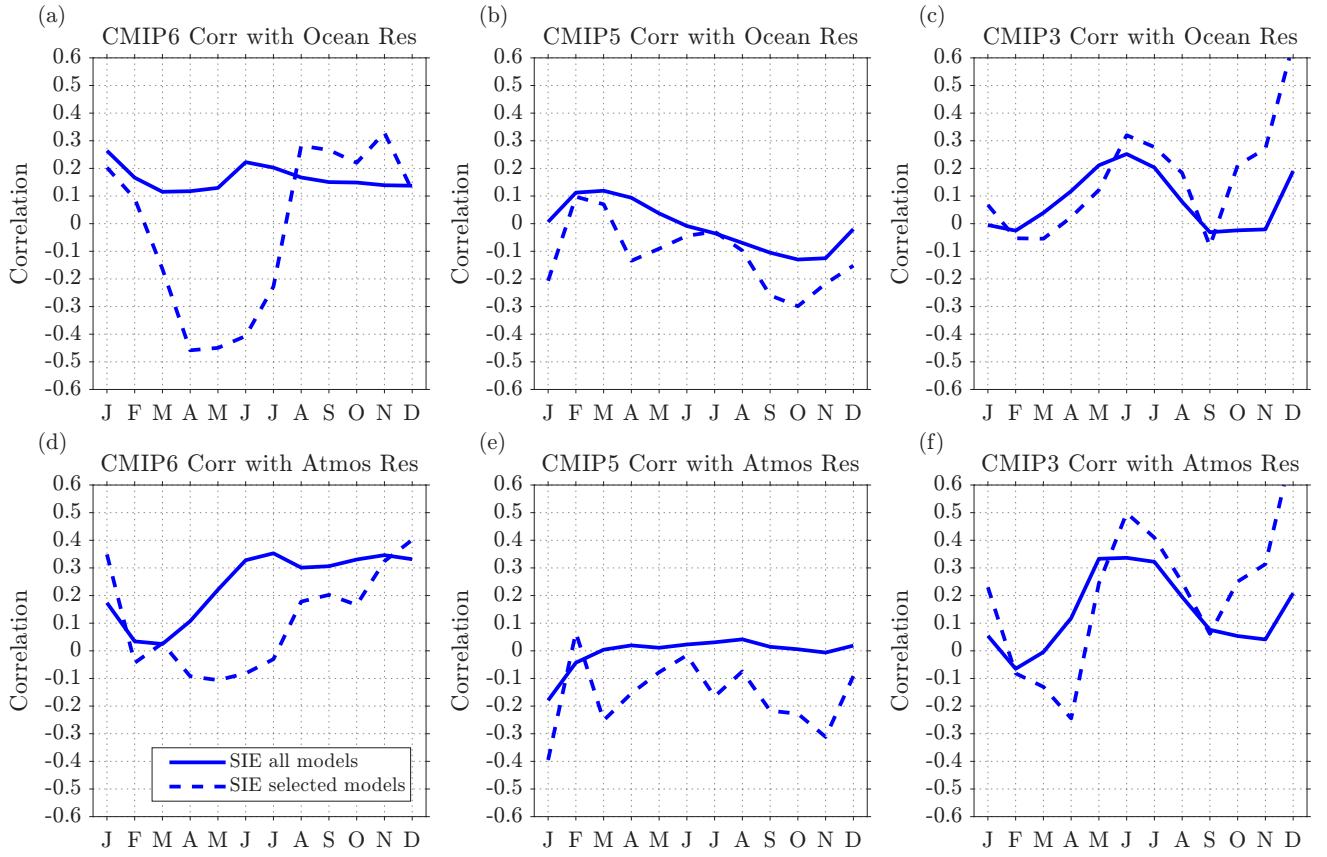


Figure S1. Inter-model correlation between monthly SIE trends over 1979–2025 and ocean (a–c) and atmosphere (d–f) resolution in CMIP6, CMIP5, and CMIP3 models. The solid lines show correlation values computed over all models and the dashed lines show correlation values computed for selected models. The criterion for selected models is that the models have climatological SIE within 3 million km² of the observed value, and is applied separately for each month.

