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Interactive comment on "Latitudinal variation of Pc3-Pc5 geomagnetic pulsation amplitude across the dip equator in central South America" *by* Graziela Belmira Dias da Silva et al.

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We thank the referee for the careful and insightful review of our manuscript. Following the editors 'suggestion, the response is structured as follows: comments from the referee, authors' response, and changes to be made to the manuscript.

(1) Page 13, Line 3,

The authors explained the amplitude depression of Pc5 at equatorial region by the propagation model proposed by Chi et al. (2001). However, regarding this paper, there were some discussions between Chi et al. and Kikuchi and Araki, while the author's

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interpretation seems to be valid explanation. It would be better to refer the following papers to consider the adequacy of the explanations.

(a) Kikuchi, T., and T. Araki, Comment on "Propagation of the preliminary reverse impulse of sudden commencements to low latitudes" by P. J. Chi et al.,J. Geophys. Res.,107(A12), 1473, doi:10.1029/2001JA009220, 2002.

(b) Chi, P. J., et al., Reply to comment by T. Kikuchi and T. Araki on "Propagation of the preliminary reverse impulse of sudden commencements to low latitudes," J. Geophys. Res.,107(A12), 1474, doi:10.1029/2002JA009369, 2002.

Reply/Changes in manuscript: We will add to the text the references suggested by the reviewer. Note that the discussion between Chi et al. and Kikuchi and Araki on the origin of equatorial PRIs support our conclusions on the Pc5s features observed in the Brazilian equatorial region.

(2) Page 18, Line 32.

The authors stated Pc5 amplitude depression and phase lag at the dip equator are not predicted by the horizontal transmission. However, these features well correspond with that of Pi2 pulsation which was indicated by Shinohara et al., (1997, and 1998). They explained that the transmitted electric fields from the polar ionosphere could cause the dayside Pi2 with amplitude depression and phase lag due to the high ionospheric conductivity at dip equator. It would be better to take account these previous studies in considering the interpretation of the observational facts of Pc5 pulsation.

Reply: The reviewer is correct in stating that incident waves coming horizontally from the poles through the Earth-ionosphere waveguide can cause phase delays in magnetic signals at the dip equator relative to off-equatorial regions. This information will be added to our manuscript, as these phase delays can be explained by invoking the induction effect with the model devised by Shinohara et al. [1997, 1998]. However, it is not clear how this model could account for the Pc5 amplitude depression observed in

our data during daytime at the dip equator. This is because the amplitude depression reported by Shinohara et al. (1997) occurred only for nighttime Pc5 pulsations. In this case, the authors resort to the MHD compressive propagation model (page 2282 of that paper), where the waves are directly incident on the equatorial ionosphere and have their amplitude damped due to screening effects. Thus, we maintain our proposal that the two propagation models should be operating interactively in our region of study.

Changes to be made to the manuscript: Corrections will be made to the manuscript to include the induction effect discussed by Shinohara et al. [1998].

(3) Page 18, Line 7; Figure 11 and Page 19, Line 5,

The authors suggest that the amplitude enhancement in H component of Pc3 at dawn terminator could be explained by the secondary electric field shown in Figure 11. However, in this model, the secondary electric field is generated by the neutral thermospheric wind. In this scenario, the secondary electric field should be modulated by the temporal variation of the neutral wind, not by the electric field associated with the Pc3. It seems to be less convinced. The authors need to explain how the secondary electric field at the dawn terminator affect the amplitude enhancement of Pc3 which is imposed on the dawn ionosphere.

Reply: Analyzing the scientific literature on how ULF wave fields couple to the ionosphere to generate secondary fields modulated by background conductivity during sunrise hours, we are now proposing that this H-component enhancement effect in Pc3 pulsations at the dawn terminator should be mainly related to the mode of propagation and incidence of these waves on the ionosphere. For example, the model of fast mode incidence on the ionosphere described by Alperovich and Fedorov [2007, p. 284-297] predicts that compressional waves in the Pc3 frequency band are those expected to produce the strongest structure of zonal electric fields and currents in the vicinity of the dip equator (mainly during the equinoxes) because its effect increases with increasing frequency. In addition, this model also allows external electric fields other than

those carried by the waves (eg, induced by dynamo action) to contribute substantially to increased zonal currents and consequent signal amplification on the ground. We understand that the dynamo mechanism suggested in our text, in which the F region thermo-atmospheric winds drive zonal electric currents, can be applied to explain the Pc3s enhancement near sunrise, given the large longitudinal variations in electrodynamic processes in the South American equatorial ionosphere. However, we still need to assume that our Pc3 events occurring around sunrise are also related to compressional MHD waves vertically incident on the ionosphere, as recognized for the Pc3 events around noon.

Changes to be made to the manuscript: This discussion will be included in the manuscript, including the summary and conclusions. In addition, a new reference will be added to the text: Alperovich, L.S., Fedorov, E.N.: Hydromagnetic Waves in the Magnetosphere and the Ionosphere. Series: Astrophysics and Space Science Library, Vol. 353, 2009, XXIV, 418 pp., doi:10.1007/978-1-4020-6637-5, 2007.

Minor comments:

Figure3, 4, 5(a), 9

It would be better to add local time on horizontal axis.

Reply/Changes in the manuscript: Local time will be added on the horizontal axes of these figures.

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