

Life cycle assessment of easterly wave disturbances on tropical south Atlantic and their impact over northeast Brazil

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Partner Institutions



INTRODUCTION AND OBJECTIVE

- Easterly Wave Disturbances (EWDs) are a major source of synoptic-scale rainfall variability throughout east coast of northeast Brazil (ENEB). Advances in the EWDs studies allowed a better understanding and identification in their life cycle on the tropical South Atlantic (TSA).
- Goal:** To present a 21-yr EWD climatology over the TSA based on the period 1989–2009, including a description of the life cycle and interannual variability of EWD activity. Additionally, we will present the synoptic-scale and dynamic characteristics associated with them for the rainy season, as well as tracking statistics.

DATA AND METHODS

Data

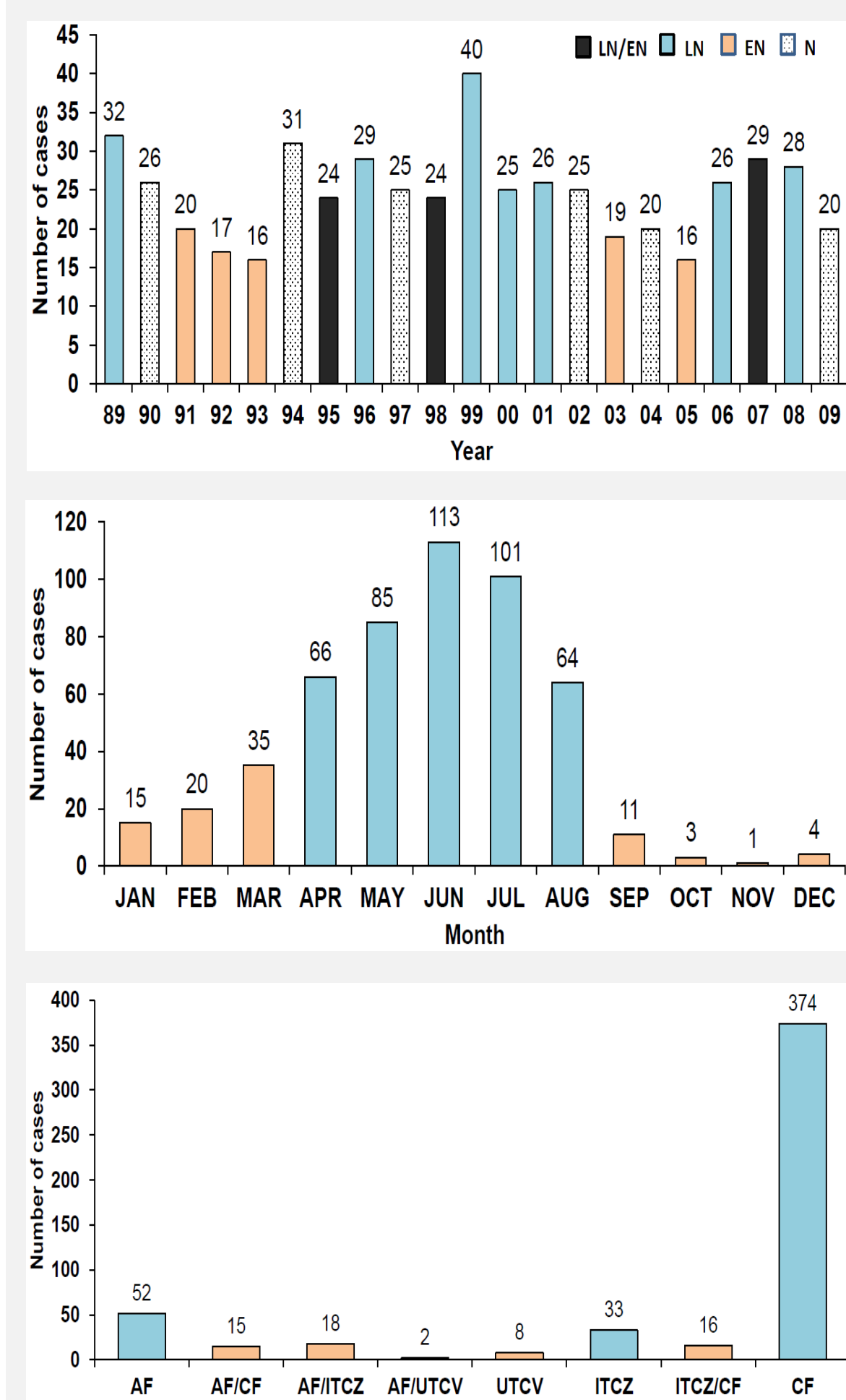
- Study period: **1989-2009**
- Dataset: ERA-I reanalysis
- Atmospheric fields: precipitation, horizontal wind, relative vorticity, divergence and vertical motion (omega)
- Levels: 1000, 925, 850, 700, 600, 500 and 200 hPa
- Satellite images: Meteosat 7 - with a 3 hours' temporal resolution in the visible, water vapor and infrared channels

