Supporting Information for "Projected changes of surface winds over the Antarctic continental margin"

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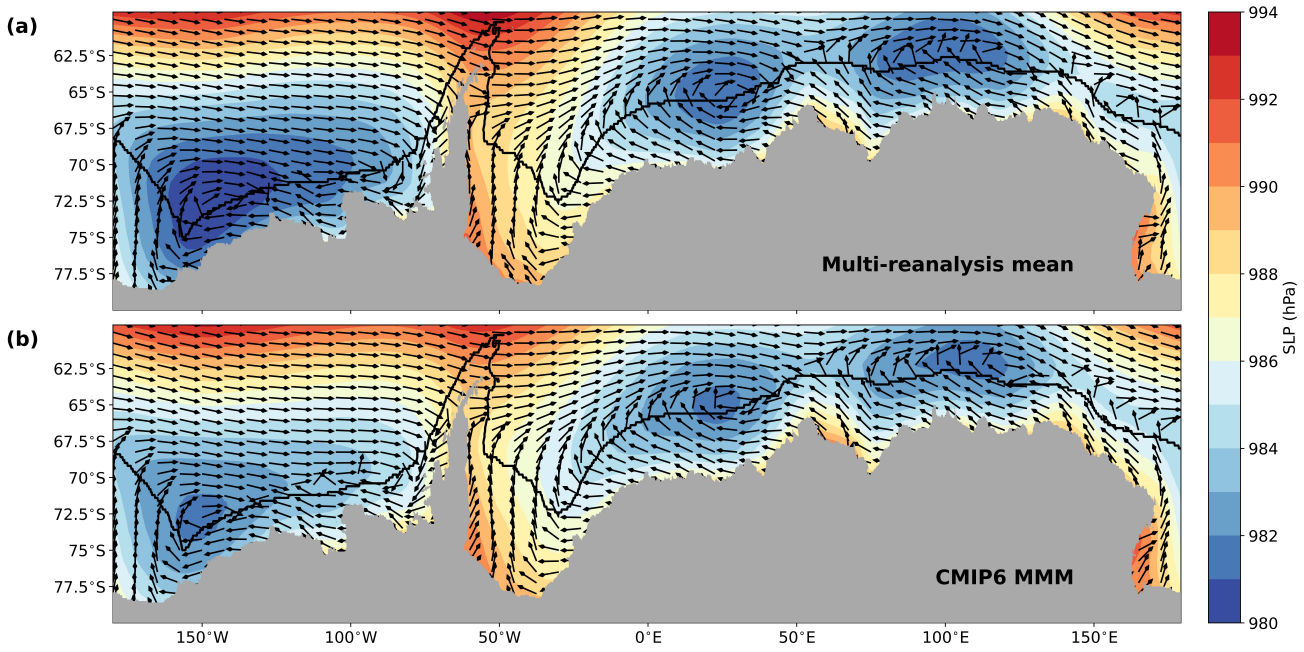

Figure S1. Sea level pressure and mean wind vectors for the historical period (1979 to 2015) of (a) the multi-reanalysis mean and (b) CMIP6 MMM. The black contour marks the northern limit of the study region.