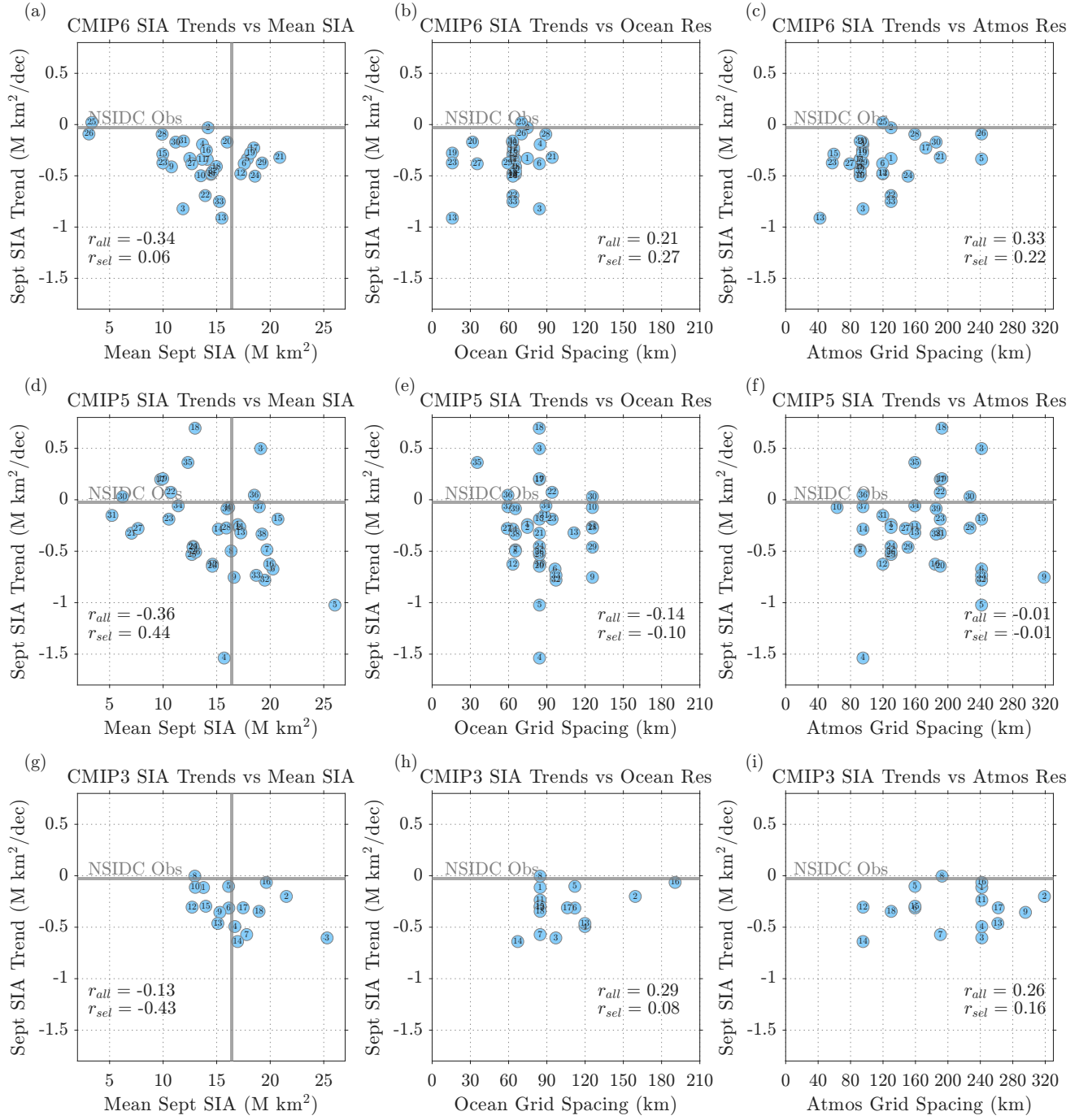


Figure S2. As in Fig. 1, but for SIA.