Methods

- Observed EWDs cases: First, were detected based on satellite images. Afterward, we selected the potential EWDs events and analyzed relative vorticity and streamlines fields to find typical EWDs circulation patterns.
- Composite anomaly: The average synoptic-scale and dynamical environments of EWD development were generated based on the rainy (April-August) season in ENEB.
- Track statistics: Are estimated using the an automated tracking scheme.

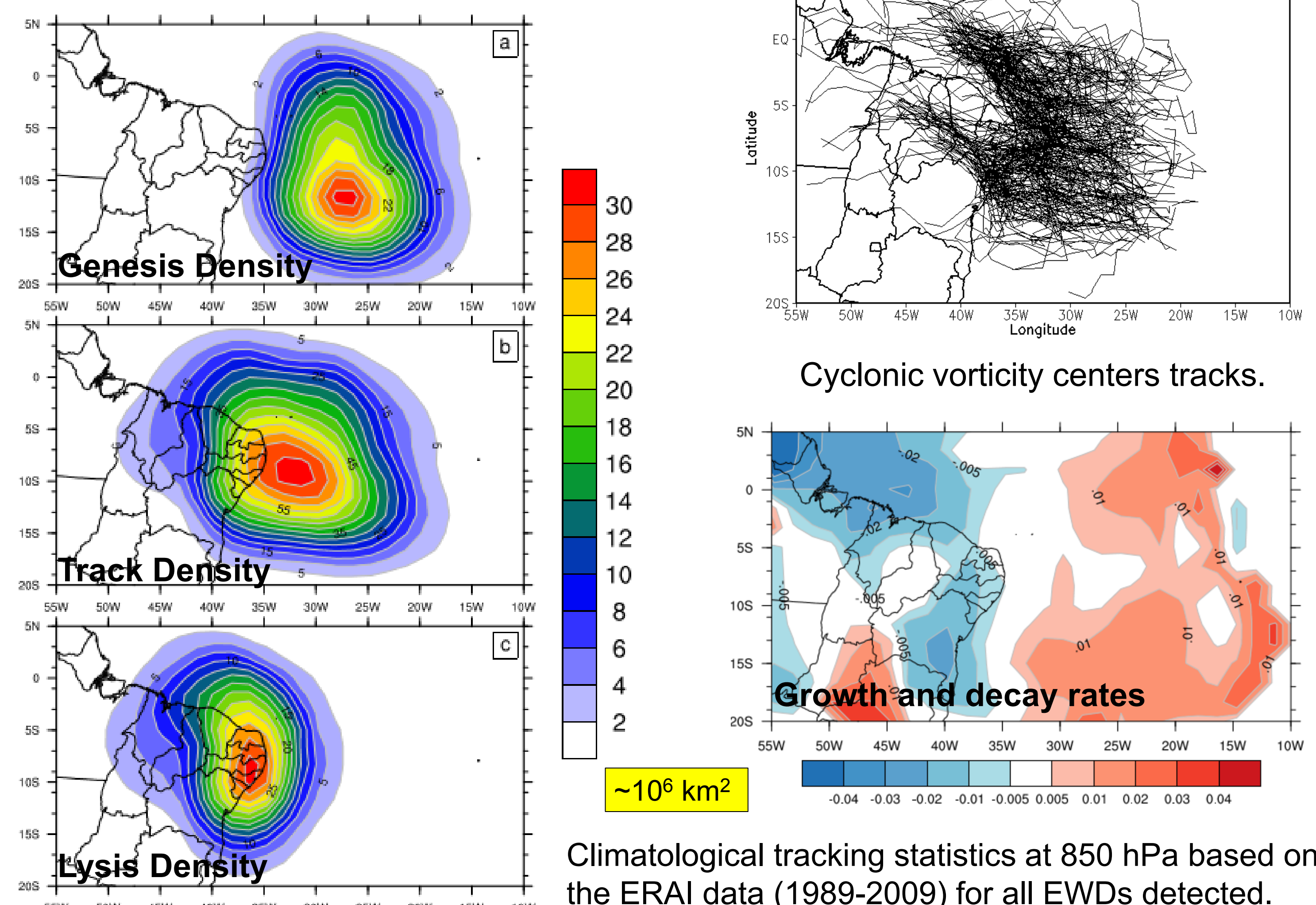
EASTERLY WAVE DISTURBANCES

Climatological Characteristics