Table S1. CMIP6 models included in the study

Model	Resolution & vertical levels	Modelling group	Reference
AWI-CM-1-1-MR	100km, L95.	Alfred Wegener Institute and Helmholtz Centre for Polar and Marine Research, Germany	(Semmler et al., 2020)
BCC-CSM2-MR	100km, L45	Beijing Climate Centre, China	(Wu et al., 2019)
CanESM5	500km, L49	Canadian Centre for Climate Modelling and Analysis, Environment and Climate Change Canada, Canada	(Swart et al., 2019)
EC-Earth3	100km, L91	European Community consortium, EU	
EC-Earth3-CC	100km, L91		
EC-Earth3-Veg	100km, L91		
EC-Earth3-Veg-LR	250km, L62		
FGOALS-f3-L	100km, L32	Institute of Atmospheric Physics, Chinese Academy of Sciences, China	(He et al., 2019)
GFDL-CM4	100km, L33	National Oceanic and Atmospheric Administration, Geophysical Fluid Dynamics Laboratory, USA	(Held et al., 2019)
GFDL-ESM4	100km, L49		(Krasting et al., 2018)
IITM-ESM	250km, L64	Centre for Climate Change Research, Indian Institute of Tropical Meteorology, India	(Krishnan et al., 2019)
INM-CM4-8	100km, L21	Institute for Numerical Mathematics, Russian Academy of Science, Russia	(E. M. Volodin et al., 2018)
INM-CM5-0	100km, L73	Institute for Numerical Mathematics, Russian Academy of Science, Russia	(E. Volodin & Gritsun, 2018)
IPSL-CM6A-LR	250km, L79	Institut Pierre Simon Laplace, France	(Boucher et al., 2020)
KACE-1-0-G	250km, L85	National Institute of Meteorological Sciences/Korea Meteorological Administration, Climate Research Division, Republic of Korea	(Lee et al., 2020)
MIROC6	250km, L81	JAMSTEC (Japan Agency for Marine-Earth Science and Technology, Japan), AORI (Atmosphere and Ocean Research Institute, The University of Tokyo, Japan), NIES (National Institute for Environmental Studies, Japan), and R-CCS (RIKEN Centre for Computational Science, Japan)	(Tatebe et al., 2019)
MPI-ESM1-2-LR	250km, L47		(Mauritsen et al., 2019)
MRI-ESM2-0	100km, L80	Meteorological Research Institute, Japan	(Yukimoto et al., 2011)
NESM3	250km, L47	Nanjing University of Information Science and Technology, China	(Cao et al., 2018)