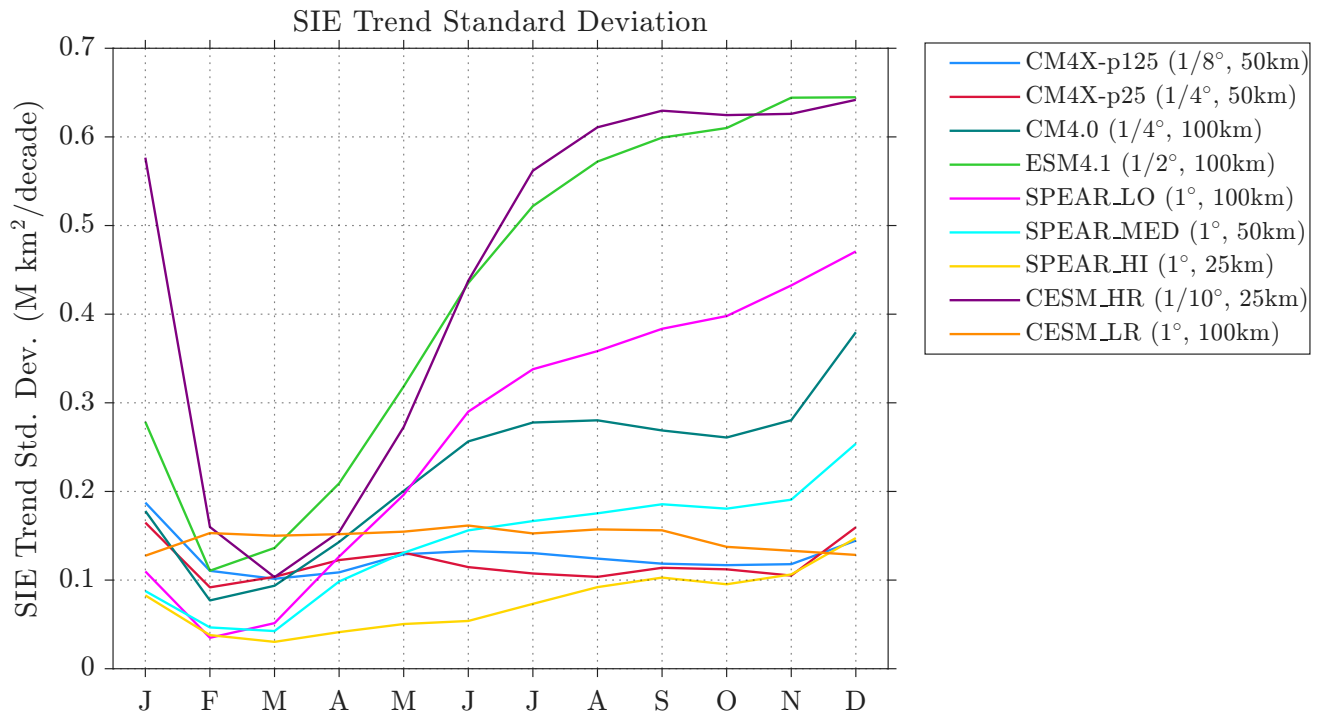


Figure S3. Variability in 47-year SIE trends computed over 1979–2025 across the GFDL and NCAR model hierarchies. Variability is quantified as the standard deviation of 47-year trends. For models with ensembles, these standard deviations are computed using the ensemble members. For the models with three or fewer members, 47-year trend standard deviations are computed using a 500-year PI control simulation.