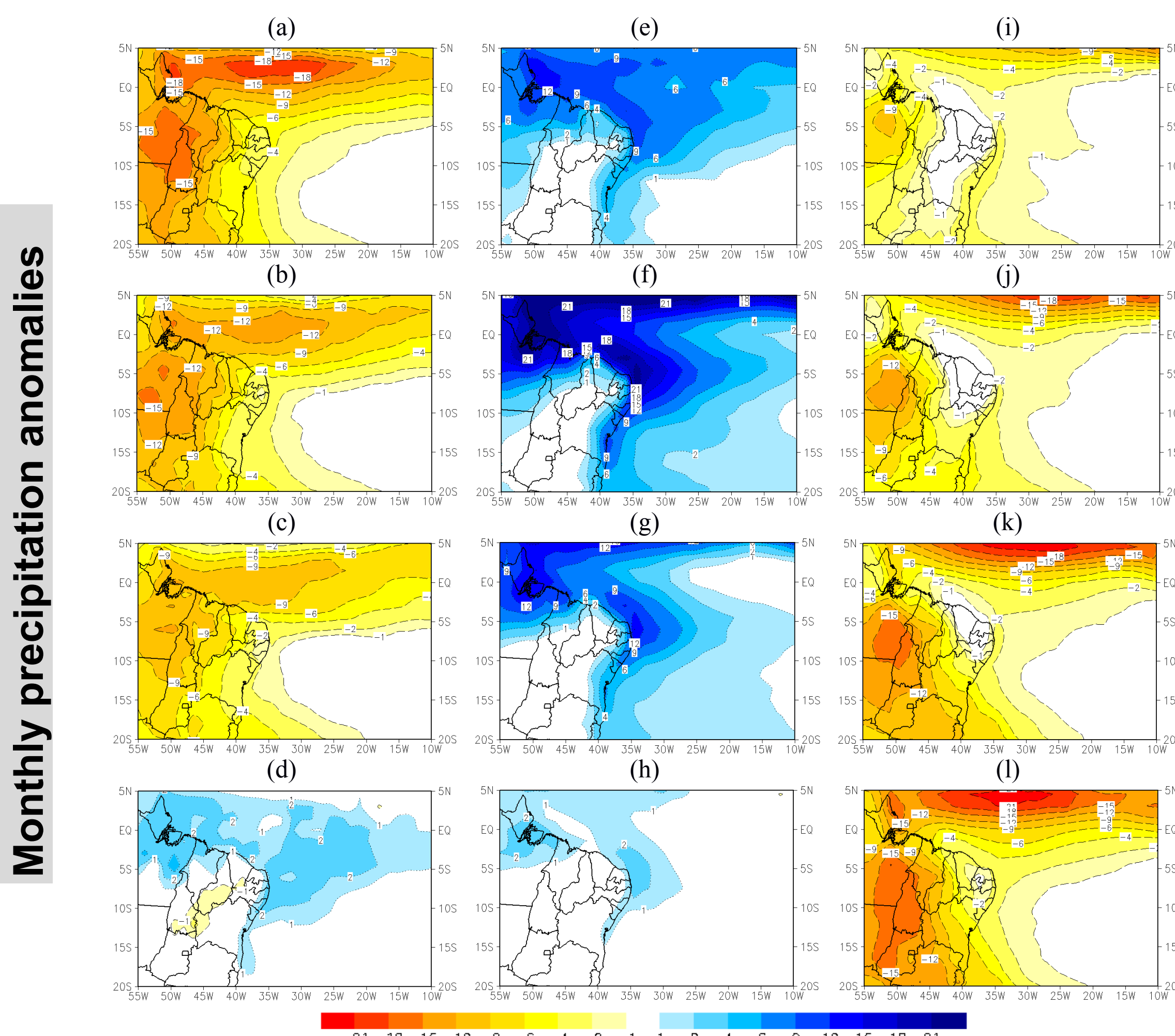


- 518 EWDs cases** over 21 years (1989-2009) were identified.
- with interannual variability of around **16-40 EWDs** with average lifetimes of **4-6 days**.
- 504 (97%)** reached the ENEB at some point in their evolution.
- 330 (64%)** systems were found to be associated with convection.
- 70 (14%)** crossed the NEB region and reached the Amazon region.
- A higher occurrence is observed between **April and August** (429 cases; rainy season) compared to the other months (89 cases; dry season).

