

# THE DERIVED DIXMAP STUDY OVER SOUTH AMERICA IONOSPHERE DURING DISTURBED PERIODS



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## Abstract

In the present work, we show a study of the derived Disturbance Ionospheric index Map (DIXBRMAP) over South America. The DIXBRMAP is an index primarily built to express the ionospheric response to magnetic disturbances and it covers the latitudinal range from 10° N up to 60° S and the longitudinal range from 90° W up to 30° W, with 5° of resolution in both coordinates. This index is constructed using the TECMAP data processed and made available by the Brazilian Studies and Monitoring of Space Weather (Embrace) Program of the National Institute for Space Research (INPE). For study two magnetic storms we have chosen: a moderate storm occurred on January 2015 (-99 nT) and an intense storm occurred on December 2015 (-155 nT). The results are presented and discussed in terms of the latitudinal evolution of the DIX behavior in relation to the Dst index during the analyzed period.

## Methodology

$$RIDX_{t}^{med} = \sqrt{\left(\frac{1}{N_{grp}-1}\right) \sum_{k=1}^{N_{grp}} ((TEC_k - TEC_{med}) / TEC_{med})^2}$$

Jakowski et al., 2006

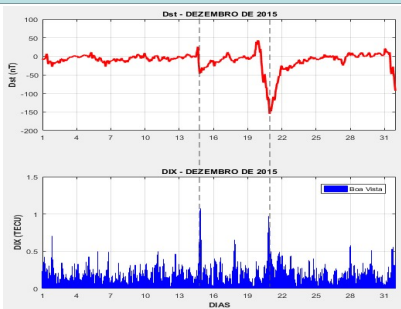
$$DIX = \left| \frac{TEC - TEC_{med}}{TEC_{med}} \right|$$

Barbosa Neto, in progress

$$DIX_{BRMAP} = \frac{\eta \left| \frac{TEC - TEC_{LB}}{TEC_{LB}} \right| + |TEC - TEC_{LB}|}{j}$$

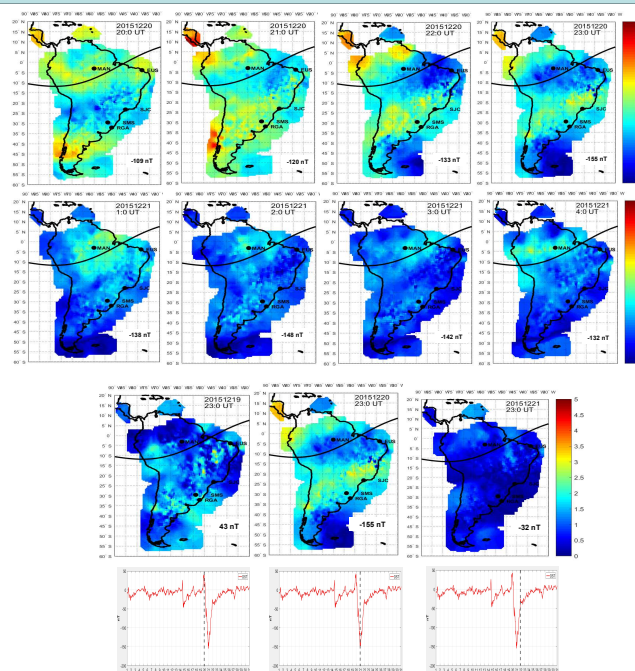
Picanço, in progress

## Preliminar Results



$$DIX = \left| \frac{TEC - TEC_{med}}{TEC_{med}} \right|$$

## DIXbrMAP – December 2015



## Summary and outlook

1. There is a good agreement between the DIXMAP and DST index. At mid-to-low latitude a TEC disturbance is observed at the beginning of the magnetic storm
2. During the magnetic storm main phase the ionospheric perturbation is observed over the whole continent
3. The DIXbrMAP seems to be a good parameter to represent the ionospheric disturbance by during magnetic disturbances over South America.
4. The construction of a parameter capable to express the ionosphere response during magnetic disturbances that synthesizing the information of the particularities and the complex behavior of the ionosphere over South America seems to go through the creation of a map instead of a global temporal index.
5. More detailed studies with other datasets will still be needed to find out which model has the potential to become a representative ionospheric disturbance index.

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## References

1. Barbosa Neto, P. Desenvolvimento de índice de perturbação ionosférica durante tempestades magnéticas sobre a América do Sul, in progress
2. Jakowski, N.; Stankov, S. M.; Schlueter, S.; Klaehn, D. On developing a new ionospheric perturbation index for space weather operations. Advances in Space Research, v. 38, p. 2596-2600, 2006.
3. Picanço, et al., Desenvolvimento de um índice de perturbação da ionosfera local, in progress.