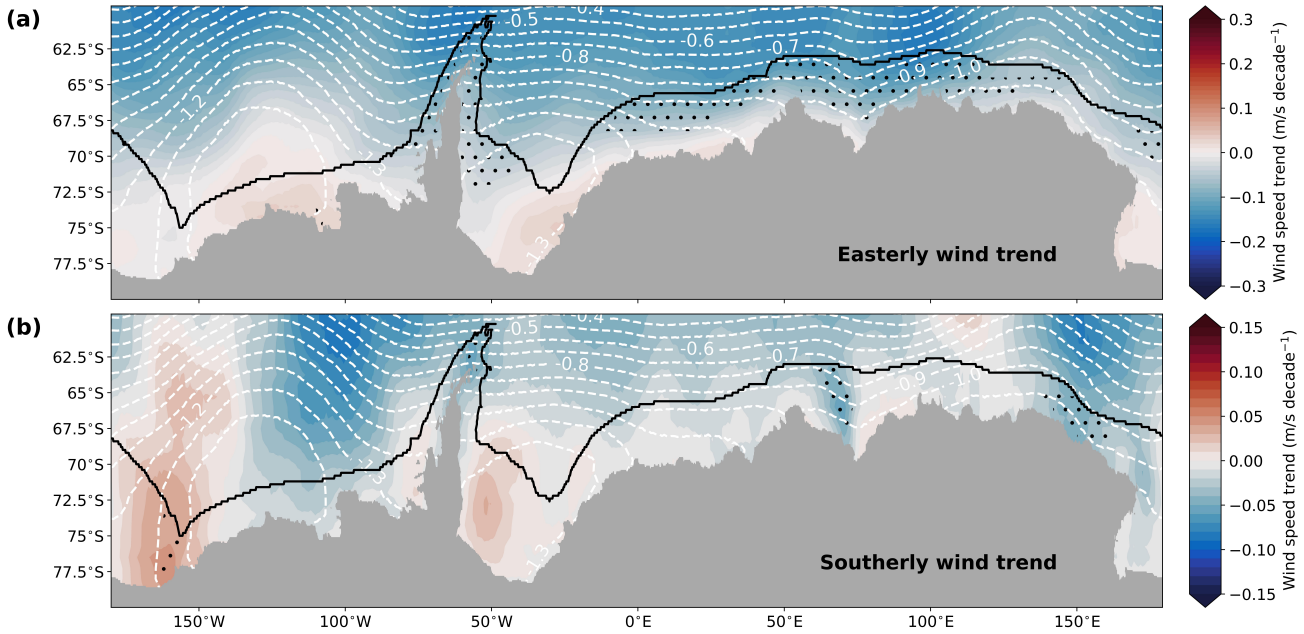

Figure S2. CMIP6 multimodel mean trends for (a) easterly and (b) southerly wind components for the historical period (1979 to 2015) with statistically significant trends ($p < 0.05$) hatched within the study region, south of the black contour. White contours show the sea level pressure difference of last ten years (2005 - 2015) with respect to the first ten years (1979 - 1989).

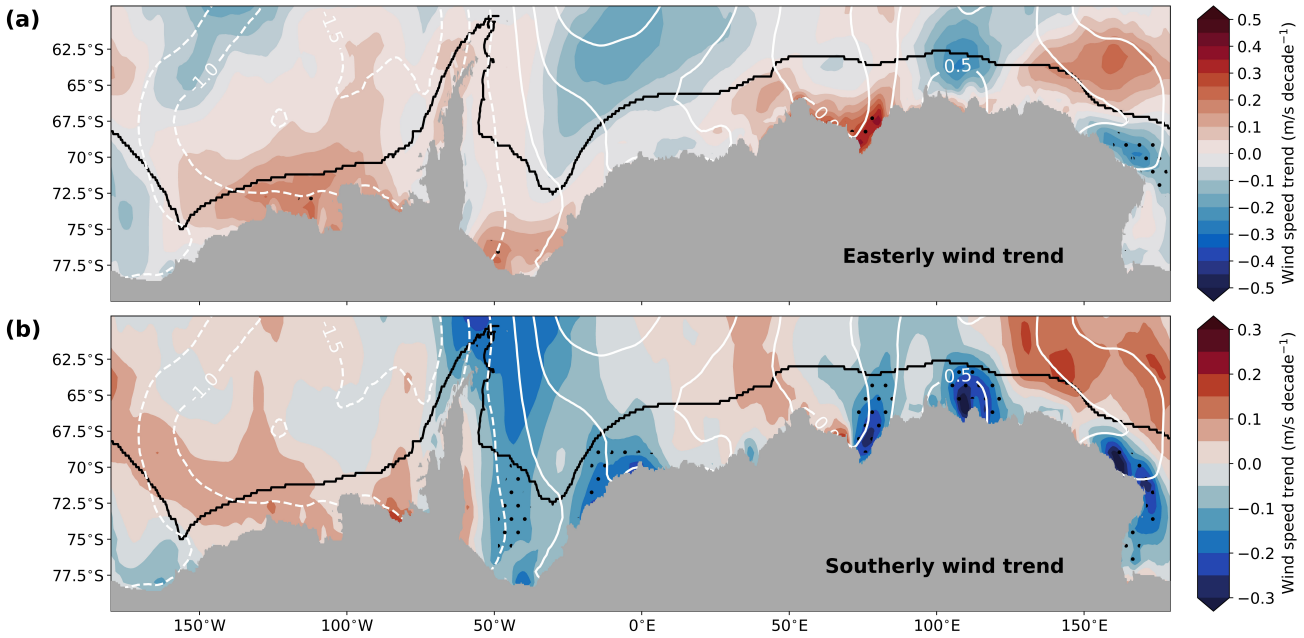

Figure S3. Multi-reanalysis mean trends for (a) easterly and (b) southerly wind components for the historical period (2015 to 2100) with statistically significant trends ($p < 0.05$) hatched within the study region, south of the black contour. White contours show the sea level pressure difference of last ten years (2005 - 2015) with respect to the first ten years (1979 - 1989).

