Online Auxiliary Materials for Projected decline in snow depth on Arctic sea ice caused by progressively later autumn open ocean freeze-up this century

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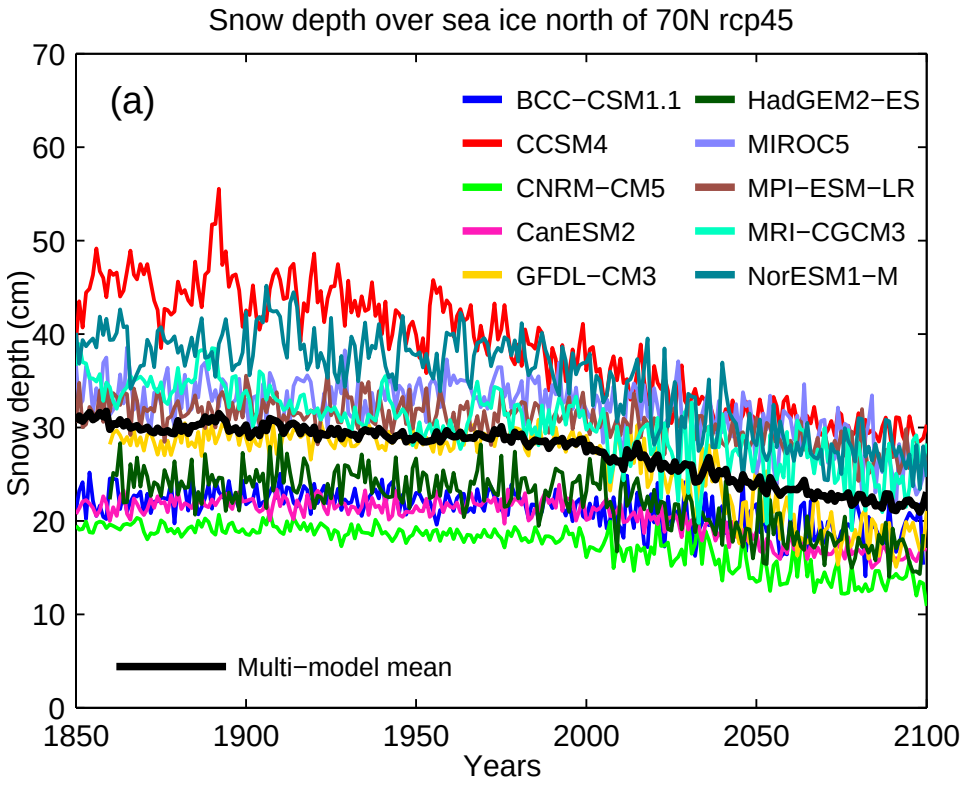
1 Introduction

