

TOWARDS IMPROVED NEAR-TERM FORECASTING FOR LAKE VICTORIA BASIN: CONVECTIVE DIURNAL CYCLE OVER THE LAKE

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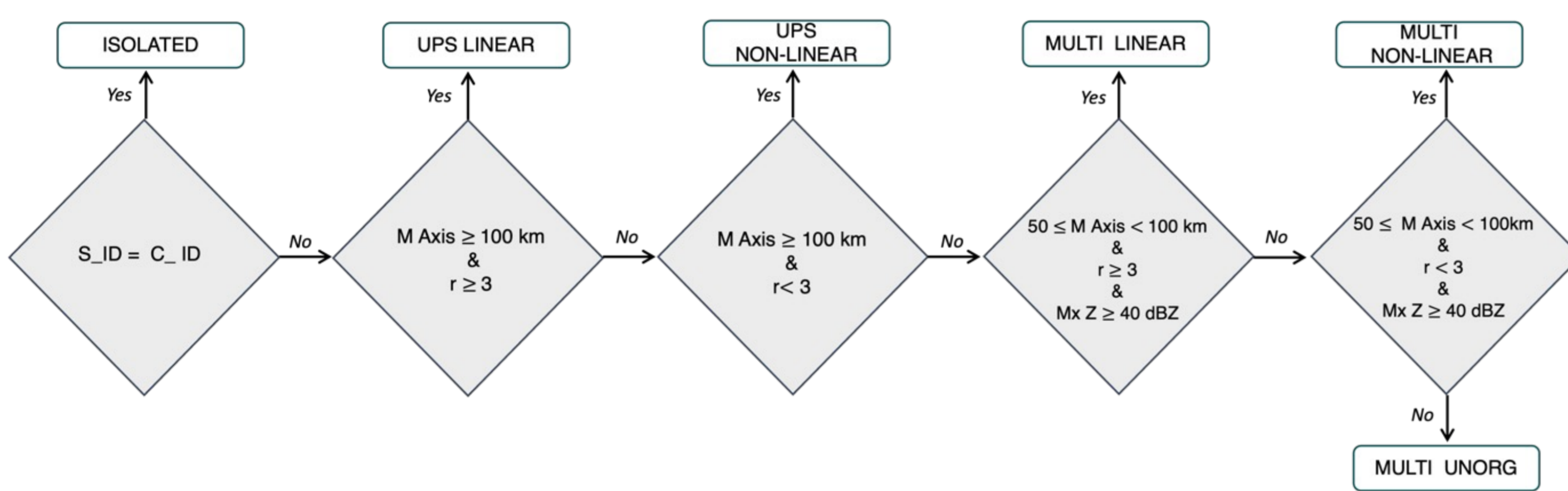
LAKE VICTORIA

Urgent need for the development and improvement of Early Warning Systems (EWS) around Lake Victoria Basin (LVB).

- Largest freshwater lake in Africa serving as one of the largest natural resources (fishing industry) for East African communities (~30 million people living on its coastline)
- Global hotspot for severe thunderstorm activity: ~1,000 fishermen die annually due to severe weather-related accidents
- Climate projections show increasing societal exposure to natural hazards + future thunderstorm intensification over the lake.

