Fig.S1 Mean CHIRPS annual precipitation, temporal standard deviation and long term trends of non-seasonal CHIRPS precipitation.
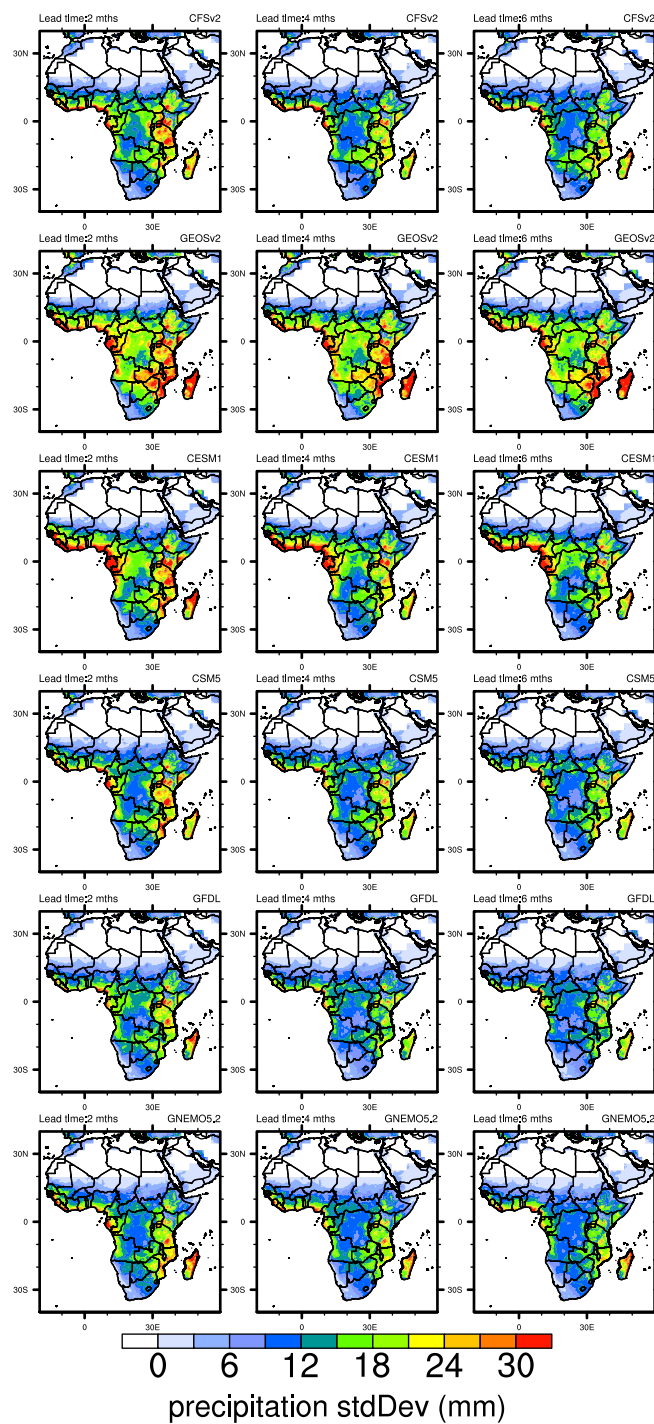
Fig.S2 Temporal standard deviation of non-seasonal NMMES precipitation at three lead times.
