

Description of Dataset: *drought_params_and_metrics.npy*

Purpose: Given Latin hypercube samples of 28 climate model input parameter values, determine the parameter value combinations that cause ensemble variability in drought metrics used to characterize drought over the Western U.S region, then find parameter values within the allowable ranges that provide the best modeled drought.

Source: The CAM4 ensemble used to generate this dataset was generated by LLNL's Uncertainty Quantification Strategic Initiative Laboratory Directed Research and Development Project (tracking code 10-SI-013) and was created under the auspices of the US Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. The work was supported by the DOE-BER Early Career Research Program award of Celine Bonfils, and by the Regional and Global Climate Modeling Program of the Office of Science of the U.S. Department of Energy (DOE). This work was also supported by the DOE Office of Science through the Scientific Discovery Through Advanced Computing (SciDAC) project on Multiscale Methods for Accurate, Efficient, and Scale-Aware Models of the Earth System. This dataset is released under IM number LLNL-MI-746648.

Relevant Information: This dataset contains values of drought metrics computed from climate model uncertainty quantification (UQ) ensembles. Ensemble members were constructed using a Latin hypercube method in LLNL's UQ Pipeline software system to sample the uncertainties of 28 model parameters within the version 4 Community Atmosphere Model component of the Community Earth System Model (CESM). The dataset contains five ensemble studies and 1316 simulations (plus one simulation run in the default CAM4 configuration). There are four separate Latin hypercube ensembles, containing 560, 140, 280 and 280 ensemble members, and a one-parameter-at-a-time (OAT) set of 56 simulations. UQ methods can be used to predict drought metrics from input parameter values, and to use sensitivity analysis, feature selection, and dimensional reduction techniques to determine the causes of ensemble variability. They can also be used to find parameter values that could provide a better representation of modeled drought than the current default configuration.

Attribute Information:

Columns 1-28: values of 28 CAM4 parameters scaled in the interval [0, 1], in the following order: cldfrc_rhminh, cldfrc_rhminl, cldopt_rliqice, cldopt_rliqland, cldopt_rliqocean, cldsed_ice_stokes_fac, cldwat_capnc, cldwat_capnsi, cldwat_capnw, cldwat_conke, cldwat_icritc, cldwat_icritw, cldwat_r3lcrit, hbdiff_ricr, hkconv_c0, hkconv_cmftau, zmconv_alfa, zmconv_c0, zmconv_dmpdz, zmconv_ke, zmconv_tau, cdn_scal_fac, hbdiff_fac, hbdiff_fak, hkconv_betamn, z0m_scal_fac, zmconv_capelmt, physpkg_sgh_scal_fac.

Columns 29 – 31: values of drought metrics in the following order: RMSE-SLP, CORR-P and RMSE-C

Row 1: Default CAM4 simulation

Rows 2 – 57: 56-member OAT ensemble

Rows 58 – 617: 560-member Latin Hypercube Sample ensemble

Rows 618 – 757: 140-member Latin Hypercube Sample ensemble

Rows 758 – 1037: 280-member Latin Hypercube Sample ensemble

Rows 1038 – 1317: 280-member Latin Hypercube Sample ensemble

Acknowledgments:

Please cite the following paper:

Uncertainty Analysis of Simulations of the Turn-of-the-Century Drought in the Western United States – Anderson, G. J., Lucas D. D. and Bonfils, C. (JGR – Atmospheres: in review). IM release number: LLNL-JRNL-739260.