

# **Analyses of Highs tracks in North Atlantic, the Azores High and Trade Winds during winter from 1950-2000**

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**Key-words:** Highs, Azores High, Trade Winds, surface level, north Atlantic.

**Abstract:** From the correlations of Highs features, surface of Azores Highs and Trade Winds, this study permit to evaluate the intensity of the relationships between these majors elements of North Atlantic Climate.

## **1- DATA and METHOD.**

The data are extracted from NCEP-NCAR Reanalysis (<http://cdc.noaa.gov/cgi-bin/njph-nc/Datasets>). The computations were done using the free statistical package R, (<http://cran.r-project.org>).

Working from National Center for Environmental Prediction-National Center of Atmospheric Research, Sea Level Pressure daily records from 01/01/1950 to 12/31/2000, we have retraced, using a method developed by A. Favre, A. Gershunov (2003, 2006) the trajectories of the Highs.

This method is divided into two successive automated stages:

- Recognition of the maxima of pressure on each map, concerning each day of the period,
- Connections between the different maxima during their movement, At all the measures of time (synoptic, seasonal, annual, for the whole period) with some of their characteristics: latitude (genesis, lysis, mean), longitude (genesis, lysis, mean), pressure (max, min, mean), speed of displacement, distance, duration, surface.

And representing the variability of Highs tracks along the period (time series).

Using NCEP-NCAR daily records of:

- zonal and meridian wind in the Subtropical North Atlantic Ocean, we get the Trade Winds evolutions,
- SLP between 40-10°N and 60°W-10°W, we estimate the surface of Azores High (by the pressure area above 1020hPa),

From these three data bases, we explore the potential relationships which exist be-

tween the Highs behaviours, the surface of Azores High and the Trade Winds by cross coefficient of correlation (Bravais-Pearson method)

## 2- RESULTS AND INTERPRETATIONS.

There are strong relationships between Highs features and Azores High evolutions (table 1). When High are less numerous, appear and disappear southward, and have a strong pressure, the Azores High recover a large area. Strangely, longitude and speed of displacement seem to be less involve into the evolutions.

	<b>Frequency</b>	<b>Latitude of genesis</b>	<b>Latitude of lysis</b>	<b>Longitude of genesis</b>	<b>Longitude of genesis</b>	<b>Speed of displacement</b>
<b>Azores High</b>	<b>- 0.57</b>	<b>- 0.52</b>	<b>- 0.51</b>	-0.17	-0.17	0.21

Table 1. Correlation between Highs features and Azores High (number cited in bold are significant at 95% level)

In that case, the Trade Winds expulse from the Azores Highs are stronger (table 2) as said M. Visbeck (1998) “*when the Azores High is anomalously high [...] the easterly surface winds in the trade belt are strong*”

	<b>VZ</b>	<b>VV</b>
<b>Azores High</b>	<b>0.83</b>	<b>0.70</b>

Table 2. Correlation between Azores High and Trade Winds (number cited in bold are significant at 95% level)

## 3-CONCLUSIONS.

This study permit to demonstrate that it exists a direct link between the characteristics of High features and Trade Winds.

### *References.*

- Deser C.,Walsh J.E, TimlinM.S., (2000). Arctic Sea Ice variability in the Context of Recent Atmospheric Circulation Trends. *Journal of Climate*: Vol. 13, No. 3, pp.617-633.
- Favre A., Gershunov A., (2006), Extra-tropical cyclonic/anticyclonic activity in North-Eastern Pacific and air temperature extremes in Western North America, *Cl. Dyn.,.*

- Hurrell J., Y. Kushnir, G. Ottersen, and M. Visbeck (Eds) (2003), *The North Atlantic Oscillation : Climatic Significance and Environmental Impact*, *Geophys. Monogr. Ser.*, Vol. 134, AGU, Washington, D.C.
- Ihaka R., Gentleman R. (1996) R: a language for data analysis and graphics. *Journal of Computational and Graphical Statistics*, 5, 299–314.
- Kalnay E. (2001) The NCEP–NCAR 50-Year Reanalysis: Monthly Means CD-ROM and documentation, *Bulletin of the American Meteorological Society*, Vol. 82, No. 2, February 2001.
- Leroux M. (1998), *dynamic analysis of weather and climate: general circulation, perturbations, climatic evolution*, SJ. Wiley ed., Praxis-Wiley series in Atmospheric Physics, London, New-York, Sydney, 365 p.
- Meehl G.A., Van Loon H., (1979), The seesaw in winter temperatures between Greenland and northern Europe, Part II: teleconnections with lower latitudes, *Mon. Weather Rev.*, 107, 10895-1106.
- Pommier A., (2005), Objective analyse of the atmospheric dynamic at surface layer over the North Atlantic region: mechanism and evolution from 1950 to 2000. Ph. D. of University of Lyon, France.
- Visbeck M., Cullen H., Krahnemann G., Naik N., (1998), An ocean model's response to North Atlantic Oscillation like wind forcing, *Geophys. Res. Lett.*, 25, 4521-4524.