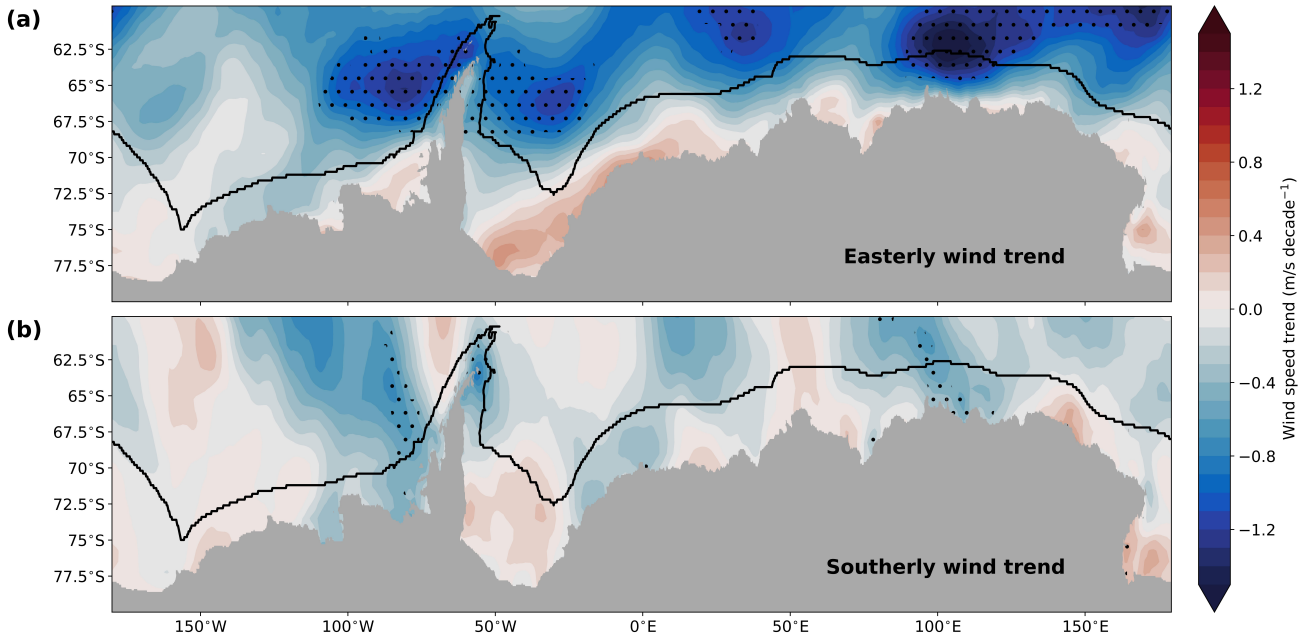

Figure S4. Multi-reanalysis summer (DJF) trends for (a) easterly and (b) southerly wind components for the period 1979 to 2000 with statistically significant trends ($p < 0.05$) hatched.

