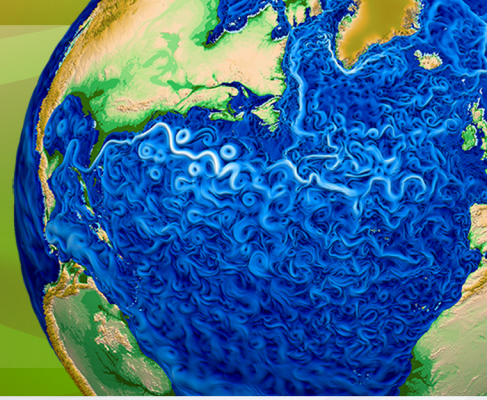
E3SM
Energy Exascale
Earth System Model



Water Cycle metrics

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Water Cycle metrics

- Topic 1: Water availability
  - Water availability is measured by the difference between precipitation and evapotranspiration (P – ET) over land. It is an important metric of the surface water balance that has direct relevance to water resources management and energy production and use. Potential changes in the total amount and timing of water availability in the future has significant implications for hydropower and thermoelectricity generation and crop production and challenges water resources management to meet the multiple objectives of water use in different river basins.
- Topic 2: Sea surface temperature
  - Sea surface temperature (SST) is an important metric of the coupled Earth system that results from interactions among atmosphere, ocean, sea ice, and land at a wide range of time scales. Precipitation over land is dominantly influenced by SST through teleconnection associated with different modes of variability such as ENSO, NAO, PDO and AMO. SST also influences atmospheric moisture transport and hence, precipitation recycling rate over land.

Topic 1: Water availability

Basin-scale water balance

$$\Delta S = P - ET - Q - D$$

change in storage
- soil moisture
- snowpack
- groundwater

precipitation

evapotranspiration

surface and sub-surface runoff

Water availability

$$P - ET = \Delta S + Q + D$$

Topic 1: Water availability

Metrics based on comparison with observations

- Precipitation
- P – ET or ET
- Storage (soil moisture, snowpack, ground)
- Runoff

$$P - ET = \Delta S + Q + D$$

For US, aggregate by USGS hydrological units (e.g. HUC2)

21 top-level 2-digit “regions”, 18 within CONUS. Could also aggregate by regions

- Western US
- Northern US
- Easter US
- Southern US