ABSTRACT

Predicting Hydrological Drought: Relative Contributions of Soil Moisture and Snow information to seasonal streamflow prediction skill

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In this study we examine how knowledge of mid-winter snow accumulation and soil moisture conditions contribute to our ability to predict streamflow months in advance. A first, "synthetic truth" analysis focuses on a series of numerical experiments with multiple sophisticated land surface models driven with a dataset of observations-based meteorological forcing spanning multiple decades and covering the continental United States. Snowpack information by itself obviously contributes to the skill attained in streamflow prediction, particularly in the mountainous west. The isolated contribution of soil moisture information, however, is found to be large and significant in many areas, particularly in the west but also in a region surrounding the Great Lakes. The results are supported by a supplemental, observations-based analysis using (naturalized) March-July streamflow measurements covering much of the western U.S. Additional forecast experiments using start dates that span the year indicate a strong seasonality in the skill contributions; soil moisture information, for example, contributes to skill at much longer leads for forecasts issued in winter than for those issued in summer.