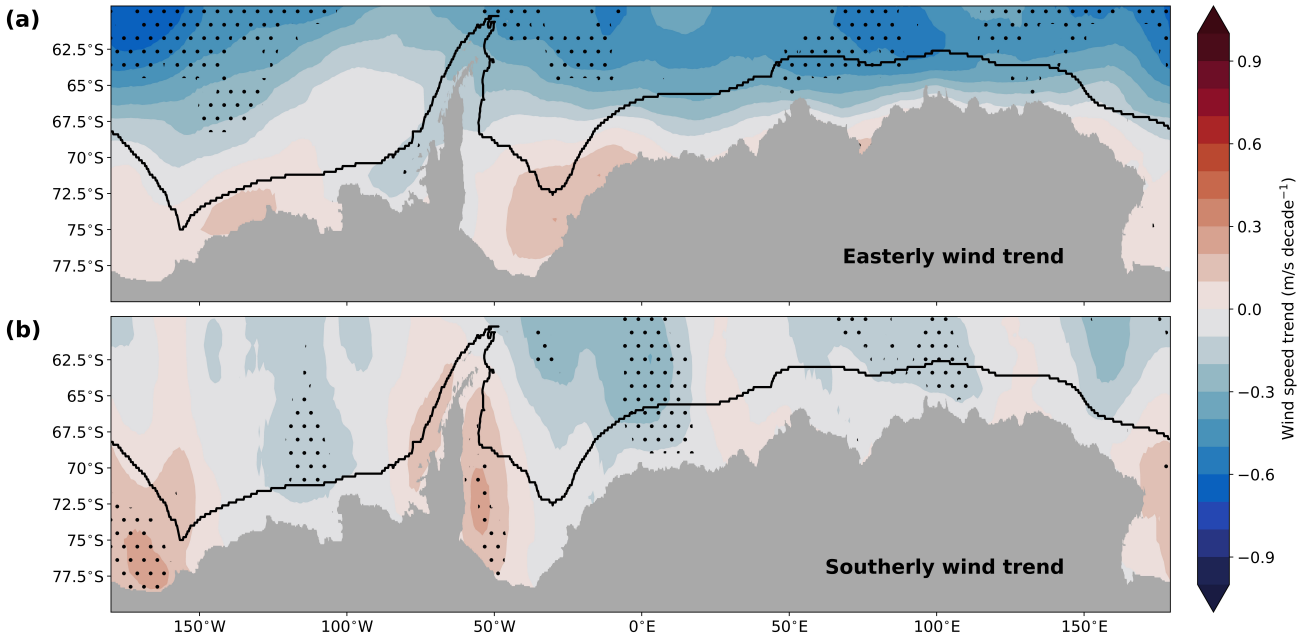

Figure S5. CMIP6 MMM summer (DJF) trends for (a) easterly and (b) southerly wind components for the period 1979 to 2000 with statistically significant trends ($p < 0.05$) hatched.