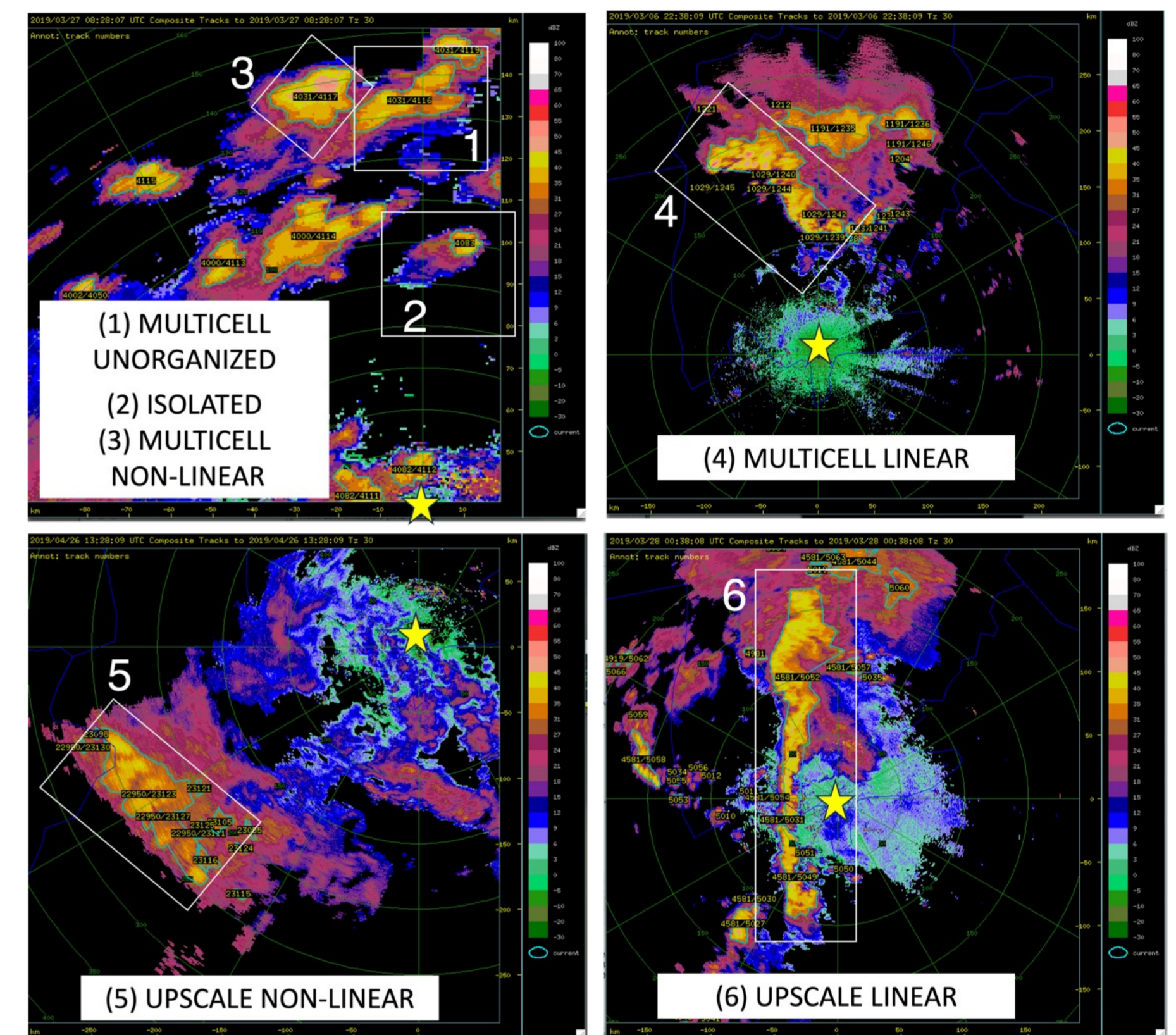


METHODS



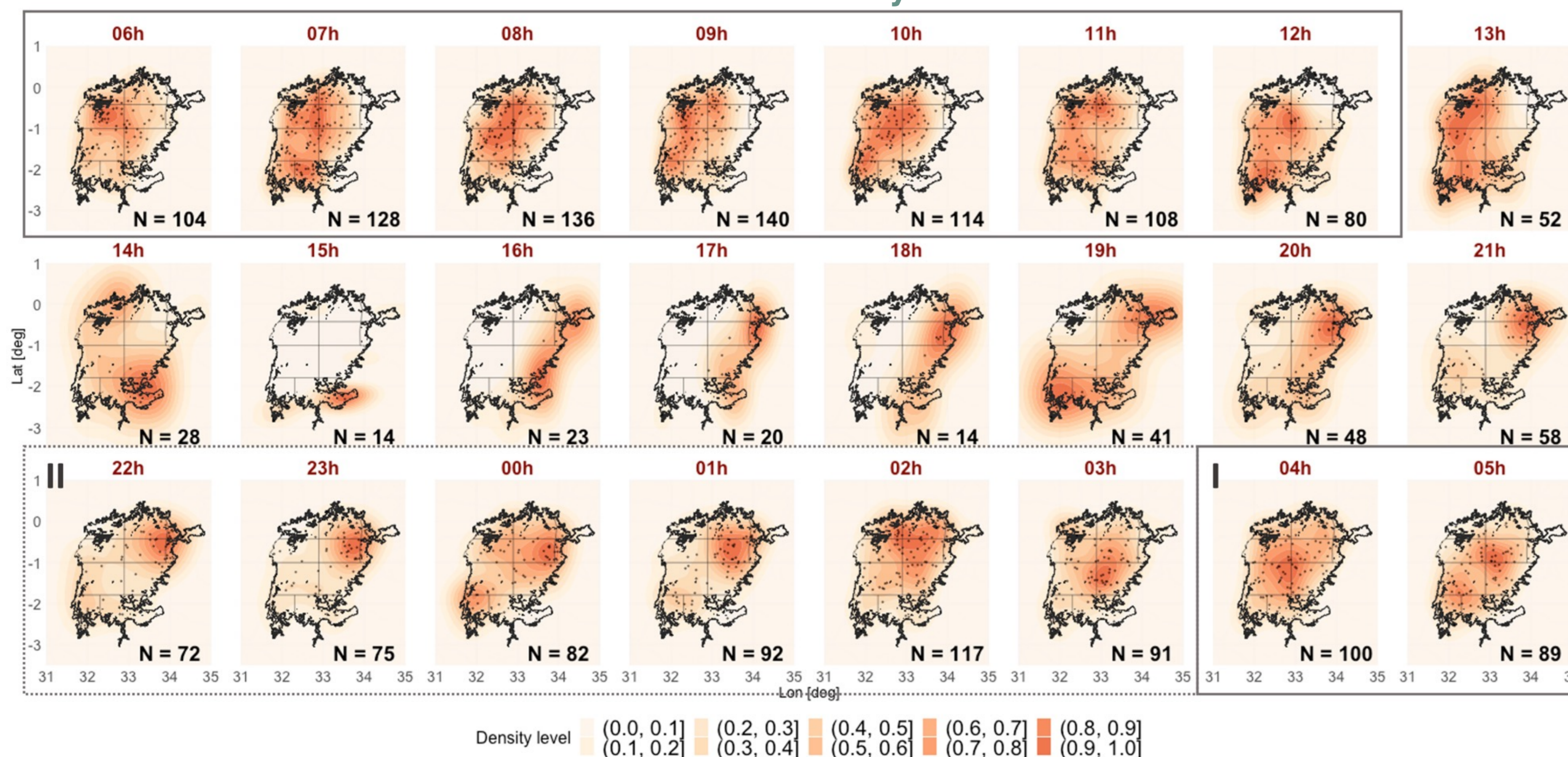
Convective mode classification

- **Source data:** S-band polarimetric radar in Mwanza (TZ, south shore of the Lake)
- **Storm identification and tracking:** TITAN algorithm (Dixon and Wiener 1998)
- **Analysis stratification:**
 - Time of the day: Morning (M) / Afternoon (A) / Night before midnight (NBM) / Night after midnight (NaM)
 - Duration of the system
 - First analysis for two wet seasons (March-May and October-December 2019)