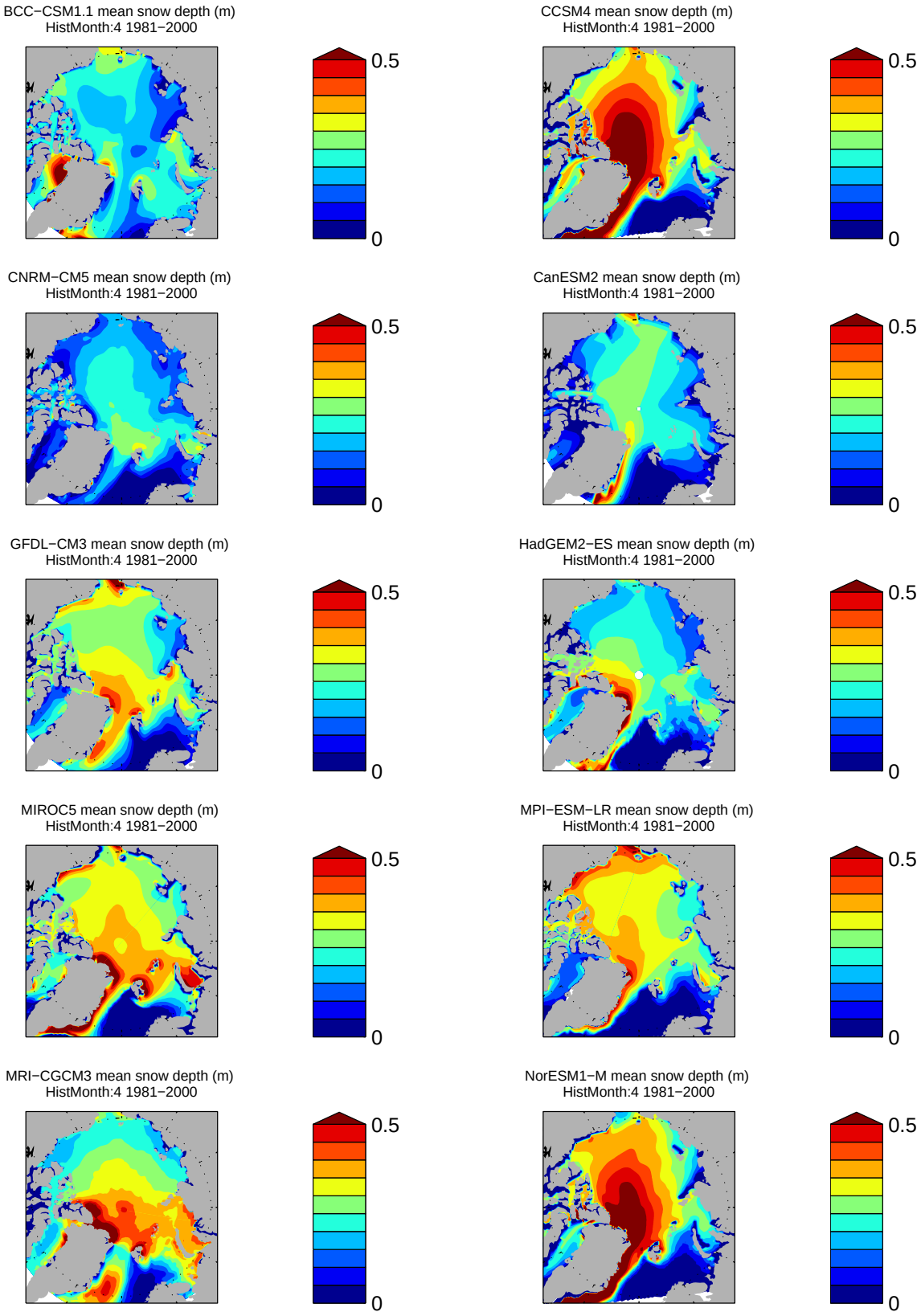
This document contains a table of the CMIP5 models used in this study and a series of supplemental figures. The first figure is shows the time series for RCP4.5 snow depths to compare with Figure 2a of the manuscript (which shows snow depths for RCP8.5). This document also presents individual model results from the CMIP5 archive as shown in Figures 1 and 4 of the manuscript. The purpose is to document the spatial and climatological characteristics of individual models and to elucidate details lost in the multimodel means.

Table 1: Models used in this study.

