Supplementary Material to

An Integrated Assessment Modeling Framework for Uncertainty Studies in Global and Regional Climate Change: The MIT IGSM-CAM (version 1.0)

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IGSM-CAM Sea Surface Temperatures

In the IGSM-CAM framework, CAM is driven by the IGSM sea surface temperature (SST) anomalies instead of the full field because the IGSM SSTs exhibit significant regional biases, mainly associated with the coupling of the ocean model to a two-dimensional, zonal-mean atmosphere. Figure S1 shows the differences between the IGSM and the merged Hadley-OI (Hurrell et al., 2008) SSTs for winter and summer over three different decades. It reveals that the bias differs between seasons but that it is fairly constant over the last 110 years. This means that the seasonal cycle of the IGSM SSTs is biased but that the anomalies from, for example, pre-industrial era agree well with the observations. In order to correct the IGSM SST seasonal cycle and to provide more realistic SSTs to the three-dimensional atmosphere model, CAM is driven by IGSM SST anomalies from a control simulation corresponding to pre-industrial forcing with an observed 12-month SST climatology corresponding to pre-industrial observed seasonal cycle. The dataset used in this study is the merged Hadley-OI SSTs, a surface boundary dataset designed for uncoupled simulations with CAM, consisting of a merged product based on the monthly mean Hadley Centre SST dataset version 1 (HadISST1) and version 2 of the National Oceanic and Atmospheric Administration (NOAA) weekly Optimum Interpolation (OI) SST analysis.



Fig. S1. Decadal mean differences between the IGSM and the merged Hadley-OI sea surface temperatures for (a) winter and (b) summer over the 1901-1910, 1951-1960 and 2001-2010 periods.

Modeling Center (or Group)	Institute ID	Model Name
Commonwealth Scientific and Industrial Research Organization (CSIRO) and Bureau of Meteorology (BOM), Australia	CSIRO-BOM	ACCESS1.0 ACCESS1.3
Beijing Climate Center, China Meteorological Administration	BCC	BCC-CSM1.1 BCC-CSM1.1(m)
College of Global Change and Earth System Science, Beijing Normal University	GCESS	BNU-ESM
National Center for Atmospheric Research	NCAR	CCSM4
Community Earth System Model Contributors	NSF-DOE-NCAR	CESM1(BGC) CESM1(CAM5)
Centro Euro-Mediterraneo per I Cambiamenti Climatici	СМСС	CMCC-CM CMCC-CMS
Commonwealth Scientific and Industrial Research Organization in collaboration with Queensland Climate Change Centre of Excellence	CSIRO-QCCCE	CSIRO-Mk3.6.0
The First Institute of Oceanography, SOA, China	FIO	FIO-ESM
NOAA Geophysical Fluid Dynamics Laboratory	NOAA GFDL	GFDL-CM3 GFDL-ESM2G GFDL-ESM2M
NASA Goddard Institute for Space Studies	NASA GISS	GISS-E2-H GISS-E2-R
National Institute of Meteorological Research/Korea Meteorological Administration	NIMR/KMA	HadGEM2-AO
Met Office Hadley Centre (additional HadGEM2-ES realizations contributed by Instituto Nacional de Pesquisas Espaciais)	MOHC (additional realizations by INPE)	HadGEM2-CC HadGEM2-ES
Institute for Numerical Mathematics	INM	INM-CM4
Institut Pierre-Simon Laplace	IPSL	IPSL-CM5A-LR IPSL-CM5A-MR IPSL-CM5B-LR
Japan Agency for Marine-Earth Science and Technology, Atmosphere and Ocean Research Institute (The University of Tokyo), and National Institute for Environmental Studies	MIROC	MIROC-ESM MIROC-ESM-CHEM
Atmosphere and Ocean Research Institute (The University of Tokyo), National Institute for Environmental Studies, and Japan Agency for Marine-Earth Science and Technology	MIROC	MIROC5
Max-Planck-Institut für Meteorologie (Max Planck Institute for Meteorology)	MPI-M	MPI-ESM-MR MPI-ESM-LR
Meteorological Research Institute	MRI	MRI-CGCM3
Norwegian Climate Centre	NCC	NorESM1-M

Table. S1. List of CMIP5 models used in this study along with the model center/group.

References

Hurrell JW, Hack JJ, Shea D, Caron JM, Rosinski J (2008) A new sea surface temperature and sea ice boundary dataset for the Community Atmosphere Model. J Climate 21(19):5145–5153, DOI 10.1175/2008JCLI2292.1