“Weather State transitions over East Africa and its implication for AEW Generation”

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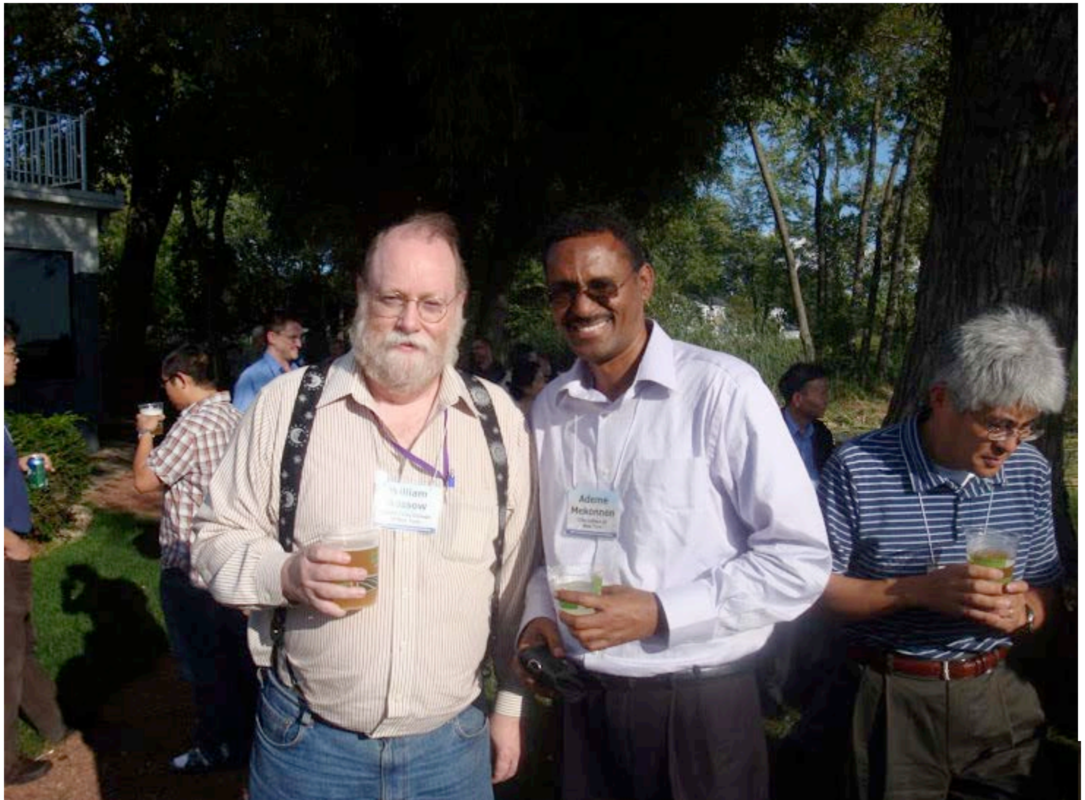
Ademe
Mekonnen