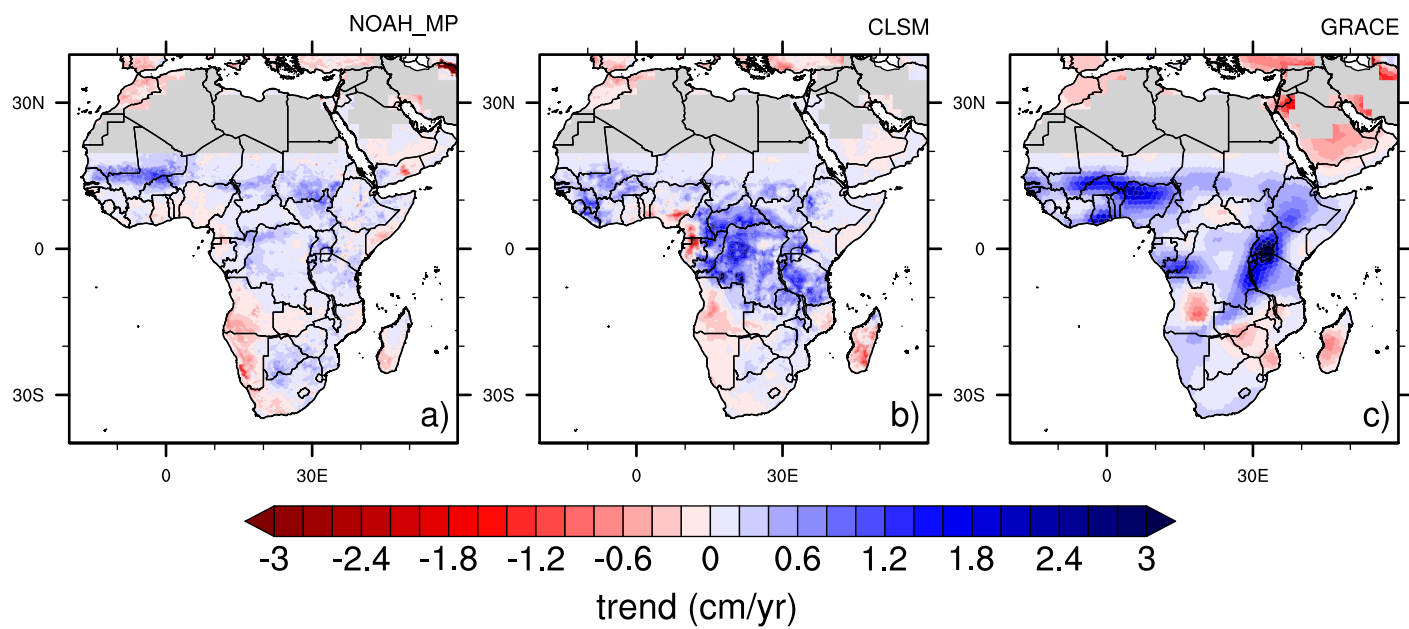
Fig.S3 Mann-Kendall trends in Noah-MP and CLSM reanalysis TWS and GRACE/FO observations.
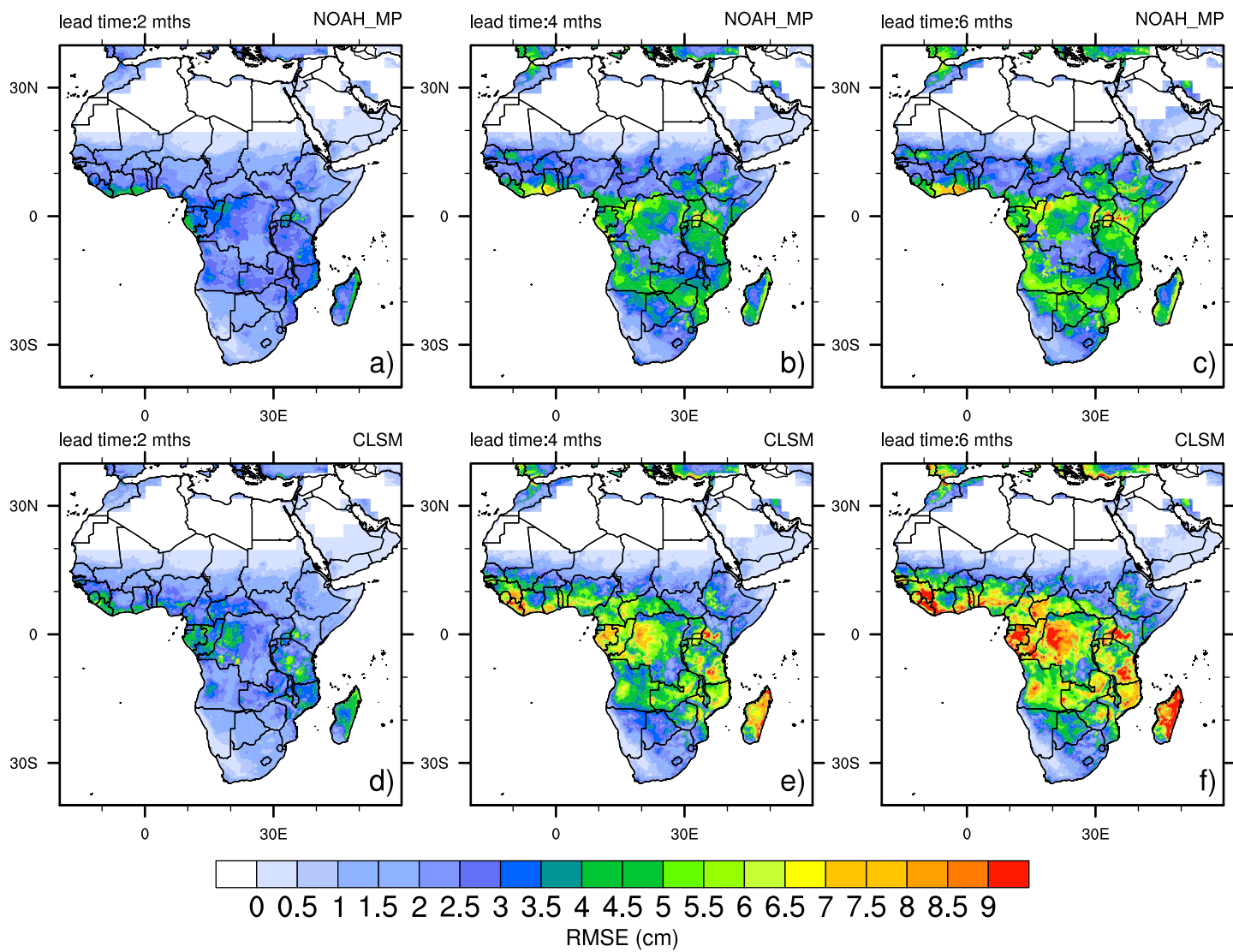
Fig.S4 RMSEs of non-seasonal ensemble mean TWS forecasts of all NMME