Sub-seasonal teleconnections between El Niño & East African long rains

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1) Motivation, Data & Method

Climate information beyond the upcoming season could be most valuable in East Africa where dry conditions have dramatically increased since 1999. This study aims at identifying recurrent weather types over a broad Indian Ocean (IO) region (Fig.1) through a k-means clustering of 1979-2013 MAM daily NOAA OLR (Liebman & Smith, 1996) and composite analyses of CHIRPS rainfall (Funk et al, 2014) & NCEP2 re-analyses (Kanamitsu et al, 2002).

2) IO convection regimes & East African long rains

The OLR clustering reveals 4 recurrent clusters (Fig.1) consisting of “wet” (1&2)/“dry” (3&4) regimes in regards to East African long rains (Fig.2), more frequent at the beginning/end of the season (Table 1). Increased regimes 3&4 frequencies (Fig.3) and regime 3 persistence (Table 1) since 1999 coincide with the abrupt long rains decline observed (Lyon, 2014).

3) Related atmospheric circulation & Pacific SSTS

A composite analysis of NCEP2 re-analyses (Fig.4) reveals,
- for wet regimes: low-level easterlies over the equatorial IO favoring moisture convergence over East Africa
- for dry regime 4: establishment of the Somali Jet feeding in the Indian monsoon to the disadvantage of East Africa

Daily OLR composites for the five largest El Niño/La Niña events of the last 30 years (Fig.5) exhibit strongest teleconnections with East African rainfall in April-May/May respectively. The pattern for El Niño resembles wet regime 1 which is most frequent in April (Table 1).

In terms of large-scale SSTS (Fig.6), one mode of variability is dominated by west-central Pacific SST gradients in the tropics (regime 1&3), another primarily controlled by off-equatorial Pacific SSTS (regimes 2&4). Increased regime 1 frequencies with warming in the west Pacific coupled with contrasted rainfall impacts between the west and central Pacific suggest that El Niño teleconnections with the long rains could be explained by this wet weather type.

4) Conclusions

Enhanced/reduced long rains are found to be associated with easterlies anomalies in the equatorial IO/the establishment of the Somali Jet. The recent drying coincides with more persistent/frequent dry regimes. El Niño teleconnections identified through one wet regime (most active in April) suggest rather wet conditions for the upcoming 2016 MAM season, illustrating the relevance of weather typing approaches for S2S predictability locally.