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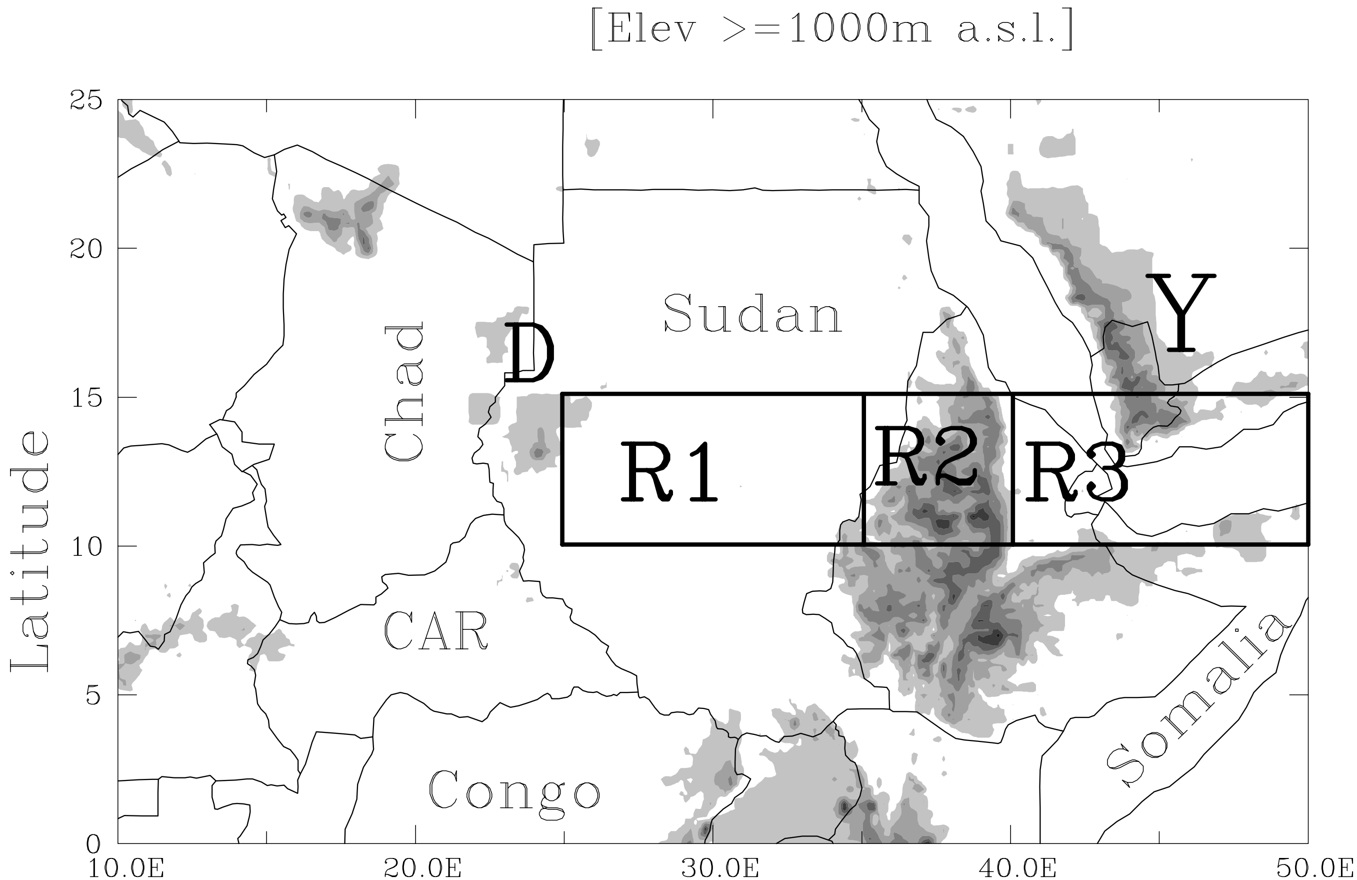
Objectives

- African easterly wave (AEW) initiation & convection
- The role of diurnal cycle
- Mechanisms that determine Weather State transition

