**Attribution of Errors in the Simulation of Snowpack in E3SMv1 to Those in Winter Mean Temperature and Accumulated Precipitation over the Contiguous U.S.**

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Snow is an important feature of land in winter. It changes the surface energy balance by increasing surface albedos and insulating the ground from the atmosphere.  It also changes the surface water balance by storing water that is released later during snowmelt. Therefore, its representation in weather and climate models is crucial.  Recently, we developed the first gridded snow water equivalent (SWE) and snow depth dataset at 4-km resolution over the contiguous U.S. (CONUS) from 1981 to present derived from upscaling in situ snowpack measurements.  We use this dataset here to evaluate snowpack simulated by E3SMv1 in its AMIP-like ensemble as compared to the AMIP simulations in three other U.S. models (CESM2, GFDL-CM4, and GISS ModelE2.1). Mean biases and spatial variability of those biases in SWE, wintertime mean temperature (T), and wintertime accumulated precipitation (P) are highest in the Western CONUS.

SWE biases and errors in trends are attributed to T and P through multi-linear regressions of normalized errors and trend errors. T errors contribute the most to SWE errors throughout the CONUS, but P errors contribute more in the Western CONUS than in the regions to the east. Errors in T trends are more impactful than those in P trends at lower elevations < 1500 m in the Western CONUS, whereas P trend errors contribute more to errors in SWE trends than T trend errors at higher elevations ≥ 1500 m. Such results suggest that both errors in simulated T and P contribute to those of SWE, but land model parameterization errors likely also contribute to the misrepresentation of SWE and its trend. Notably, E3SMv1 and the other U.S. models smooth out the various mountain ranges of the Western CONUS; many of these still exist in the high resolution data used to generate the PRISM dataset when it is regridded to a 1 degree resolution comparable to E3SMv1, CESM2, and GFDL-CM4.