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[Climate system and Hydrology]

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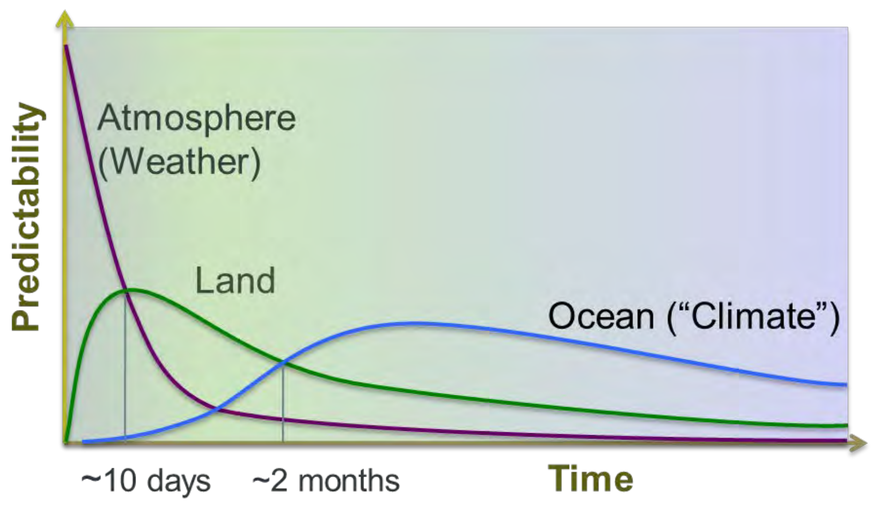
Land Processes and Feedback to Climate Forcing in Coupled Model Intercomparison Project Phase 6 (CMIP6)

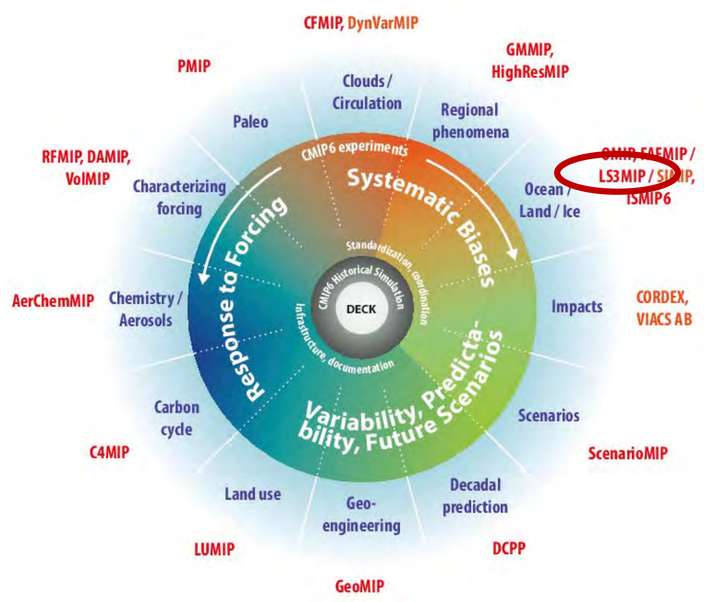
The Influence of Land Process on the Regional Climate

The solid and liquid water, notably snow and soil-moisture, stored at the land surface has a large influence on the regional climate. Land states (namely soil moisture, snow and vegetation) can provide predictability in the window between deterministic (weather) and climate (O-A) time scales.