models with respect to reanalysis TWS for Noah-MP (top row) and CLSM (bottom row) at three lead times.
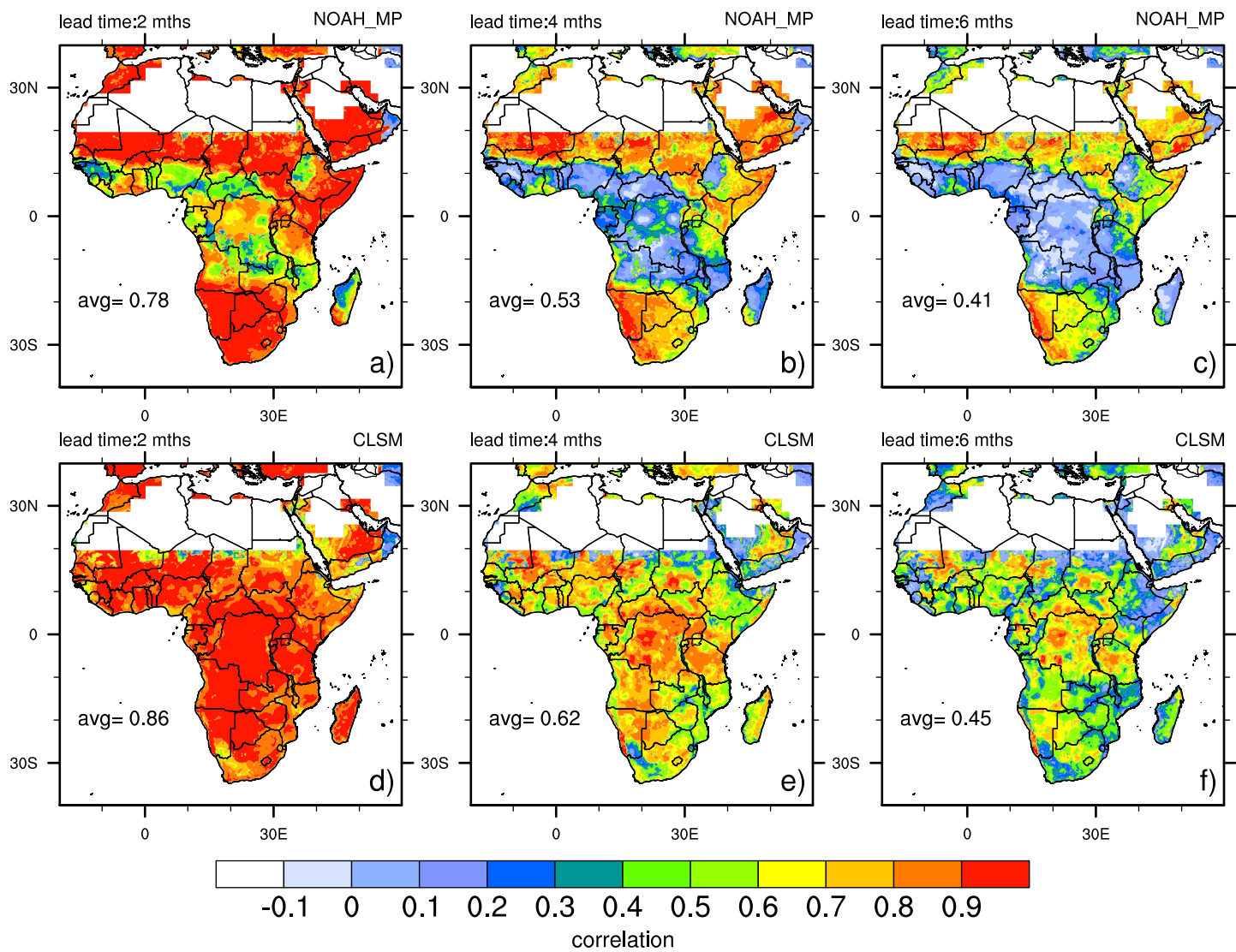
Fig. S5 Same as Fig.S4 but for correlations. Domain averaged correlations are provided in inset text.