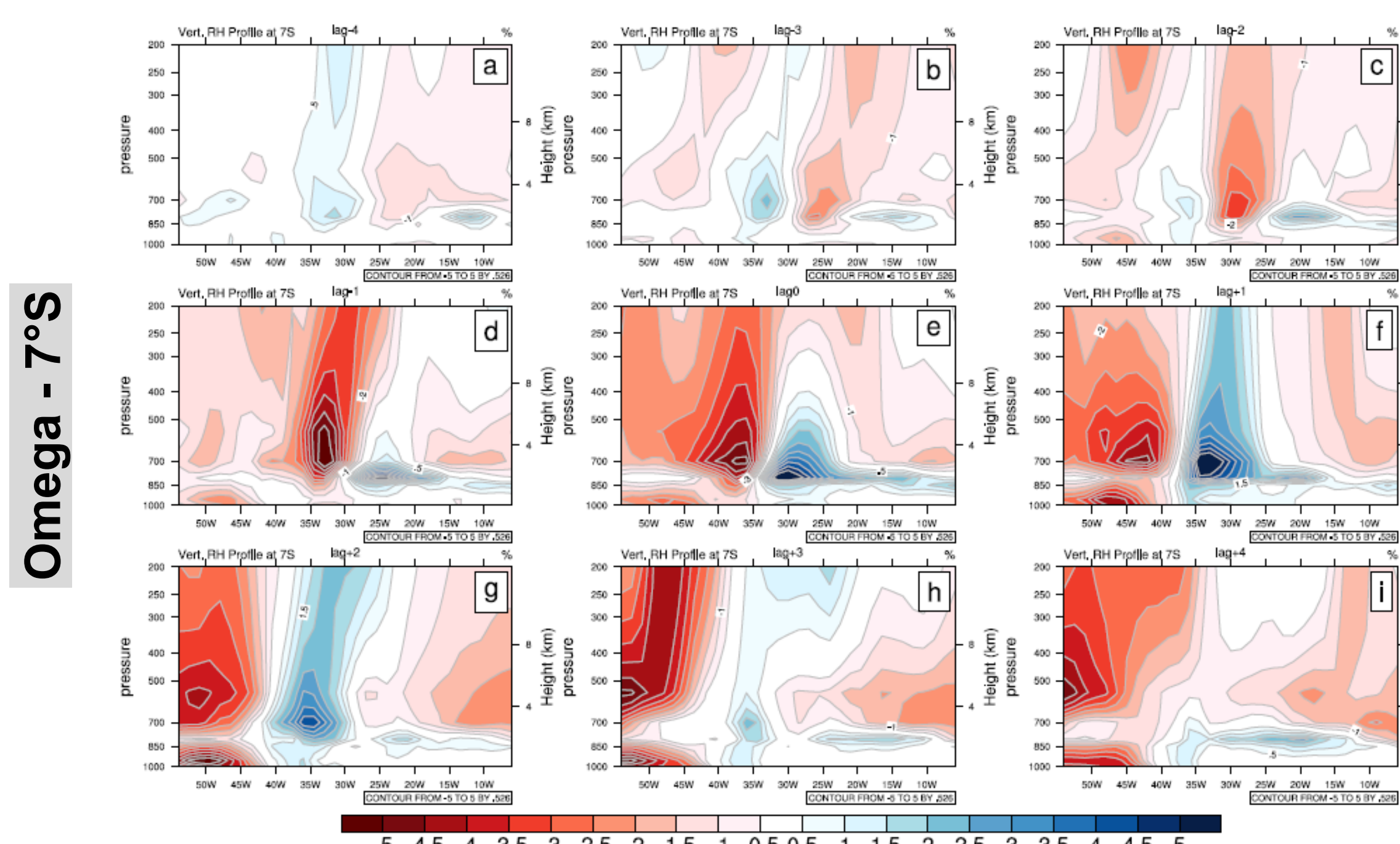
EWDs TRACKING CLIMATOLOGY