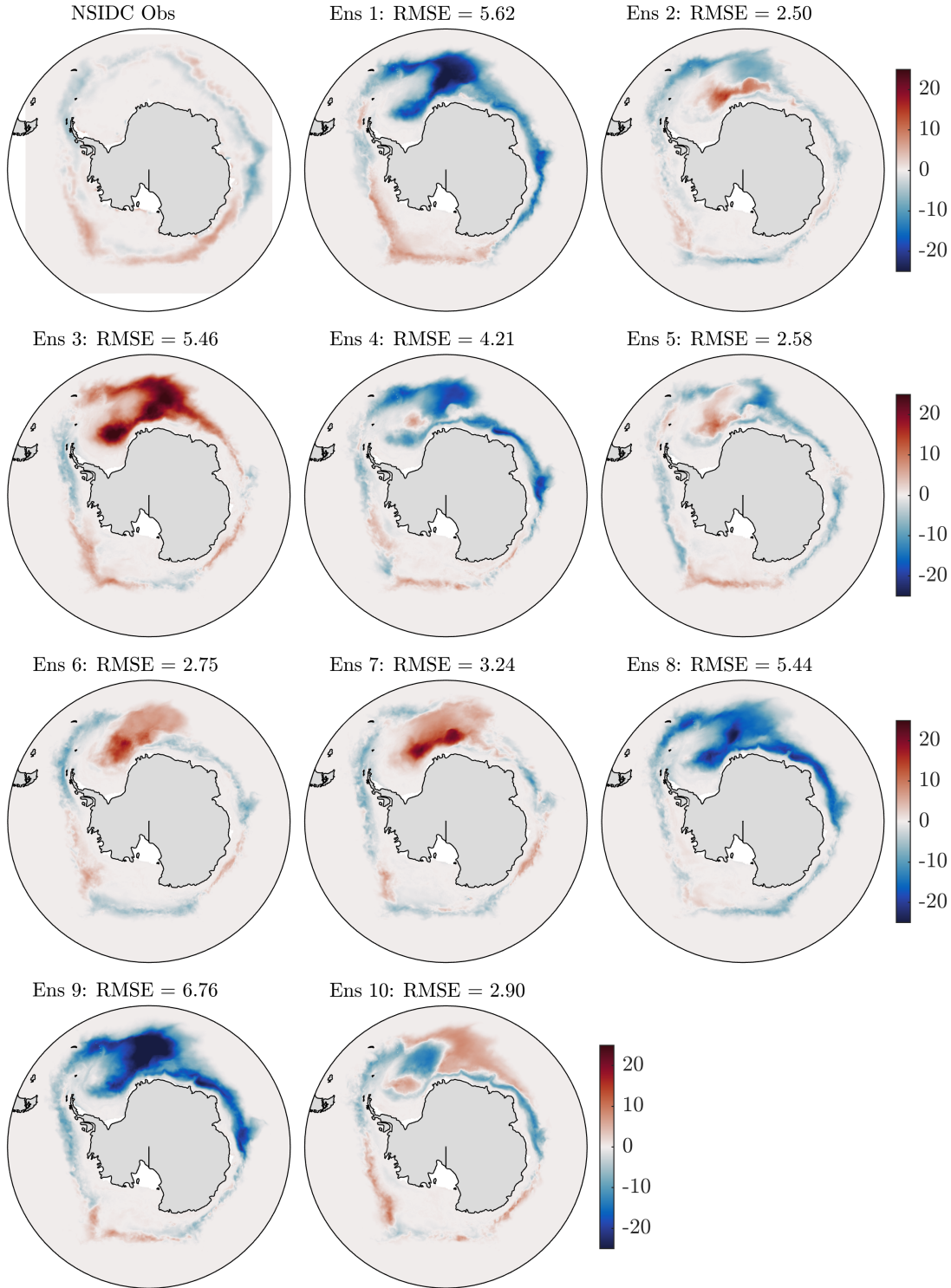


Figure S4. Spatial September SIC trends (%/decade) over 1979–2025 in NSIDC observations and CESM-HR ensemble members. Members 6, 7, and 10 have Pan-Antarctic SIE trend values that are close to the observed value. The RMSE values are the spatial RMSE relative to NSIDC SIC trends, averaged over all grid points south of 50°S.

