



## **Multi-year Predictability of Total Soil Water, Drought, and Wildfire over the Globe**

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Severe drought and increased chance in wildfire occurrence have significant impacts to a wide range of sectors such as agriculture, energy, food security, forestry, drinking water, and tourism. This study aims to assess multi-year predictability and prediction skill for total soil water, drought, and wildfire occurrence over the Globe using a multi-year dynamical prediction system based on the Community Earth System Model version 1.0.3 and to better understand sources of their predictability. We demonstrate that the dynamical prediction system has a high degree of skill in forecasting total soil water, drought, and wildfire probabilities up to 2~4-year lead time over many parts of the Globe including the southern part of North and South America, Central America, the northern part of South Africa, Maritime Continents, Europe and Asia. The important sources of multi-year predictability identified in the study include the Trans-basin variability (TBV) between the Atlantic and Pacific sea surface temperature (SST), the low-pass filtering characteristics of soils, and anthropogenic radiative forcing. In particular, the positive phase of TBV, characterized by the relatively warmer SST over the Atlantic than the Pacific, is favorable for less precipitation, less soil water, drought, and more wildfire occurrence over the southern part of North and South America, the northern part of South Africa and many parts of Europe and Asia. However, the opposite condition tends to prevail in Central America, the southern part of South Africa and the Maritime Continent. The multi-year predictability of drought and wildfire occurrence can be utilized for Humanitarian Crisis Management.