ScienceHub – "CESM Lakes" (*ScID*: A-31zg; *Research Effort Lead*: Tanya Spero)

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This entry into ScienceHub covers the following article:

> Spero, T. L., C. G. Nolte, J. H. Bowden, M. S. Mallard, and J. A. Herwehe, 2016: The impact of incongruous lake temperatures on regional climate extremes downscaled from the CMIP5 archive using the WRF Model. *J. Climate*, **29**, 839–853.

This research effort primarily supports ACE 155 (under MDST-4) in the FY12-15 RAP, and ACE AIMS-2.3 (ACE 6.02) in the FY16-19 StRAP. This is the Dynamical Downscaling task.

This research effort was conducted on the EPA HPC platform "sol".

The CESM (a.k.a., CCSM4) data used for downscaling was obtained from the CMIP5 archive at the Earth System Grid (http://www.earthsystemgrid.org). The years labeled 1995-1997 were used. These are "historical" data, which means that they represent the climatological era but do not correspond to observed conditions during those years. There are no leap years in climate model data. The data are stored locally in:

> Sol:/asm/CLIMSIM/cmip5/CCSM4/historical

The downscaled WRF model runs created for this research effort and used in the published journal article were conducted using WRFv3.6.1. Initial results used WRFv3.4.1, but an updated version of WRF was used for the final analysis. The WRF Model was obtained from the National Center for Atmospheric Research (http://www.wrf-model.org). The version of WRF that was used for this work is in:

> Sol:/home/ste/wrf/WRFV3.6.1 (linked to /home/hhg/wrf/wrf_v3.6.1, maintained by J. Herwehe)

The paper focuses on comparison of "default" (using WRF default definition of lake temperatures) and "clmlst" (using lake surface temperatures from CLM) to downscale data from CESM (a.k.a., CCSM4) under the CMIP5 archive. The paper was published using data from the runs labeled "test4". The WRF runs were conducted by Tanya Spero. The WRF scripts are in:

> Sol:/home/ste/projects/cesm_lakes/scripts ("ste" is user Tanya Spero)

The method to link CLM data into CESM for downscaling with WRF was developed by Tanya Spero and Chris Nolte. Chris wrote up the instructions, which are in:

        Sol:/home/ste/projects/cesm_lakes/scripts/README
        (which is linked to Sol:/home/cnolte/project/cmip5/cesm/v6/README)

Post-processing codes and scripts used in this research are in:

        Sol:/home/ste/myprog/wrfextr4a_noleap

        Sol:/home/ste/myprog/monthly4_noleap

Input data for these runs, as well as raw model output ("wrf") and 1st- and 2nd-level post-processing data ("extr" and "monthly") are archived in:

        Sol:/asm/CLIMSIM/downscale/cesm_lakes

Scripts were developed in R to create all of the figures in the published paper. Those scripts are in:

        Sol:/home/ste/myprog/Rscripts/_for_cesm_lakes

Observational comparisons were drawn against climatological records from buoys stationed in the Great Lakes region. Buoy observations were obtained from the NOAA National Data Buoy Center (http://www.ndbc.noaa.gov). Those data are stored locally in:

        Sol:/asm/CLIMSIM/obs/buoy_data

The manuscript was developed by Tanya Spero. Drafts of the manuscript and other supporting documentation are stored on her EPA laptop in:

        Documents/articles/downscale_cesm_lakes

Acronyms:

ACE	Air, Climate, and Energy (one of the EPA's National Research Programs)
EPA	Environmental Protection Agency
CCSM4	Community Climate System Model, version 4
CESM	Community Earth System Model
CLM	Community Land Model (a component of CESM)
CMIP5	Fifth Coupled Model Intercomparison Project
HPC	High Performance Computing
NCAR	National Center for Atmospheric Research
NOAA	National Oceanic and Atmospheric Administration
RAP	Research Action Plan
StRAP	Strategic Research Action Plan
WRF	Weather Research and Forecasting Model