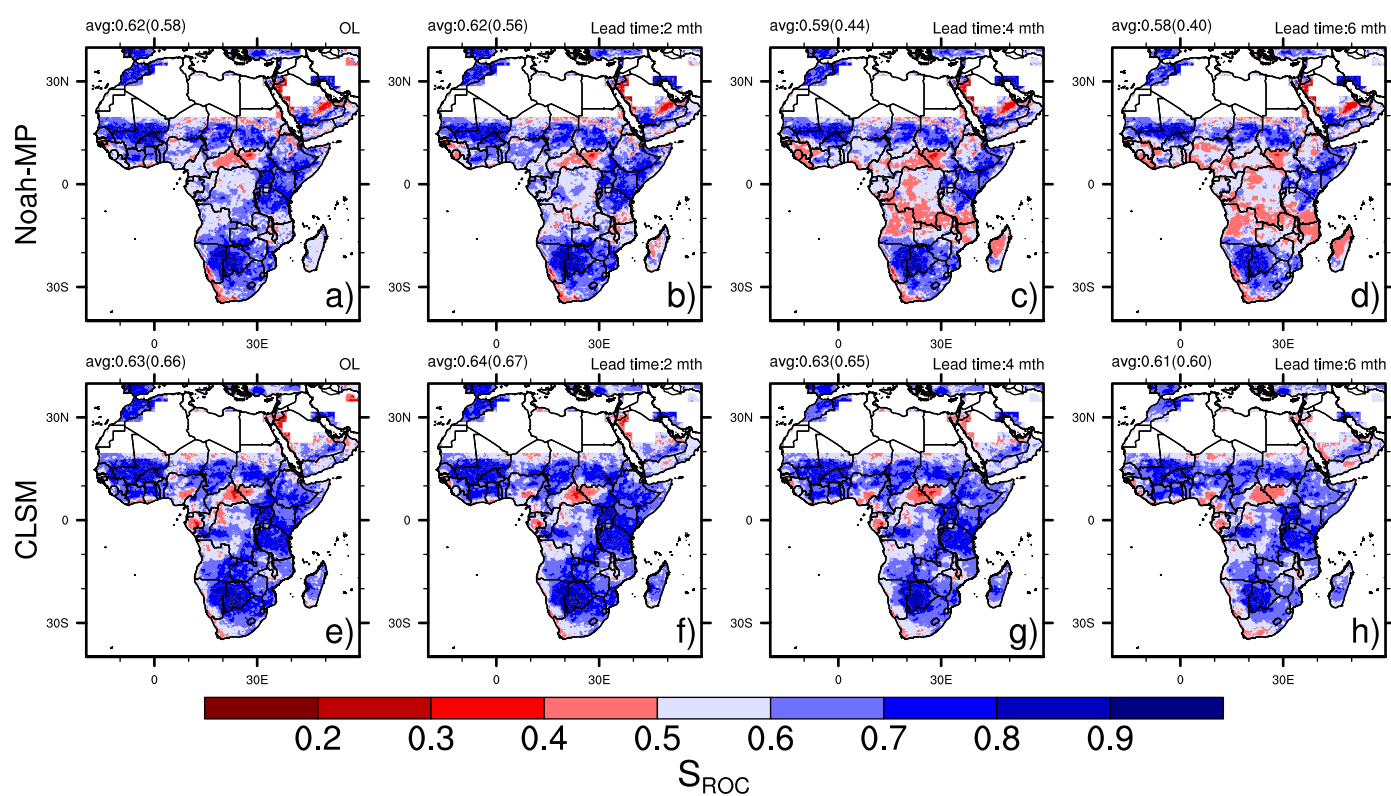
Fig.S6 Upper tercile ROC scores (S_{roc}) of ensemble mean TWS forecasts of all NMME models. Average ROC scores and the fraction of area with $S_{roc}>0.6$ are provided in the upper left text.