RESULTS

Convective diurnal cycle



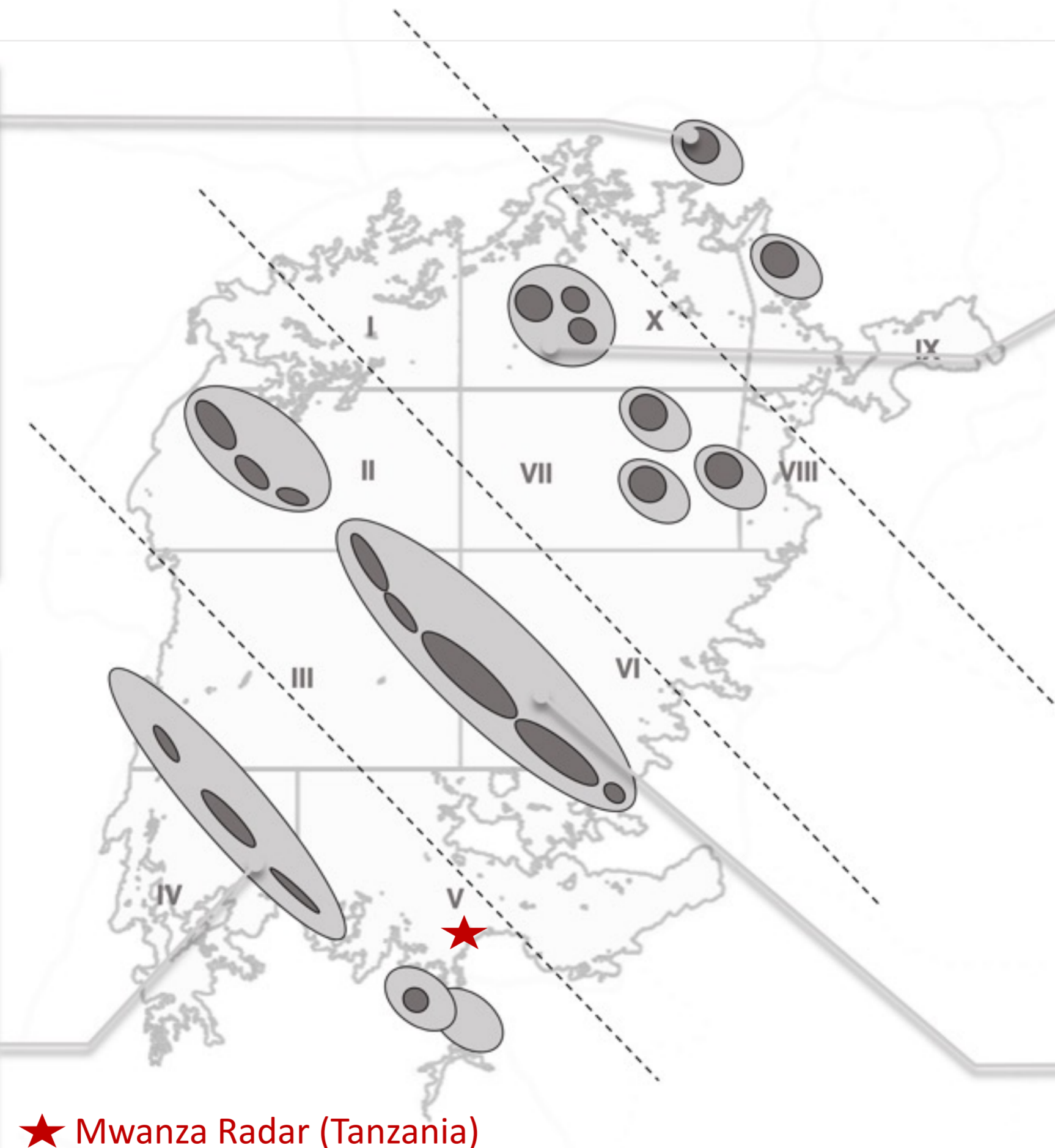
Hourly spatial distribution for the isolated category: black points represent the cell centroid, red shades represent the 2D density heatmap associated with the centroid location (normalized to 1) and computed with a kernel density estimation (KDE), and N represents the total amount of centroids. I (solid line box) and II (dashed line box), highlight the period with the two frequency maximums.

AFTERNOON – 12.00 -17.59 LT

- Minimal: Isolated
- Sectors: mostly eastern but all LV
- Kenya, Tanzania, and Uganda (minimal)
- Max Z: 40-45 dBZ
- HTOP: 5-10 km
- Propagation direction: West

MORNING – 06.00 -11.59 LT

- Upscale convection and dissipation
- Sectors: III, IV, V
- Uganda and Tanzania
- Max Z: 50-55 dBZ
- HTOP: 10-15 km
- Propagation direction: South/Southwest/West



