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Robust multi-year predictability on continental scales

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New statistical techniques have been used to optimally diagnose forced and unforced predictable components of surface air temperature (SAT) and precipitation on continental scales. The unforced predictable components of SAT and precipitation are identified from pre-industrial control runs of CMIP3 multi-model data set in six individual continents. The leading unforced predictable components can be predicted in independent control runs with statistically significant skill for 3-6 years in SAT and 1-3 years in precipitation, depending on continent, using a linear regression model with global sea surface temperature (SST) as predictor. The leading unforced predictable components of SAT are related to ENSO and the persistence of SSTs near the continent itself. The only exception is Europe, which has no significant ENSO relation. The leading unforced predictable components of precipitation are significantly correlated with an ENSO-like SST pattern. No unforced predictability of land precipitation could be found in Europe. The externally forced components of continental SAT also are identified by maximizing the variance ratio in the 20th-century runs to the control runs. There is only one significant forced pattern of SAT in each continent. The largest amplitudes of these forced patterns concentrate in high latitudes. No significant forced pattern of continental precipitation could be identified on a multi-model basis. Although the forced and unforced patterns of SAT are identified in model simulations, they are not separable in observations, presumably because of the large similarity between them.