NMME Based TWS Forecasts, Initialized on January 01, 2016
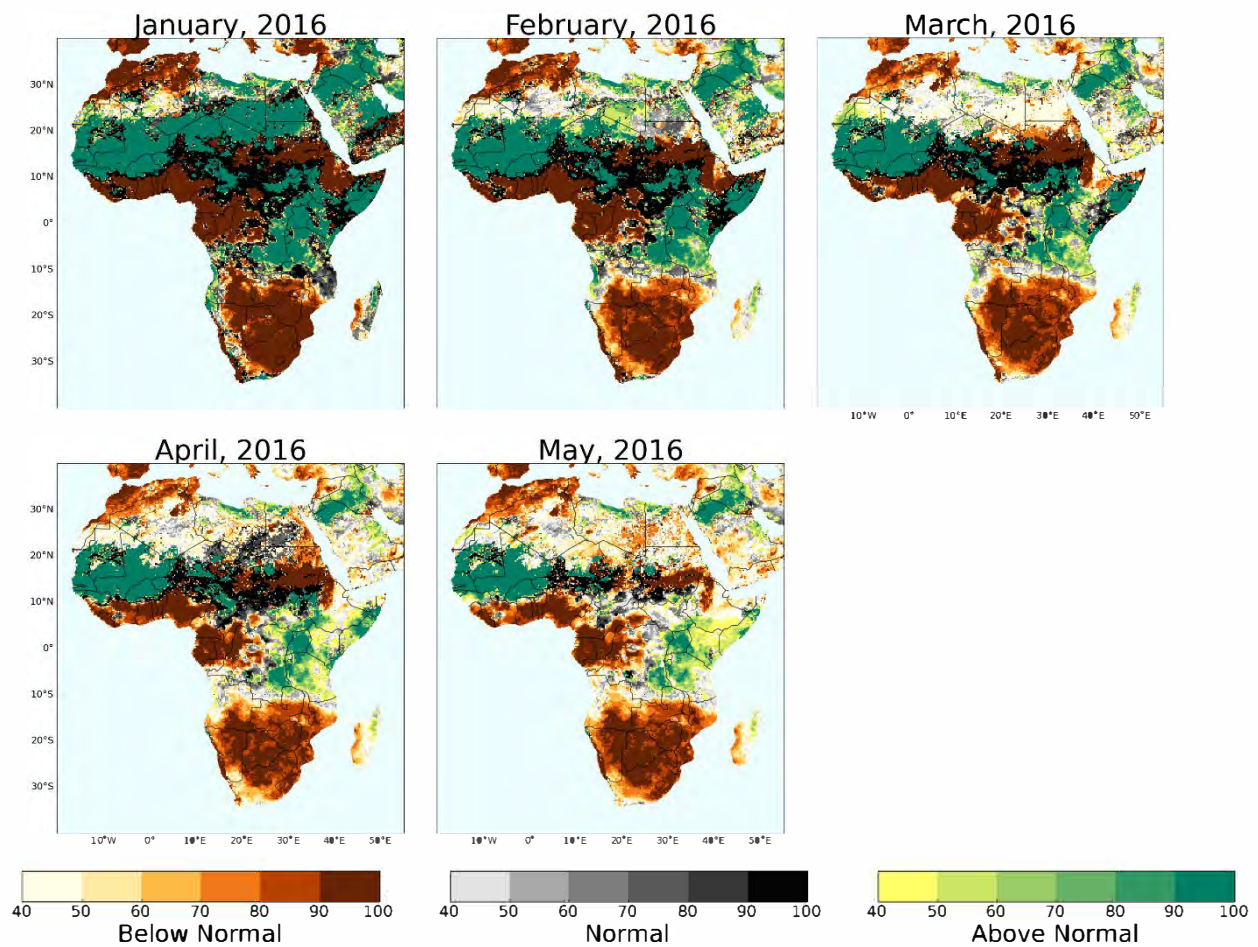
Fig.S7 Probability maps for CLSM tercile forecasts initialized in Dec. 2015.