NIGHT BEFORE

MIDNIGHT – 18.00-23.59 LT

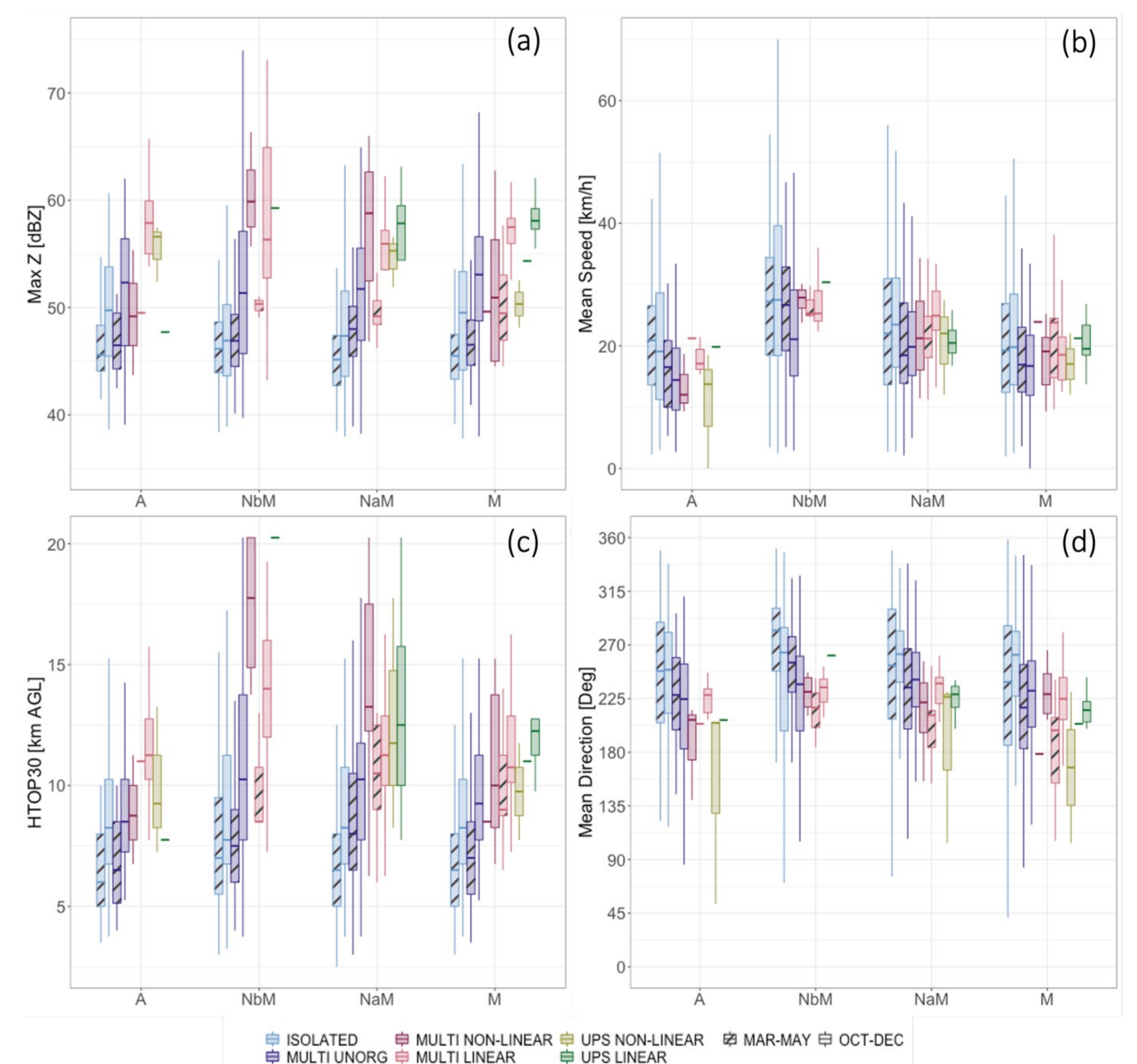
- Established convection (isolated and unorganized)
- Sectors: VII, VIII, IX, X
- Kenya, Uganda and Tanzania
- Max Z: 45- 50 dBZ
- HTOP: ~10 km
- Propagation direction: West

NIGHT AFTER

MIDNIGHT – 00.00-05.59 LT

- Organized convection and Upscale (especially linear)
- Sectors: I, II, III, VI, VII, X
- Uganda and Tanzania
- Max Z: 55-60 dBZ
- HTOP: > 15km
- Propagation direction: South/Southwest/West

Radar-based attributes for convective modes



- The diurnal convective cycle in Lake Victoria: afternoon (1200-1759 LT), night before midnight (1800-2359 LT), night after midnight (0000-0559 LT), and morning (0600-1159 LT).
- Convective **maximum activity occurs at nighttime (NBM and NaM)**, when organized and occasionally upscale systems, with greater intensities, propagation velocities, and vertical development, take place in the central lake sectors.
- **Upscale systems:** pose a **major risk for fishermen** because they occur in open waters and during darkness: hazardous weather conditions are likely more difficult to observe and rescue response time might be longer than in the daytime.
- **Linear organized and upscale modes:** might produce **threatening convective straight-line winds and heavy precipitation.**
- **Morning inherent risks:** especially for the **community along the south and west shore of the lake**, including **women drying out the fish on the shore** because major storms propagate in that direction before dissipating inland.



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