

Tracking Tropical Cyclones with Low Level Potential Vorticity

Yury Yusupov

MapMakers Group Ltd., Moscow, Russia, E-mail: usupov@gismeteo.com

The GIS Meteo technology was developed in MapMakers Group Ltd. for use in meteorologist's operational work [1]. In this paper a new tool for tracking tropical cyclones (TC) is represented.

Shapiro and Franklin (1995) documented the potential vorticity (PV) structure of Hurricane Gloria of 1985. They showed that a TC is a strong localized positive PV anomaly in the lower and middle troposphere [2].

PV on isobaric surfaces is calculated using the following equation [3]:

$$PV_p = -g [(f + (\partial v / \partial x - \partial u / \partial y)_p) \partial \theta / \partial p + (\partial \theta / \partial y)_p \partial u / \partial p - (\partial \theta / \partial x)_p \partial v / \partial p]$$

The appearance of Low Level PV anomaly in Tropics is one of the conditions for the development of TC. Other conditions are: sea surface temperature greater than 26°C, very little vertical shear, relatively high tropospheric moisture, strong disturbance etc.

But the Low Level PV anomaly alone may be used as a precursor of possible TC development.

The samples (see Fig. 1 and Fig.2 – Atlantic and Pacific regions respectively) are constructed from PV values on isobaric surface at 850 hPa in the grid points where PV is greater than a threshold ($PV_{850} \geq 0.6$ PVU).

The GIS Meteo technology can create forecast charts automatically for arbitrary regions, thus enabling monitoring. You can find daily updated animations of PV_{850} fields in Pacific region on our website in Internet (<http://dyn.gismeteo.ru/ANIMOP/typhoon.gif>)

As input data we use standard set of GRIB data distributed by WMO.

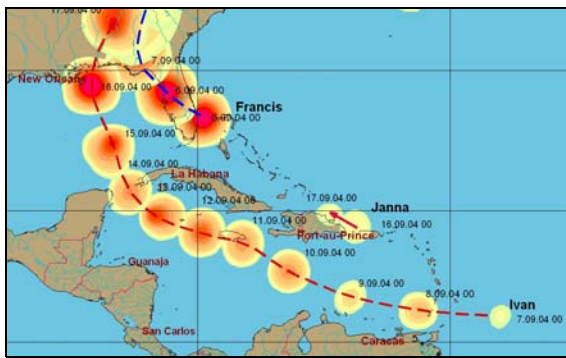


Fig. 1

Hurricanes Francis, Ivan, Janna, September 2004

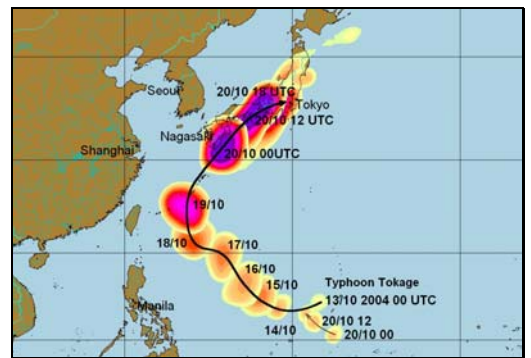


Fig. 2

Typhoon Tokage from 13 of October 2004

References.

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