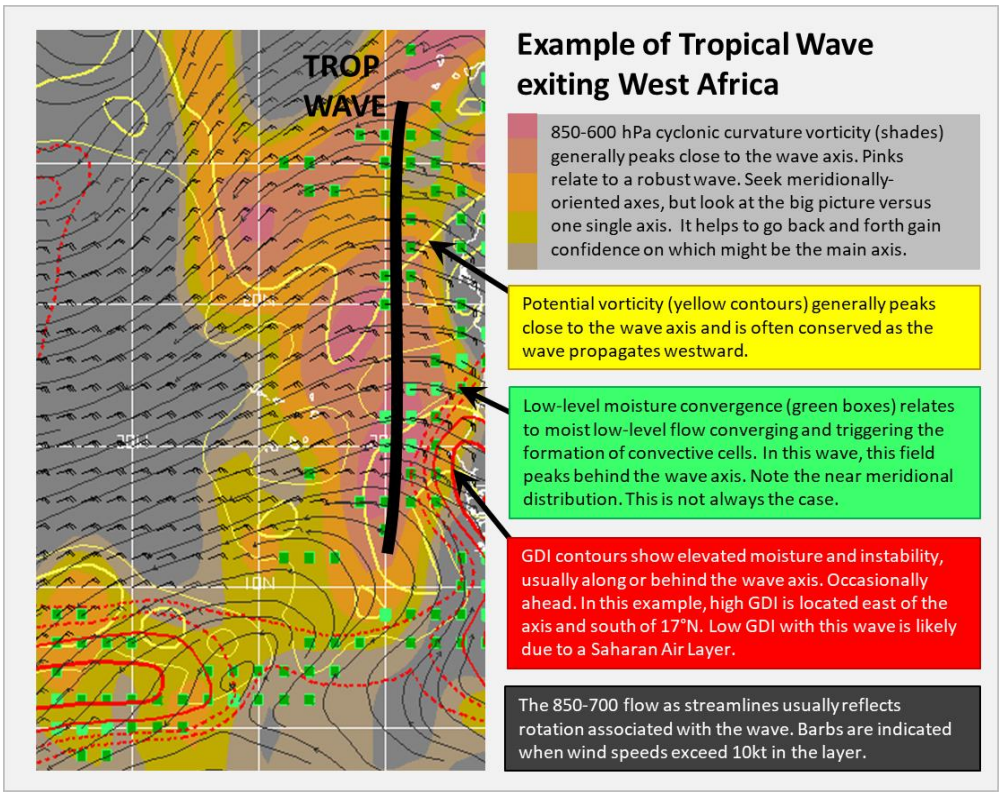
TROPW Algorithm (for aiding with the tracking of Tropical Waves)

First One-Pager Draft

WPC International Desks, 12 July 2024

The WPC International Desks Tropical Wave Tracking algorithm (TROPW) is an experimental tool designed to aid with the tracking of waves propagating in the easterly trades. It was first developed in 2019 and improved in 2023 and 2024.

It was released online as an experimental tool on 12 July 2024. The current algorithm available online runs on GFS 00 UTC 1° operational runs. Thus for its use, it is recommended to contrast its result with other models. It is also recommended to contrast initial conditions with satellite data and observations. See the figure for an interpretation example.



Variables Plotted:

►Curvature Relative vorticity, shaded field

This variable is depicted in the shaded background. Yellow to pink colors denote cyclonic curvature vorticity. Based on research and extensive testing by WPC International Desks fellows, it was concluded that the 850-600 hPa average worked best for identifying curvature associated with tropical waves. A well-defined wave would be reflected by higher values of curvature vorticity, possibly shaded pink. Note that not all shaded areas are associated with tropical waves. It is important to identify the origin of the structures and to observe progression to gain confidence in concluding that the feature should be analyzed as a propagating wave.

►850-700 hPa flow, black streamlines and wind barbs

Troughs associated with propagating waves in the trades often reflect best in 850-700 hPa winds. Higher wind speeds are also highlighted, by including barbs when layer winds exceed 10 knots. In occasions, accelerated winds occur in the poleward tier of waves, which could provide confidence for analyzing the feature.

►Potential Vorticity, yellow contours

Potential vorticity is averaged in the 315-320 isentropic layer and is shows in yellow contours. This quantity is conserved in isentropic surfaces and helps with the tracking of propagating waves in the easterly trades.

►Gálvez-Davison Index (GDI), red contours

The GDI provides an indication of the areas with potential for deep convection. The range of values used in this algorithm is GDI=25 (red dashed contours) to GDI=55 (pink contours) in increments of 5. This range generally highlights areas with enhanced moisture and instability, which often tend to align close to axes of tropical waves. Precipitable water is also useful, but the GDI was chosen as it tends to tight better to the convective structure of the wave.

►925-700 hPa Moisture Flux Convergence, green boxes

Highlights areas favorable for convective initiation, which generally occur in the vicinity of the wave axis.

Note: This is an experimental tool at this point in time. In addition, more thorough documentation will follow later in the year, including thresholds, units and use cases for examples of applicability. Special acknowledgements to Gabriela Chinchilla (IMN), Shamal Clarke (CINWS) and Andrew Levine (NHC/NOAA) for their work and feedback provided for the development of this experimental algorithm.