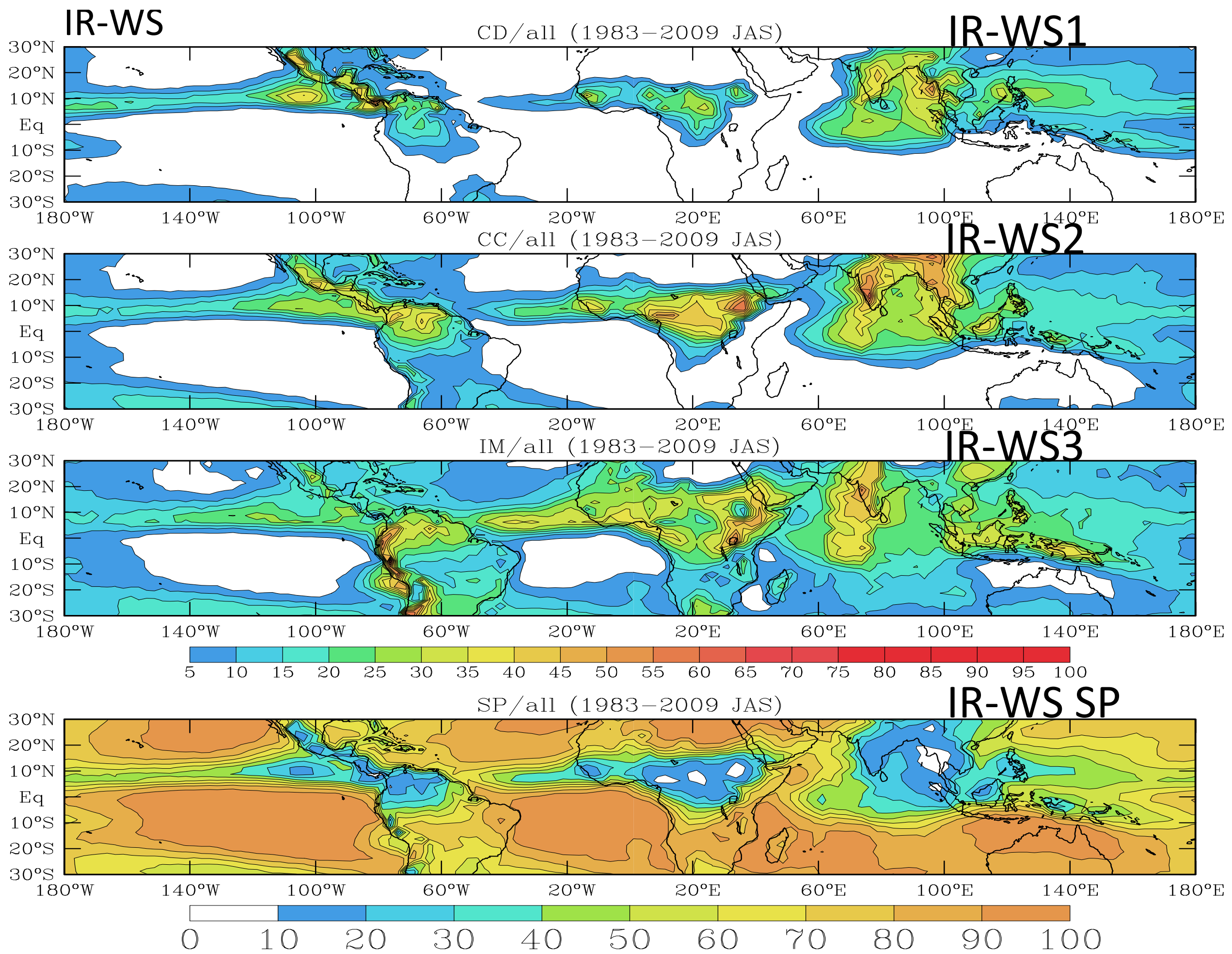


Locator map of Central and East Africa, elevation ≥ 1000 m. Boxes R1 (10°-15°N, 25°-35°E), R2 (10°-15°N, 35°-40°E; northern half of Ethiopian highlands), and R3 (10°-15°N, 40°-50°E) denote the study areas where transition in weather states (aka cloud regimes) appear to occur (Mekonnen and Rossow 2011; See text for details). The major highlands in the region are the Darfur Mountains (denoted by D; just north-west of R1), the Ethiopian highlands and the Yemen highlands (denoted by Y; north of R3).