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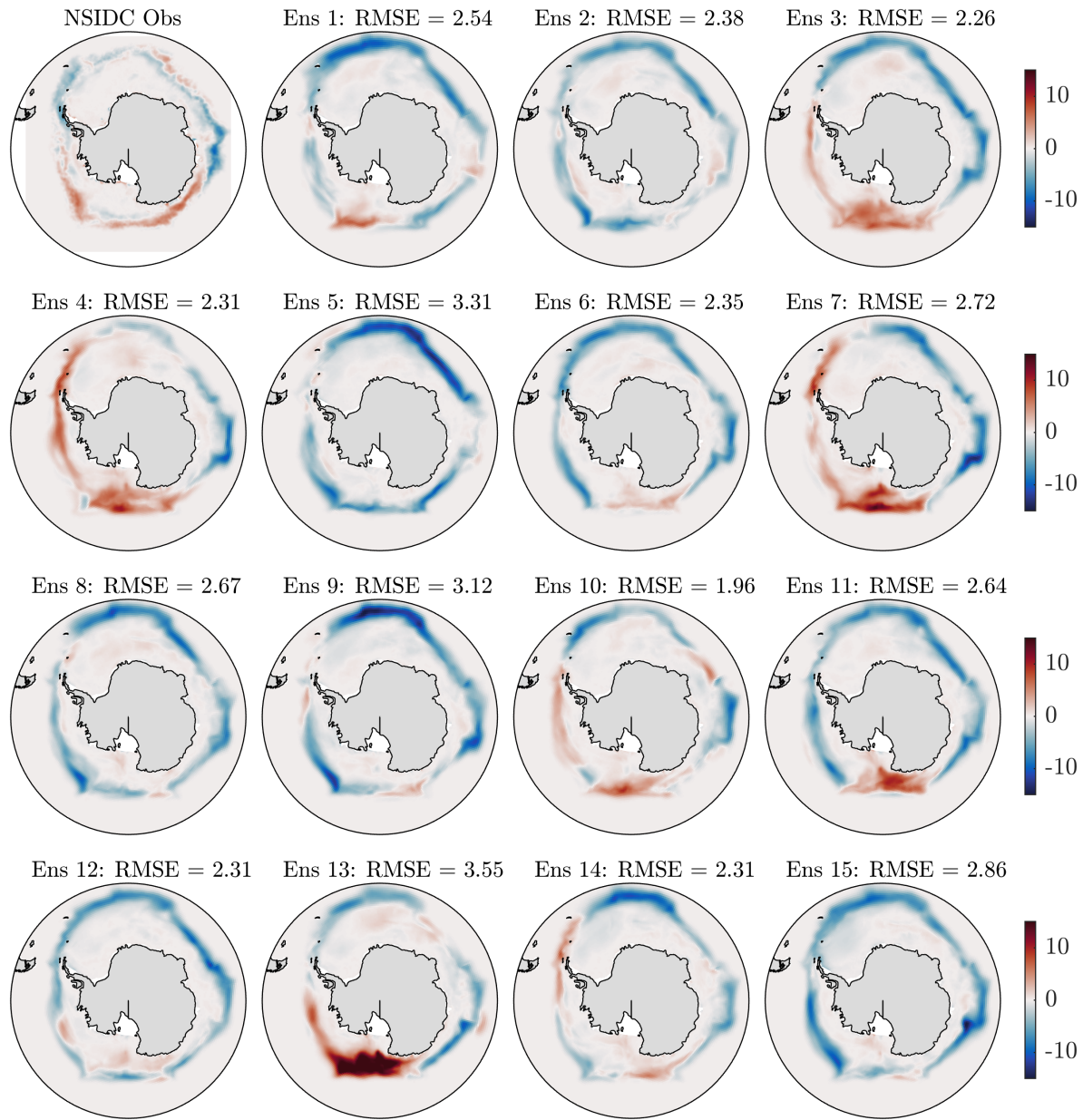


Figure S5. As in Fig. S4, but for SPEAR_LO ensemble members 1–15. Note that the color scale range is $[-15, 15]$, whereas Fig. S4 uses $[-25, 25]$. SPEAR_LO members 7, 10, 18 and 19 have Pan-Antarctic SIE trend values that are close to the observed value.