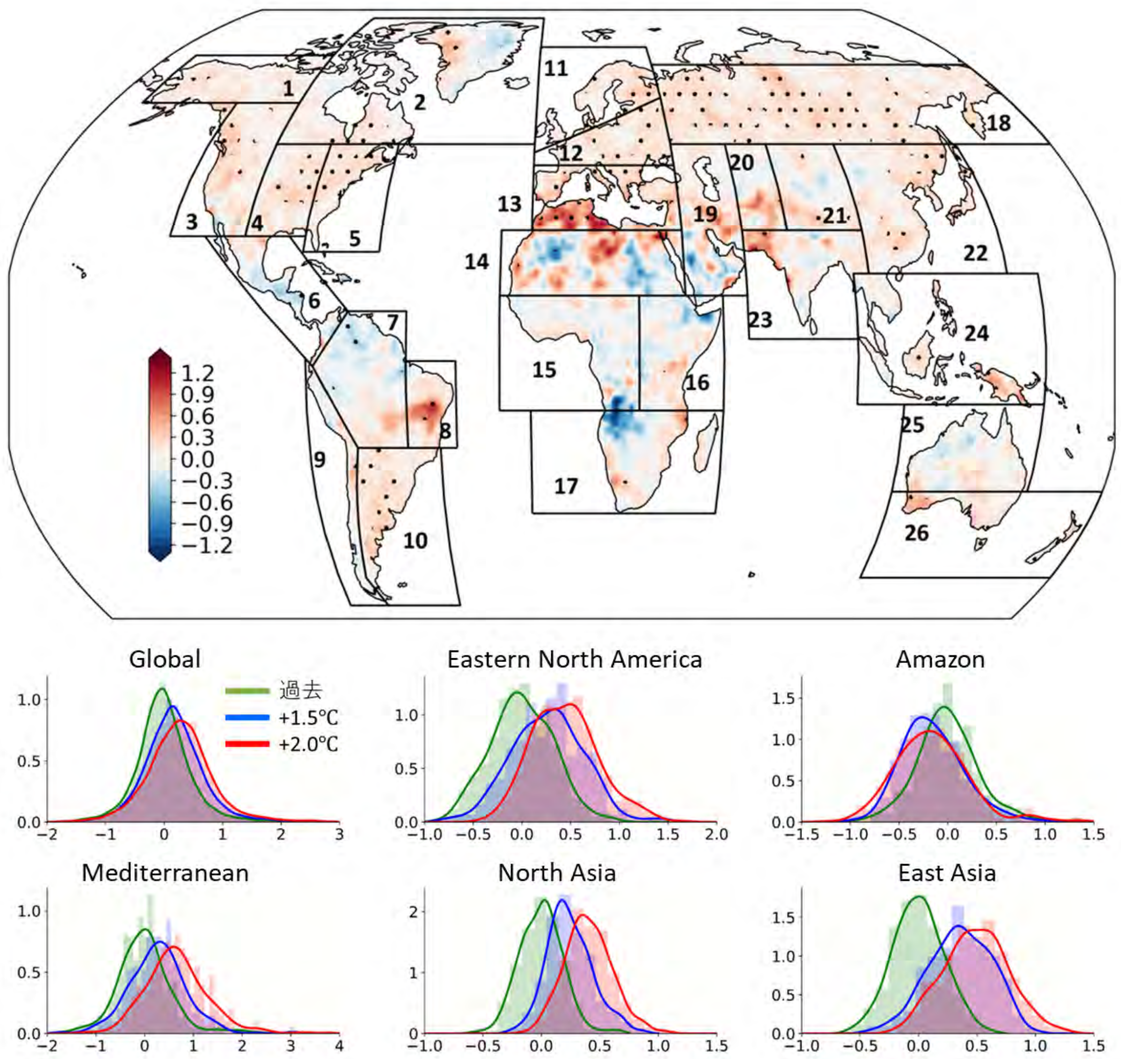


Contribution to the CMIP6

CMIP has coordinated climate model experiments since 1995, aiming to advance scientific understanding of the Earth system. CMIP model simulations have also been regularly assessed as part of the IPCC Climate Assessments Reports and various national assessments.
As the 6th phase of CMIP has started in 2016, the Land Surface, Snow and Soil-moisture Model Intercomparison Project (LS3MIP) was designed to provide a comprehensive assessment of land feedbacks on climate variability and climate change, and to diagnose systematic biases in the CMIP6 ESMs.



Global Warming, Disaster Risks and Paris Agreement



(Top) Changes (2.0℃ – 1.5℃ increase) of hydroclimatic intensity for extreme events
(Bottom) Changes of hydroclimatic intensity in extreme events for selected regions

The Paris agreement was adopted to hold the global average temperature increase to well below 2℃ and pursue efforts to limit it to 1.5℃. Here, we investigate the event-to-event hydroclimatic intensity, where an event is a pair of adjacent wet and dry spells, under future warming scenarios. According to a set of targeted multi-model large ensemble experiments, the results suggest that extreme dry and wet events will increasingly co-occur globally for an additional 0.5℃ warming beyond 1.5℃, such as the switch from extreme drought to severe flooding we saw in California and Japan in the recent past. The high damage potential of such drastic changes between flood and drought conditions poses a major challenge to adaptation. At least in terms of disaster mitigation and water security, there would be significant benefits to limiting global warming to 1.5℃ to dampen the intensification of flood and drought compound variability.