Data: IR-WS, ERA-Interim, TRMM-3B42

Period of study: July-September, 1983-2008

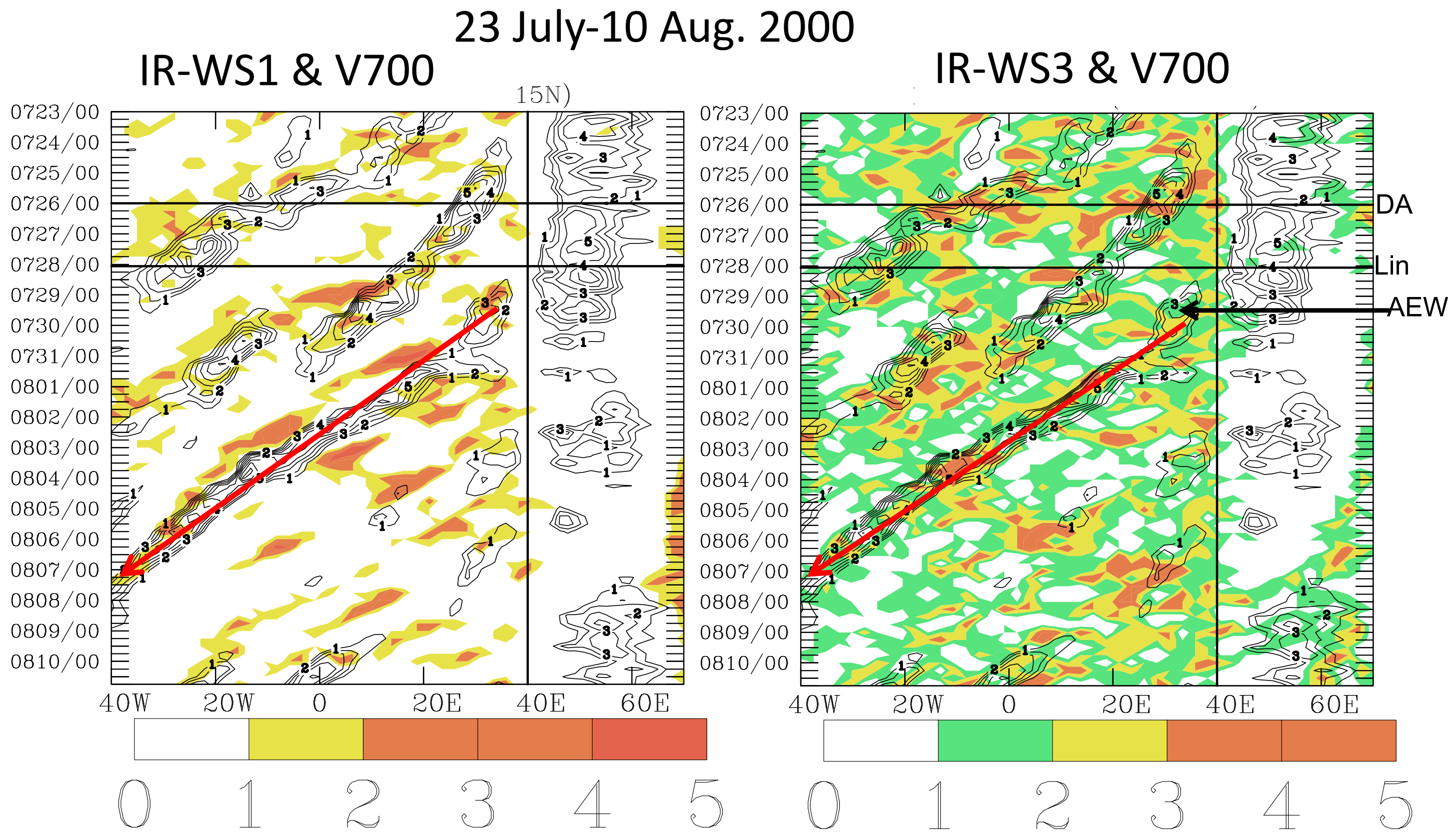
Results based on composites using lag-regressions and IR-WS dates