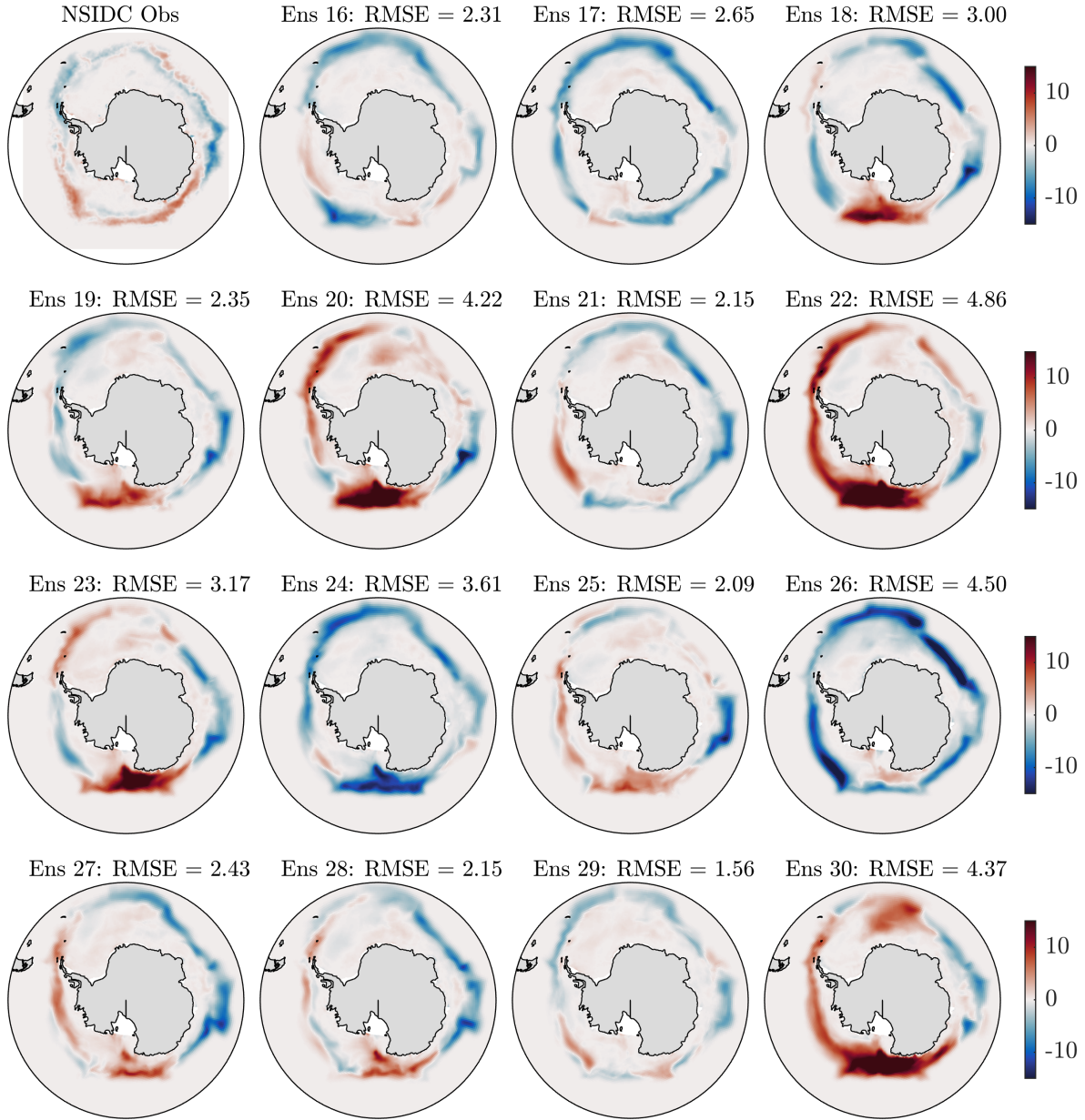


Figure S6. As in Fig. S4, but for SPEAR_LO ensemble members 16–30. Note that the color scale range is $[-15, 15]$, whereas Fig. S4 uses $[-25, 25]$. SPEAR_LO members 7, 10, 18 and 19 have Pan-Antarctic SIE trend values that are close to the observed value.