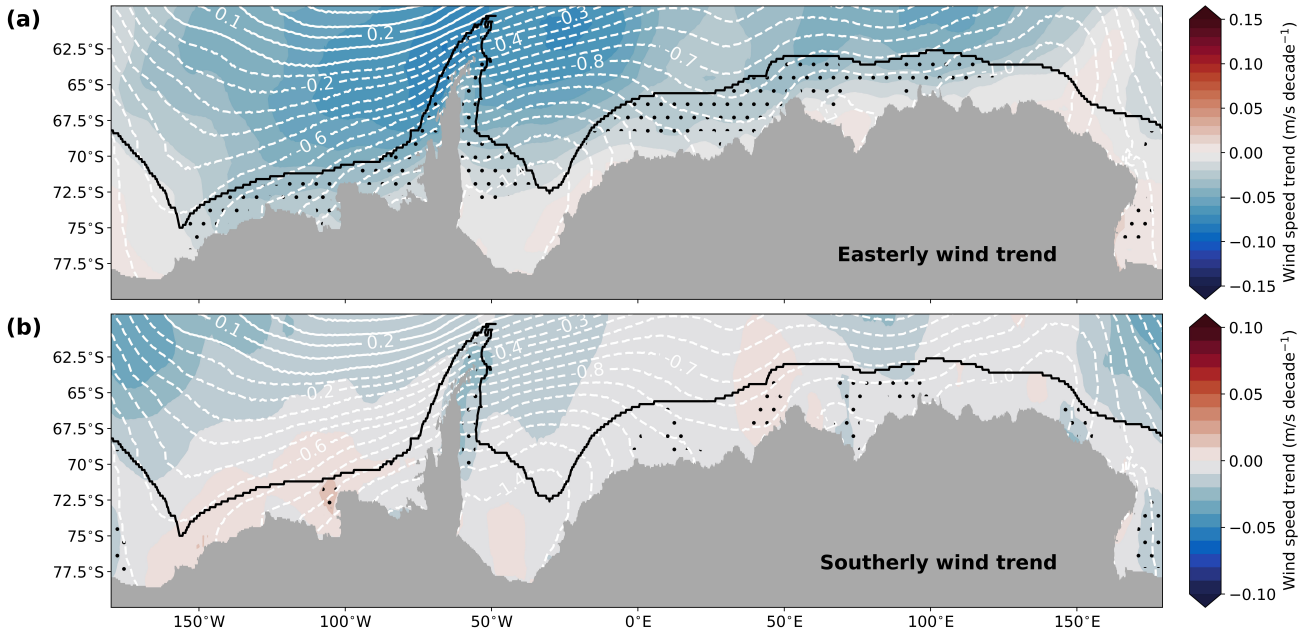

Figure S6. CMIP6 multi-model mean trends for a) easterly and b) southerly wind for emission scenario SSP245 during the period 2015 to 2100, with statistically significant trends with $p < 0.05$ hatched only for the study region. Pink contours show the difference in SLP of the last ten years (2090 to 2099) relative to the first ten years (2015 to 2025) and the black contour marks the northern limit of our study region.

Table S2. Easterly and southerly wind component trends (m/s century^{-1}) for individual reanalysis products, multi-reanalysis mean and CMIP6 MMM during the historical period and future projections under the SSP245 and SSP585 scenarios. Significant trends at 5% confident levels are highlighted in bold.

	Easterly wind trend	Southerly wind trend
Era-Interim	0.34	-0.03
ERA5	0.64	-0.004
CFSR	-0.06	**-0.84**
JRA55	-0.45	**-1.01**
Multi-reanalysis mean	0.11	**-0.47**
CMIP6 MMM Historical	**-0.41**	**-0.08**
CMIP6 MMM SSP245	**-0.17**	**-0.04**
CMIP6 MMM SSP585	**-0.56**	**-0.15**

Table S3. Easterly and southerly wind component trends (m/s century^{-1}) for the summer season (DJF) for individual reanalysis products, multi-reanalysis mean and CMIP6 MMM during the historical period and future projections under the SSP245 and SSP585 scenarios. Significant trends at 5% confident levels are highlighted in bold.

	Easterly wind trend	Southerly wind trend
Era-Interim	-1.17	-0.34
ERA5	0.74	-0.36
CFSR	-1.92	**-1.10**
JRA55	-1.04	**-0.83**
Multi-reanalysis mean	-1.22	**-0.65**
CMIP6 MMM Historical	**-1.08**	**-0.27**
CMIP6 MMM SSP245	**-0.24**	**-0.08**
CMIP6 MMM SSP585	**-0.84**	**-0.28**

Table S4. Easterly and southerly wind component trends (m/s century^{-1}) for the summer season (JJA) for individual reanalysis products, multi-reanalysis mean and CMIP6 MMM during the historical period and future projections under the SSP245 and SSP585 scenarios. Significant trends at 5% confident levels are highlighted in bold.

	Easterly wind trend	Southerly wind trend
Era-Interim	0.64	0.22
ERA5	0.94	0.27
CFSR	0.72	0.70
JRA55	-0.60	-1.07
Multi-reanalysis mean	0.43	-0.32
CMIP6 MMM Historical	0.32	0.08
CMIP6 MMM SSP245	-0.13	0.02
CMIP6 MMM SSP585	**-0.38**	-0.006