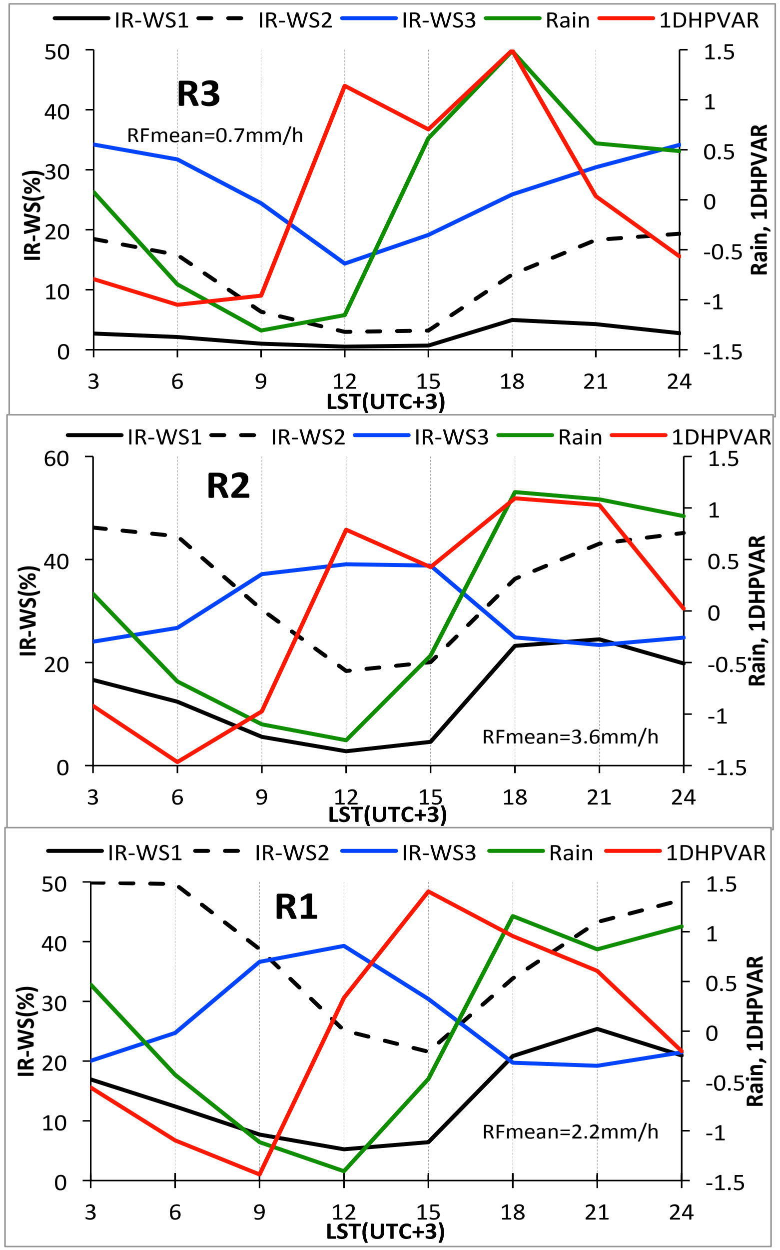
The geographic distribution of IR-WS averaged for July–September 1983-2009. Percentages are with respect to the total frequency of all cloud occurrences. The first three present different types of convectively active regimes, while the bottom panel presents suppressed regimes