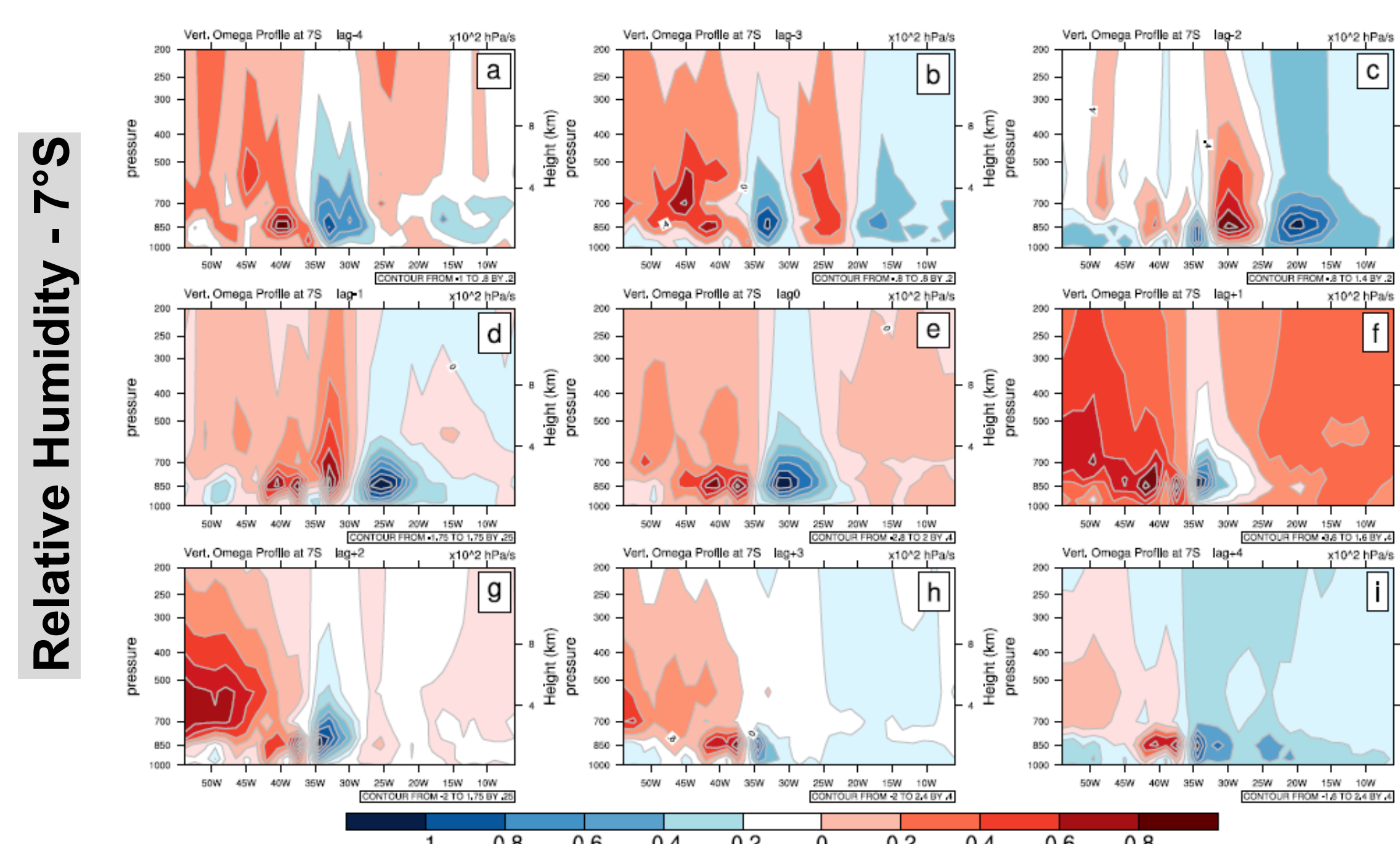
EWDs Composites (anomalies)