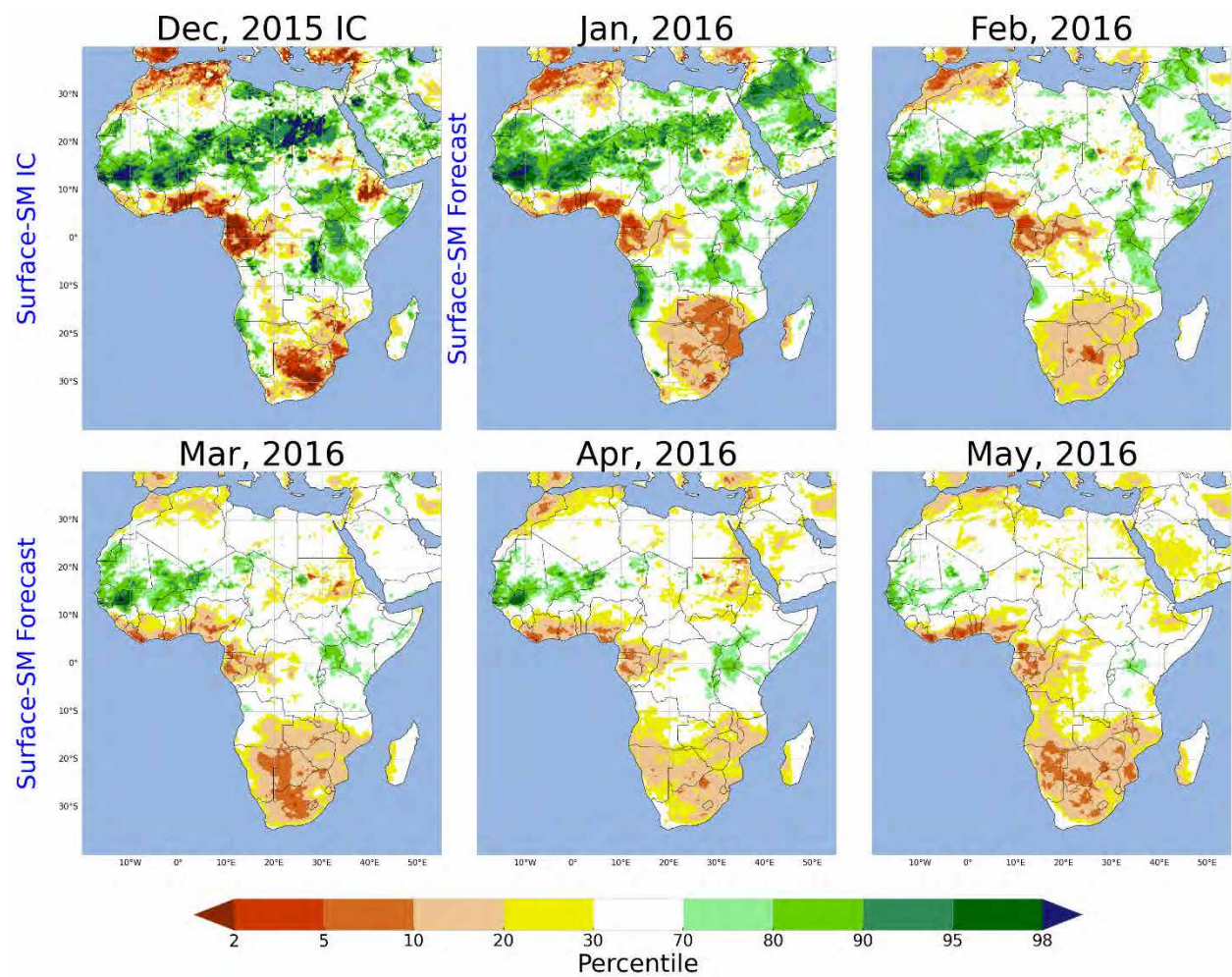
Fig.S8 Surface soil moisture percentile maps derived from CLSM forecasts initialized in Dec, 2015.