Weather State transition

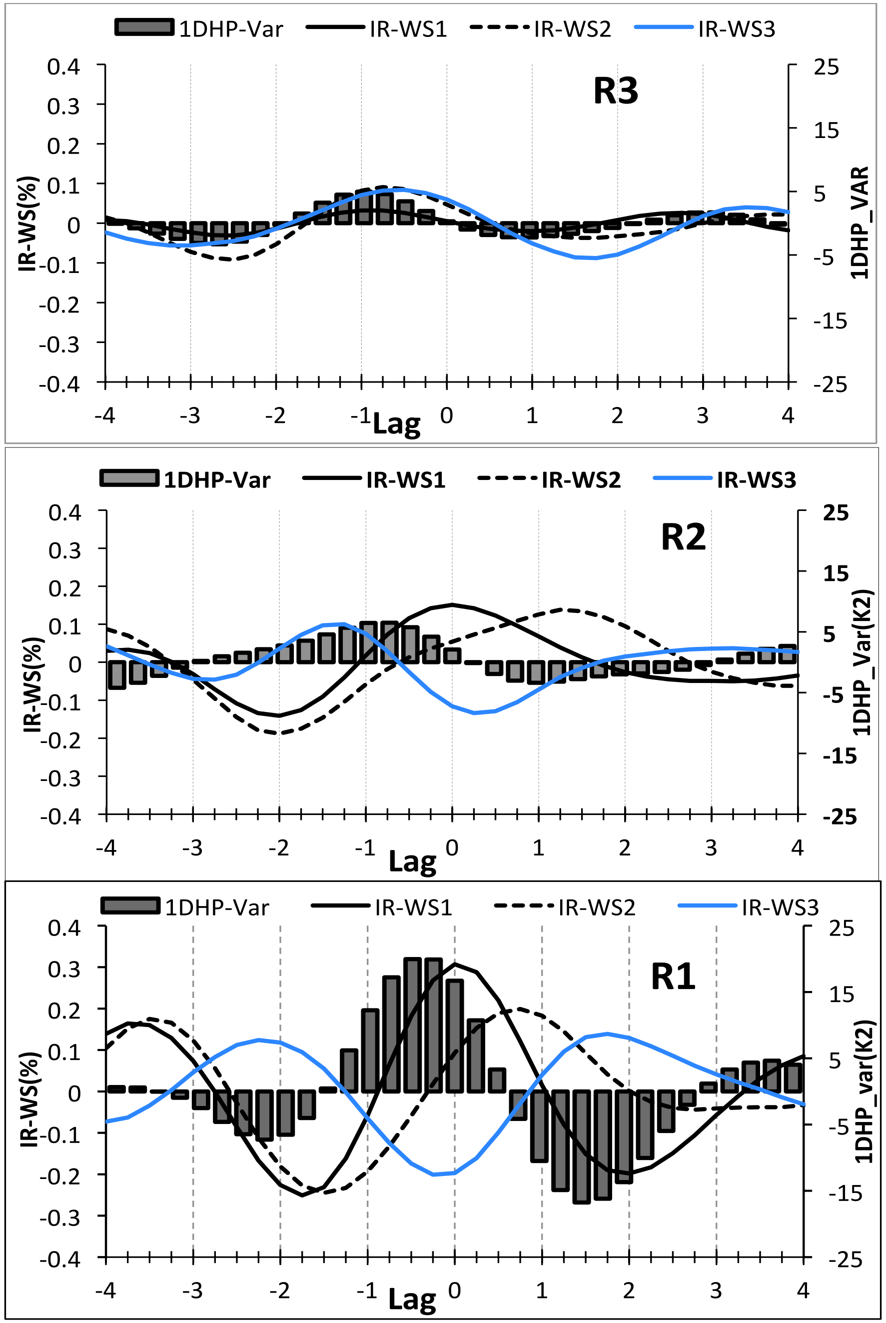
- WS3 transitions to WS1 (e.g. Mekonnen & Rossow, 2011; Tromeur and Rossow 2010)
- AEW initiation pathways
    i. WS3→WS1→AEWs
    ii. WS3→AEW→WS1



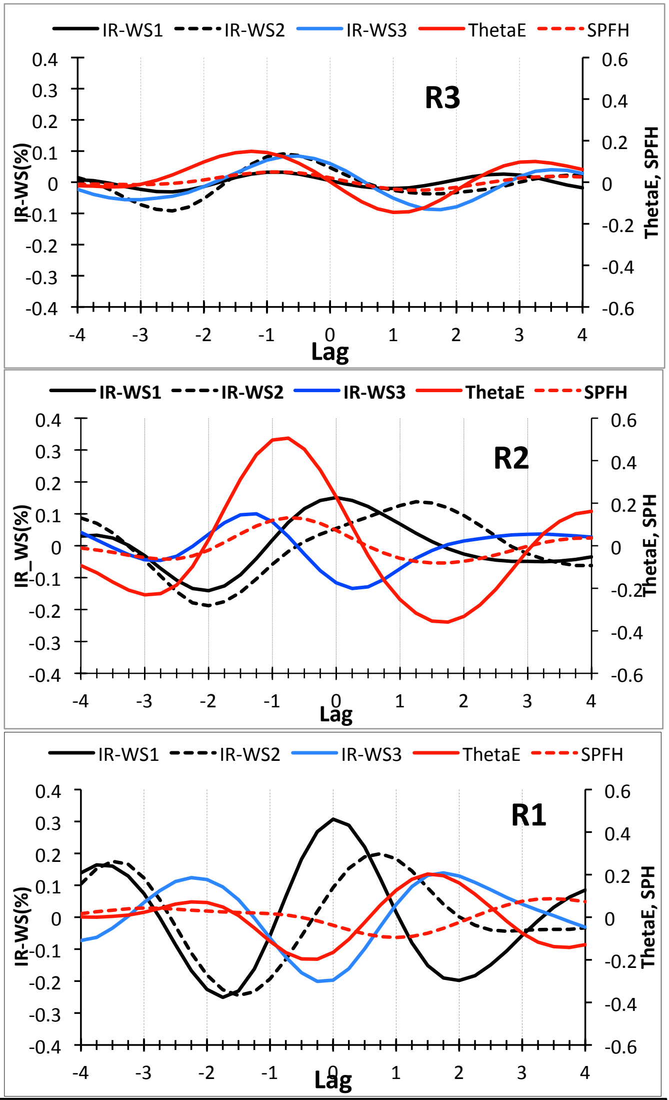
Frequency of occurrences of IR-WS1 (left) and IR-WS3 (right) and unfiltered 700-hPa meridional wind for 0Z 23 July – 18Z 10 August 2000 for the 5°-15°N latitudinal belt. WS1 and WS3 are counts ≥ 1 at 3-hr interval and shaded (in 4-grid points). Winds are averaged in latitude (southerly anomalies, contoured every 1m/s, are shown for clarity). Pre-Alberto AEW is identified by an arrow and labeled AEW. The horizontal lines at day 07/26/00 denote the Diaz and Aiyyer (2013) suggestion of an old AEW that triggers pre-Alberto AEW, while the line at 07/28/00 denote Lin et al. (2005)'s conclusions of initial MCS that triggers pre-Alberto AEW. The vertical line at 40°E delineates the eastern edge of Ethiopian mountains.