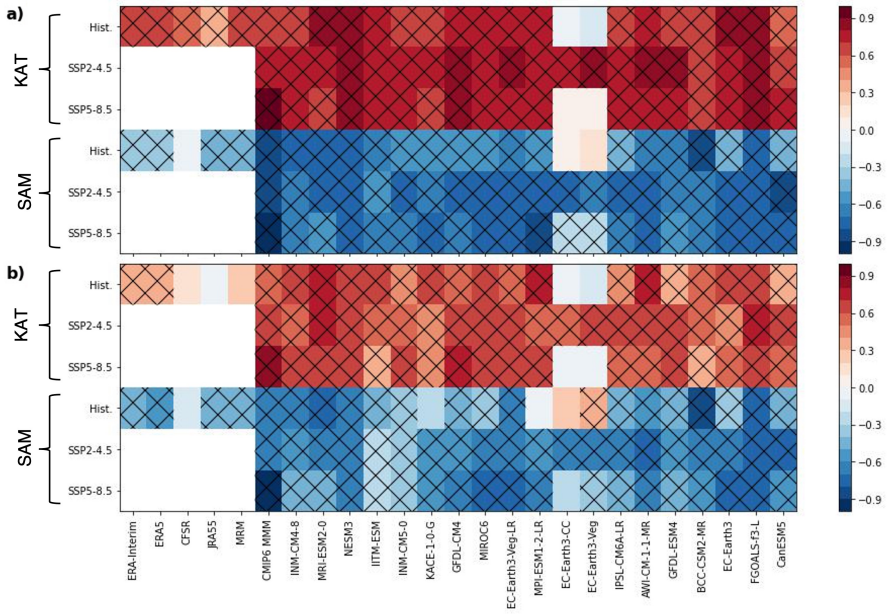

Figure S7. Correlations between the circumpolar average of the easterly and southerly wind components within the study region (time series in Figure 4) and the SAM and katabatic wind (KAT) indices for the (a) easterly and (b) southerly wind components during the historical period and future projections under SSP245 and SSP585 scenerios. Statistically significant correlations ($p < 0.05$) are hatched.