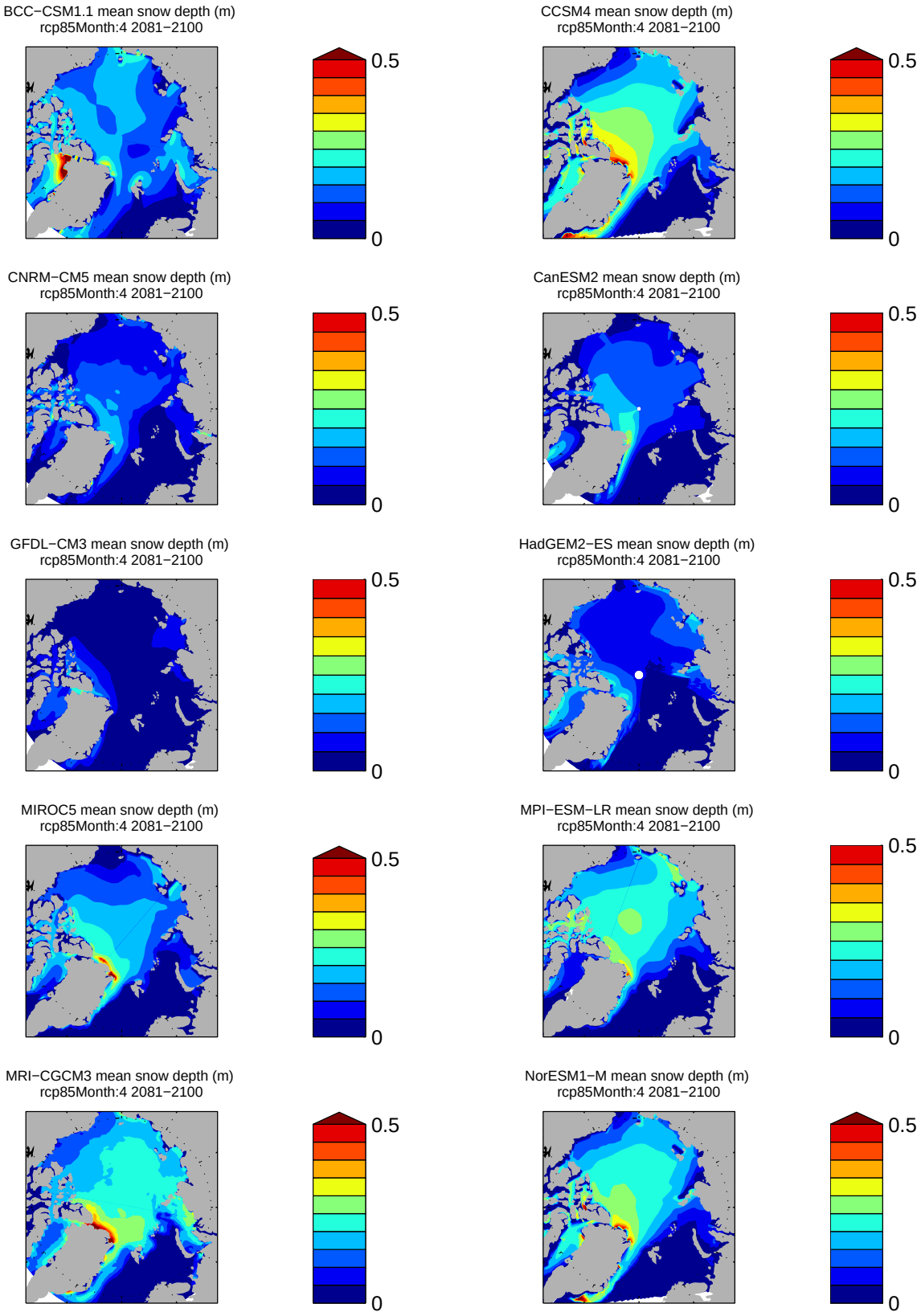
Model	Institution	Ensembles	
		Hist.	RCP8.5
BCC-CSM1.1	Beijing Climate Center, China Meteorological Administration (BCC)	3	1
CanESM2	Canadian Centre for Climate Modelling and Analysis (CCCMA)	5	5
CCSM4	National Center for Atmospheric Research (NCAR)	4	5
CNRM-CM5	Centre National de Recherches Meteorologiques / Centre Europeen de Recherche et Formation Avancees en Calcul Scientifique (CNRM-CERFACS)	10	5
GFDL-CM3	NOAA Geophysical Fluid Dynamics Laboratory (NOAA GFDL)	5	1
HadGEM2-ES	Met Office Hadley Centre (MOHC)	1	1
MIROC5	Atmosphere and Ocean Research Institute (The University of Tokyo), National Institute for Environmental Studies, and Japan Agency for Marine-Earth Science and Technology (MIROC)	1	1
MPI-ESM-LR	Max Planck Institute for Meteorology (MPI-M)	3	3
MRI-CGCM3	Meteorological Research Institute (MRI)	5	1
NorESM1-M	Norwegian Climate Centre (NCC)	3	1



