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Spatial structure and potential predictability of summer precipitation in Ethiopia

S. Wild (1,2), J.M. Eden (1), M. Widmann (1), G.C. Leckebusch (1,2)

(1) School of Geography, Earth and Environmental Sciences, University of Birmingham, Birmingham, UK, (s.b.wild@bham.ac.uk), (2) Institute of Meteorology, Freie Universitaet Berlin, Berlin, Germany

Variations in sea surface temperature (SST) and atmospheric circulation on both regional and global scales substantially influence interannual variability of precipitation in Ethiopia and the surrounding countries. Previous studies have revealed links between ENSO and summer rainfall in East Africa. As this region has been frequently affected by severe droughts during the last few decades, most recently in 2011, improving understanding of these influences is crucial for developing prediction methods for seasonal precipitation variability.

More than half of the Ethiopian precipitation occurs during the Kiremt season (JJAS), which is therefore closely related to drought events. In the northwestern part the Kiremt rains are most prominent whereas the Belg precipitation (FMAM) is important for the southeastern part. We here objectively define homogenous rainfall regions in East Africa and analyse links between the rainfall in these regions with global SST.

PCA of the gridded GPCP dataset (1979-2010), which includes station records and satellite data, reveals a dipole structure with two precipitation regimes divided geographically by the Ethiopian Rift Valley. We will show the response of precipitation in these regions to changes in Pacific SST, using the HadSST2 dataset. First results of concurrent relationships between Ethiopian precipitation (for the total over the whole country and for the northwestern part) and SST are consistent with an ENSO signal with positive correlation in the north- and southwestern Pacific, as well as negative correlation in the central eastern Pacific. Further investigations will also include lagged correlations. These findings corroborate the results of previous studies but extend them by using cross-validated principal component multiple linear regression (PC-MLR) models to estimate NW-, SE- and total Ethiopian rainfall from Pacific SST. It has already been shown by Eden et al. (see Poster in Session CL3.3/NP5.4, EGU2012-10302) that spring variability of an individual precipitation record from Addis Ababa can be partly estimated from Pacific SST. Considering our findings in seasonal prediction models may improve drought forecasting across East Africa.