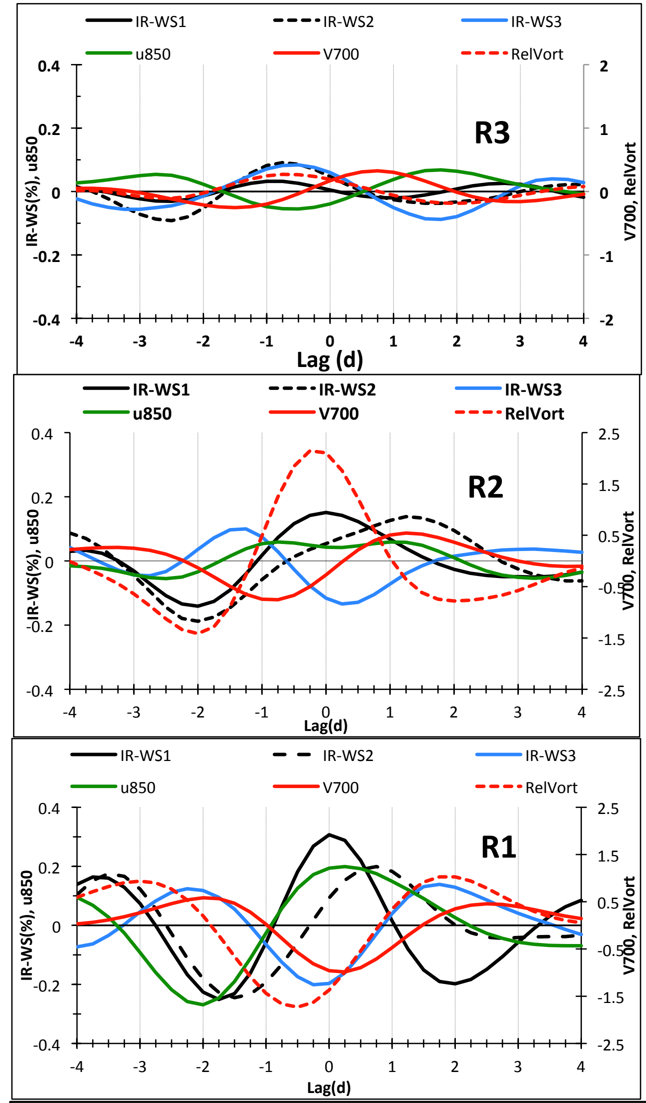
The mean diurnal evolution of different convective cloud regimes (IR-WS1-3), total rainfall and intradiurnal variance during July-September.