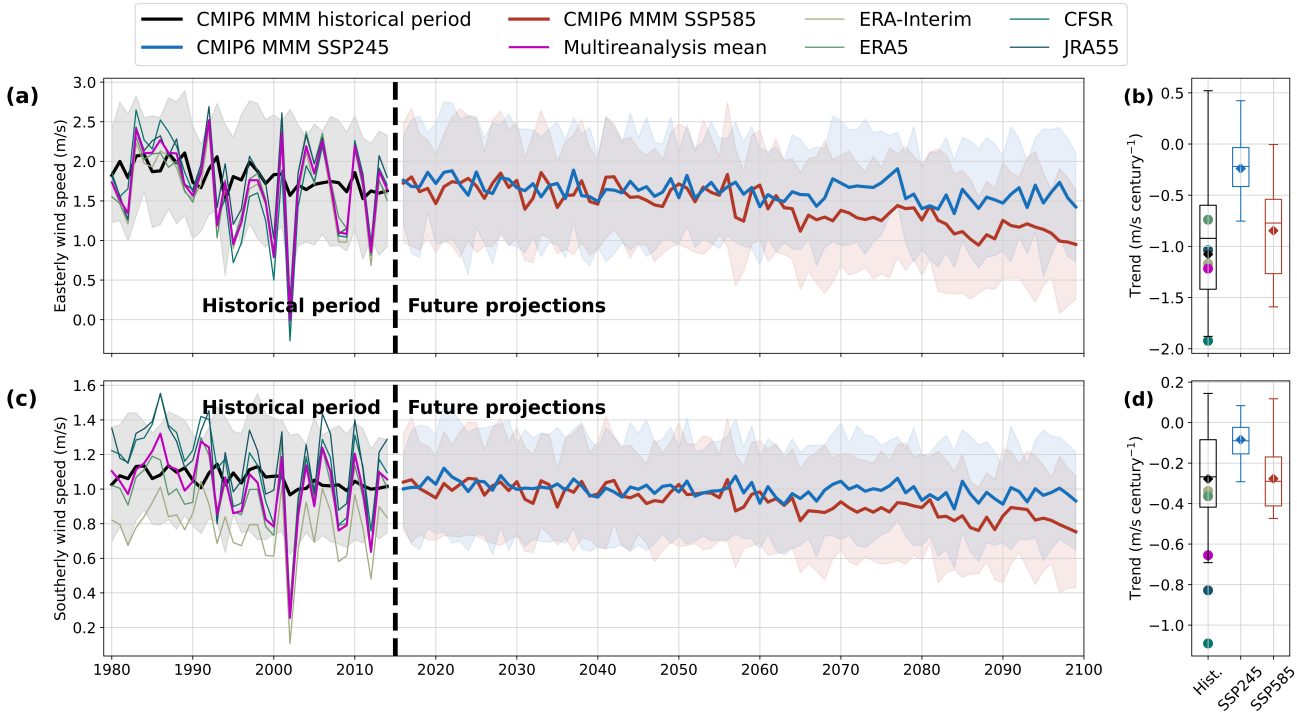

Figure S8. Summer time (December to February) (a) Easterly and (c) southerly wind speed averaged over the study region for CMIP6 multi-model mean and $\pm 1SD$ shading, the multi-reanalysis mean, ERA-Interim, ERA5, CFSR and JRA55. Boxplot of (b) easterly and (d) southerly wind trends (m/s decade^{-1}) for CMIP6 models for the historical period, SSP245 and SSP585. Dots mark trends in CMIP6 multi-model mean, multi-reanalysis mean, ERA-Interim, ERA5, CFSR and JRA55.

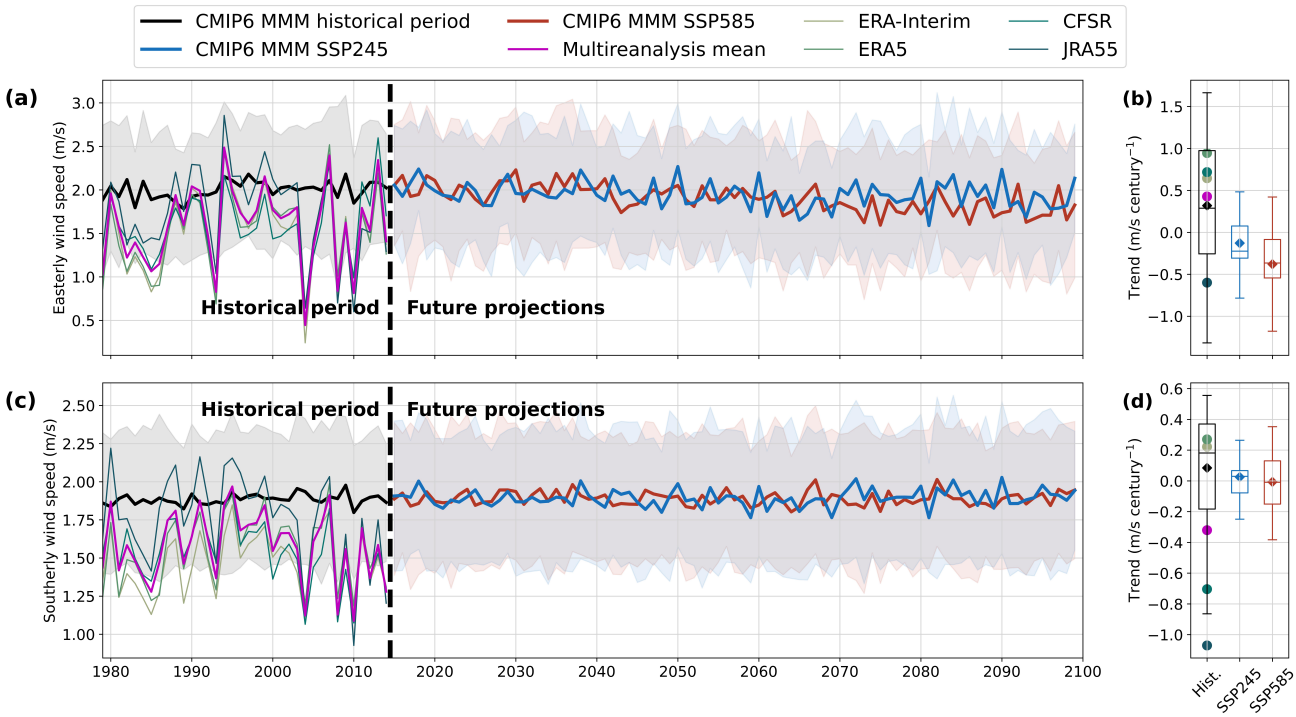

Figure S9. As in Figure S8 only shown for winter time (June to August).

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