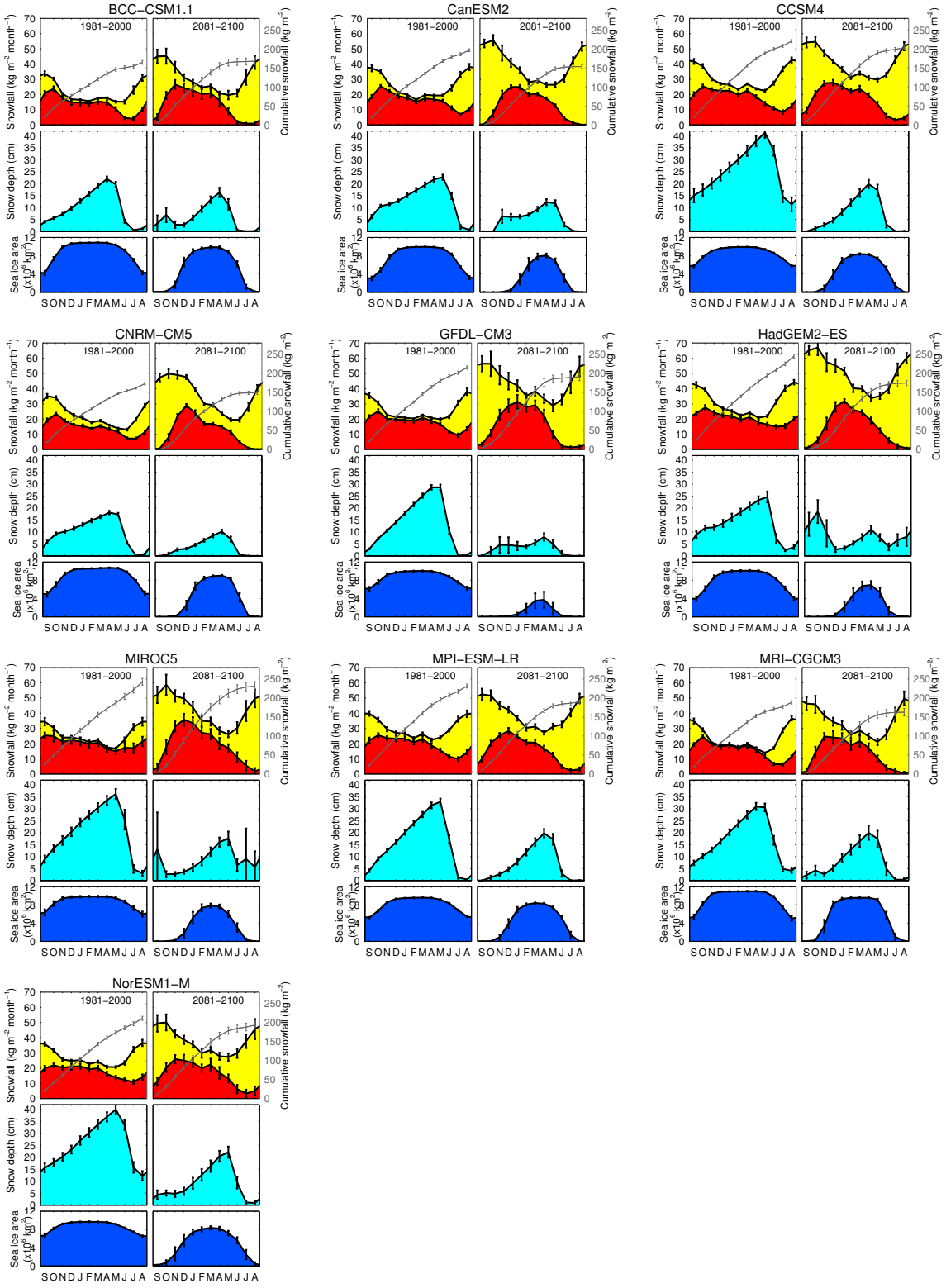
Timeseries of mean snow depth (cm) for all models in RCP4.5 scenario, as in Figure 2a of main manuscript.



Mean snow depth (m) (1981-2000) on sea ice for each of the 10 models as in Figure 1 of the main manuscript.



Mean snow depth (m) (2081-2100) on sea ice for each of the 10 models as in Figure 1 of the main manuscript.



Climatology for each of the 10 models for snowfall and rainfall, snow depth, and ice area for north of 70 N, similar to Figure 4 in the main manuscript. For each model, the climatology is given for the periods 1981-2000 (Historical) (left) and 2081-2100 (RCP8.5) (right). Errorbars are 1 standard deviation of means from all available ensemble members in the given period.

(Top) Stacked snowfall (red) and rainfall rates (yellow), where the total represents the the

total precipitation rate (kg/m^2/month), as an area-weighted average over the ocean north of 70 N. The grey line is the cumulative snowfall (kg/m^2, right axis).

(Middle) Snow depth (cm), area-weighted average over sea ice north of 70 N for sea ice concentration $> 15\%$.

(Bottom) Ice area (x10^6 km^2) north of 70 N for sea ice concentration $> 15\%$. Months are from September through August.