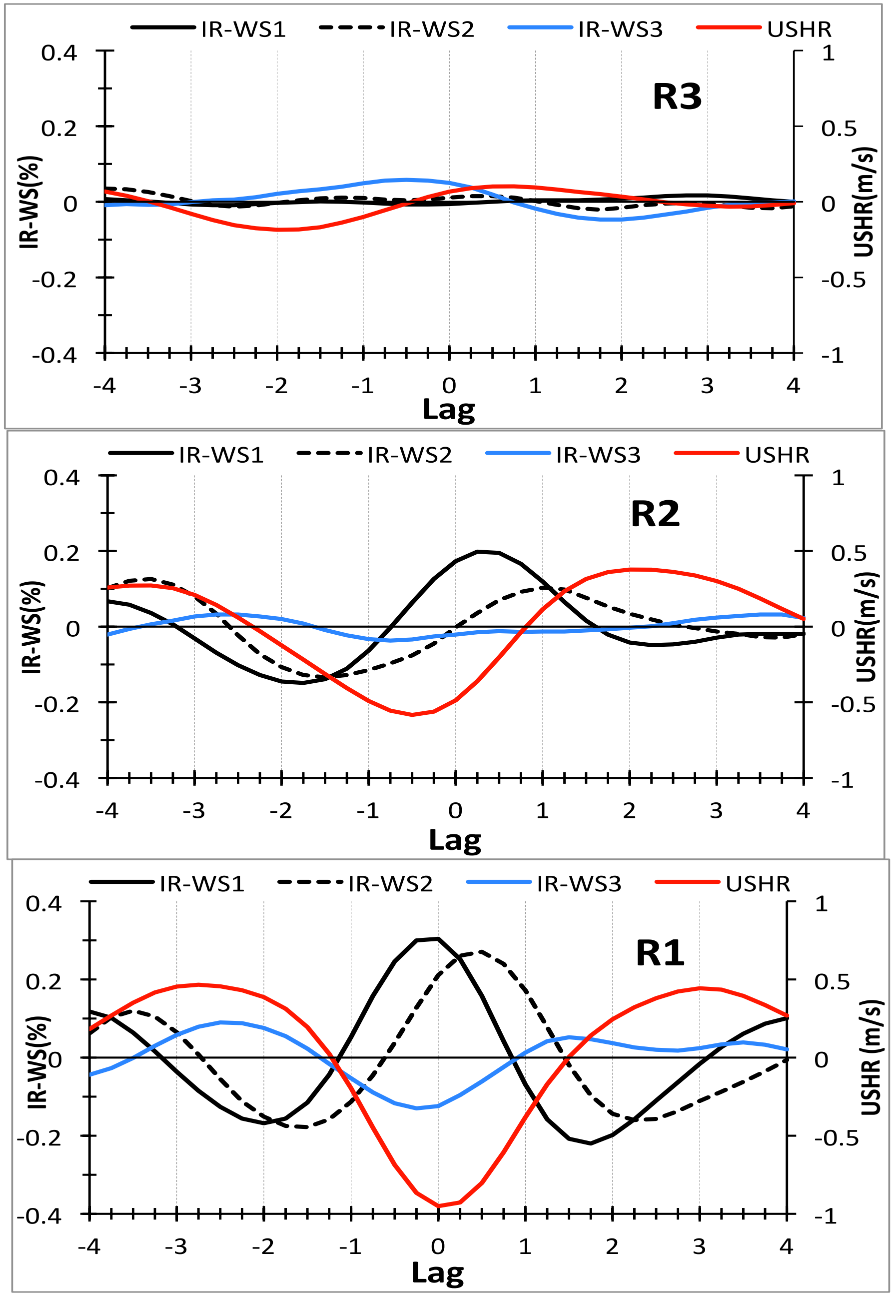
Composite anomalies of intradiurnal variance (1DHP-Var), IR-WS1, IR-WS2 and IR-WS3 over R1, R2 and R3.



Composite anomalies of IR-WS, Θ_E, Q



Composite anomalies of IR-Ws, u850, v700, and Relative vorticity



Composite anomalies of IR-WS and zonal wind shear (based on 2-10 day filtered 600-850hPa zonal shear at 12.5N, 32.5E.

Summary

- Thermodynamic process
  - IR-WS3↑, Θ & q↑ → IR-WS1
- Dynamic measures
  - Dominant: **IR-WS3→IR-WS1→AEW**