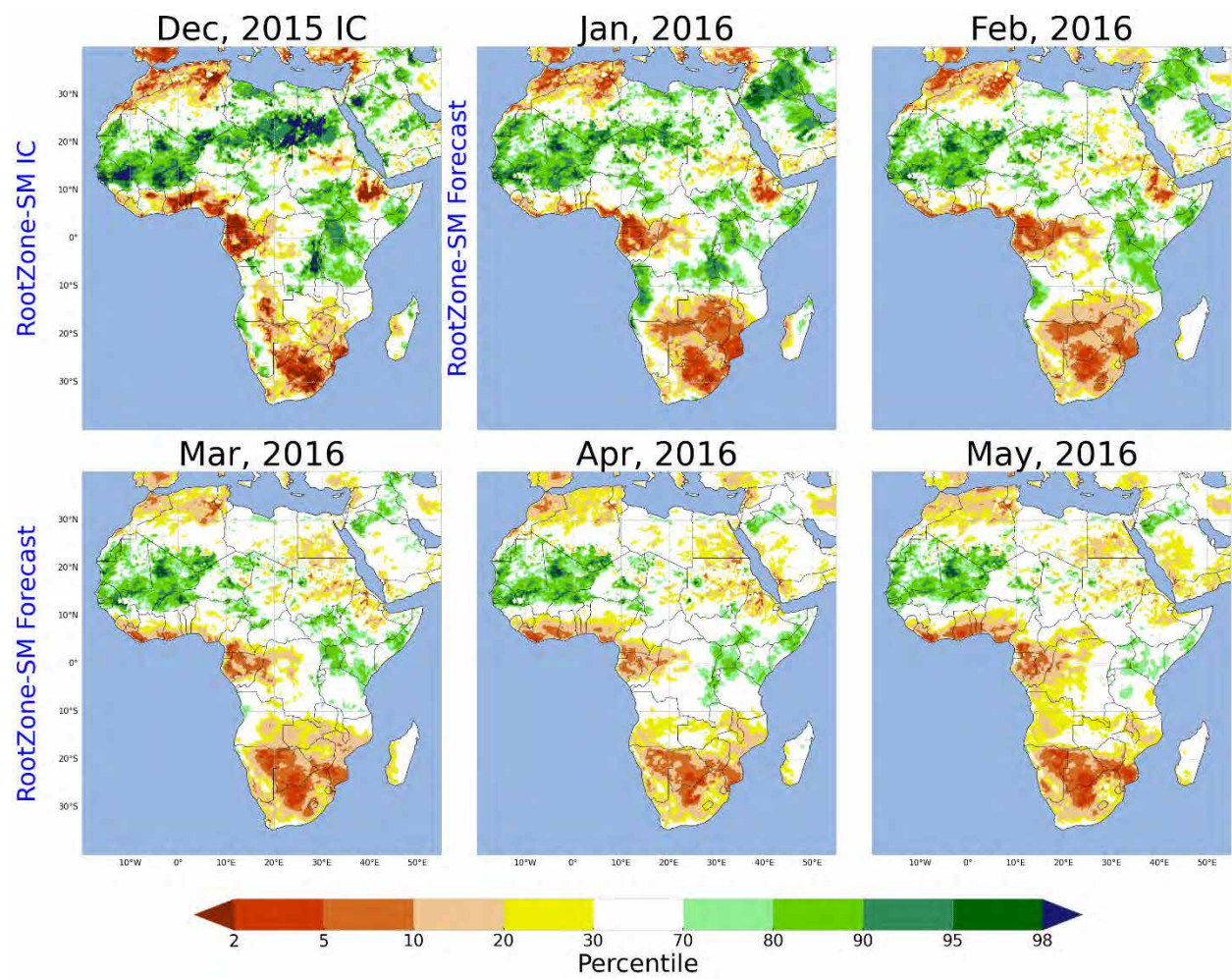
Fig.S9 Same as Fig.S8 but for root zone soil moisture.