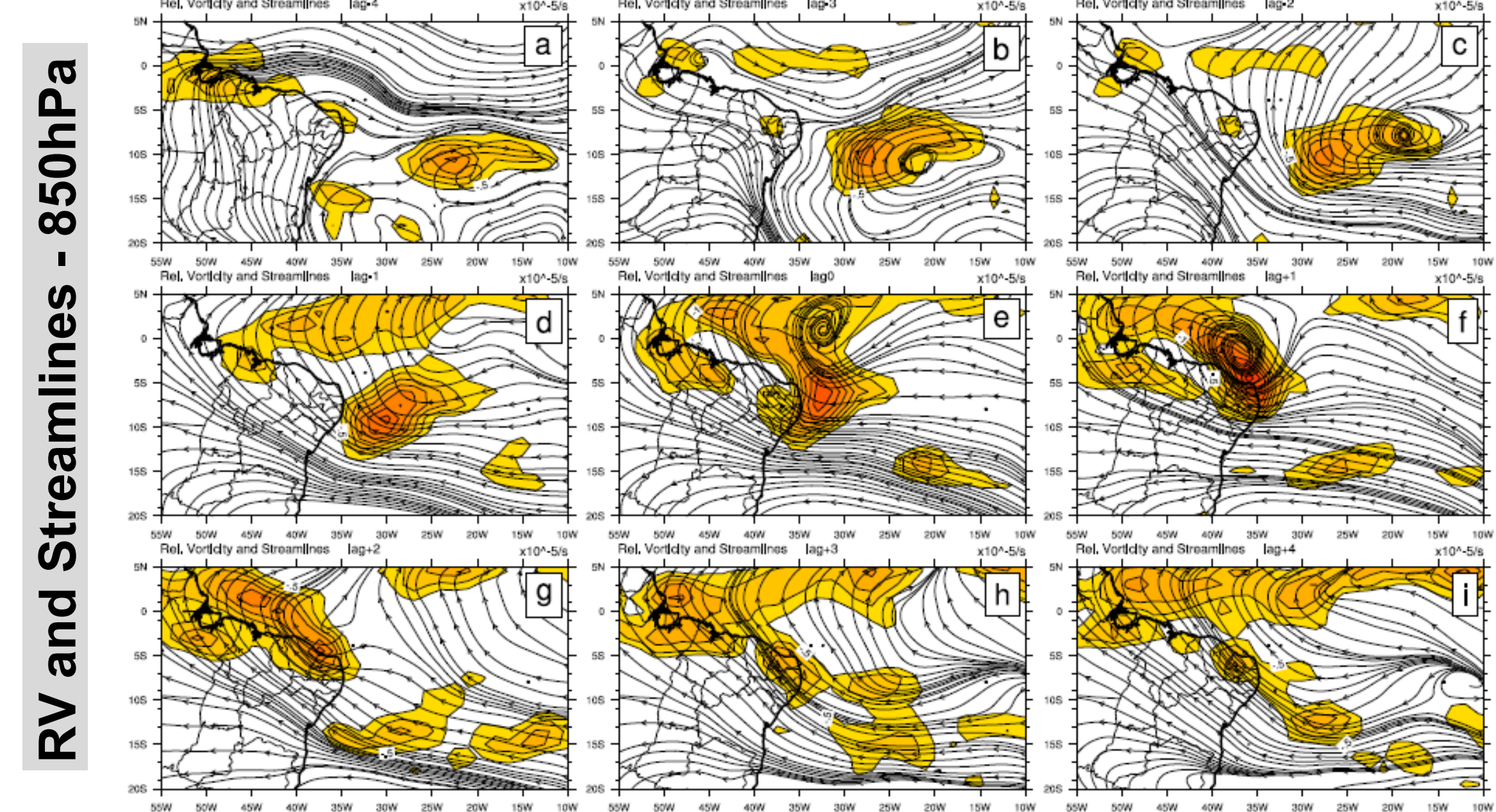
Omega - 7°S



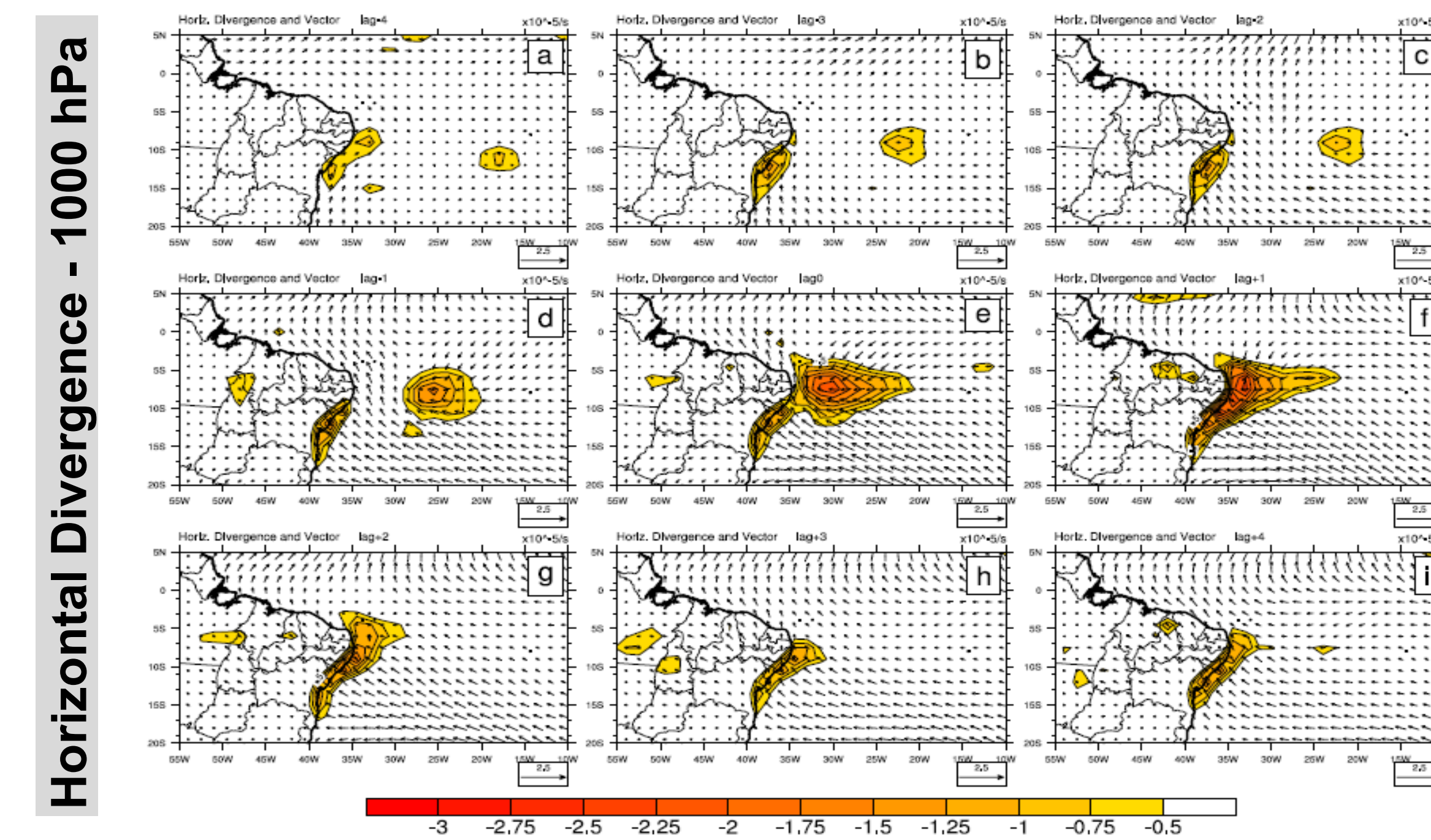
Relative Humidity - 7°S



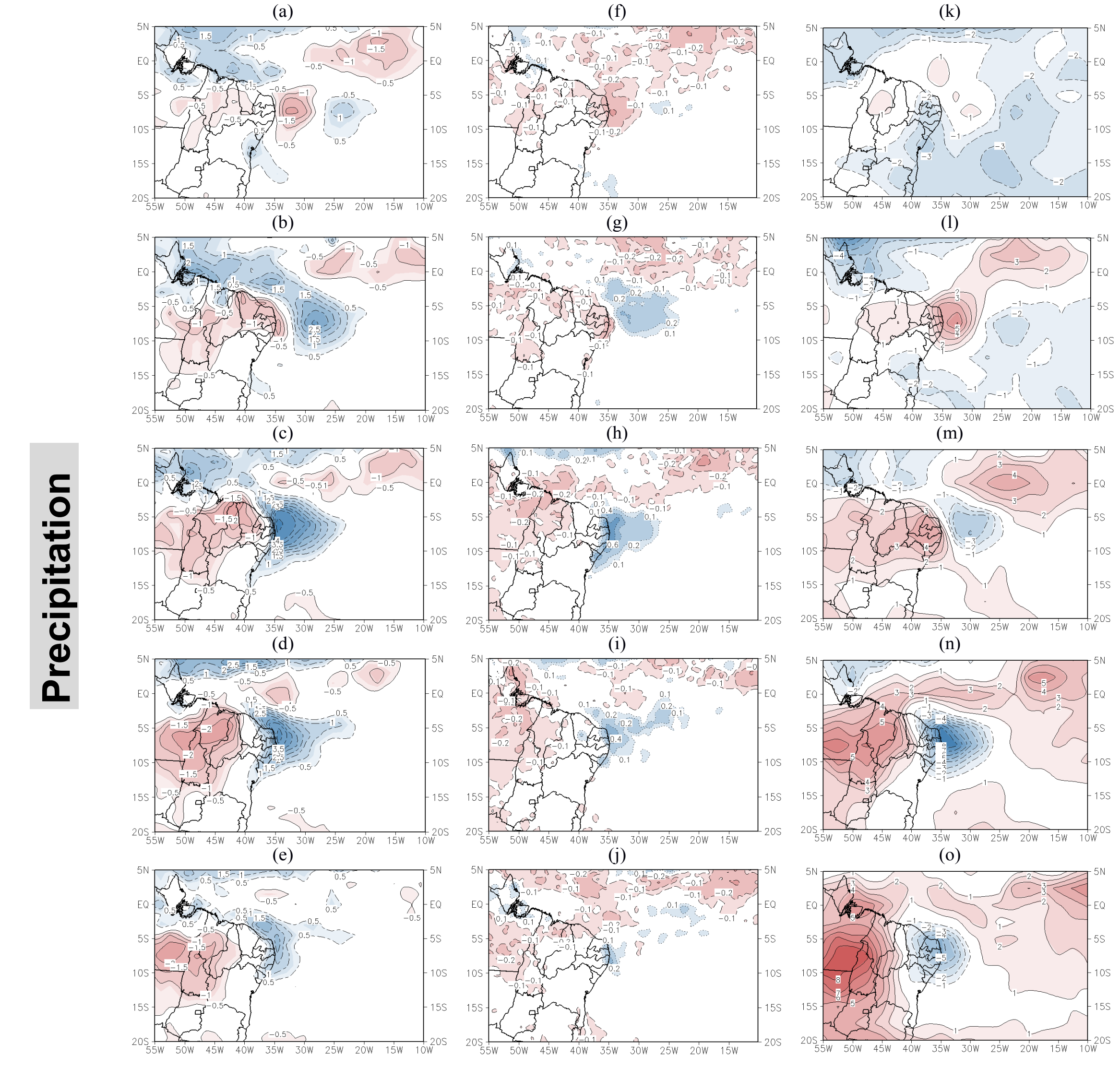
RV and Streamlines - 850hPa



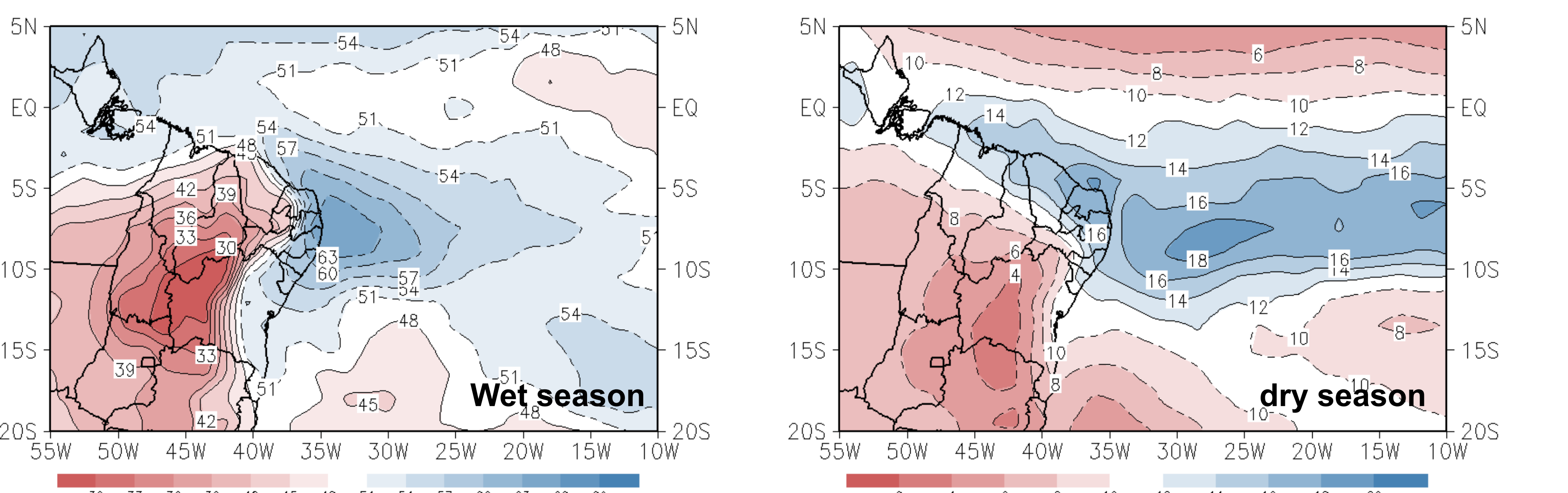
Horizontal Divergence - 1000 hPa



Precipitation



Ratio (%) between the precipitation observed during the composition days (lag-4 up to lag+4) and the total precipitation over NEB and TSA regions.



SUMMARY AND FUTURE WORK

- A 21-yr climatology of EWDs over TSA has been examined using data from ERAI and satellite.
- EWDs were first identified in ERAI, resulting in 518 observed cases. These were found to show notable interannual variability with around 16-40 episodes by year and with average lifetime of 4-6 days.
- Of the identified EWDs, 97% reached the coast of NEB, of which 64% were convective in nature and 14% moved across the NEB region and reached the Amazon.
- EWDs originate in association with five types of system: cold fronts, convective clusters from the west coast of Africa, Intertropical Convergence Zone, Tropical Upper Tropospheric Cyclonic Vortices, those that have their formation on the subtropical high in the southeast Atlantic Ocean and move in the southeast/northwest direction.
- In the future we will evaluate the contribution of EWDs over NEB region in future climate scenarios and contrast it with their current distribution.

