

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.

Anonymous Referee #1

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This manuscript investigates a latitudinal structure of amplitude and phase of Pc 3 and Pc 5 pulsations observed around the magnetic equator in central South America. It was demonstrated that Pc 3 pulsations with periods shorter than ~ 35 s are attenuated around local noon at the dip equator and the authors proposed that the amplitude attenuation of dayside Pc 3s is caused by the ionospheric screening effect on MHD compressional waves incident on the equatorial ionosphere. On the other hand, dayside Pc 5 pulsations showed the amplitude enhancement around the equator, with a slight depression at the dip equator compared with those at the neighboring equatorial stations. They proposed a coupled model of the Earth-ionosphere waveguide propagation and the compressional wave propagation. The attenuation of dayside Pc 3s

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at the dip equator and the enhancement of dayside Pc 5s around the equator have already been reported by several previous papers, but the detailed spatial structure of the pulsations within 3 degrees dip altitude is new and clear. In addition, this manuscript includes some new findings, i.e., the attenuation in Pc 5 amplitude at the dip equator and the increase in the H-to-D amplitude ratio of Pc 3s at the dawn terminator. Thus, I believe that this paper is suitable for publication in Annales Geophysicae. However, the manuscript is not acceptable in the present form, because there are some points to be improved in the discussion.

Specific comments:

Section 5: To explain the equatorial enhancement of Pc 3 pulsations in the H component at the dawn terminator, the authors suggested a mechanism that eastward neutral winds in the F-region ionosphere across the dawn terminator cause the enhancement of zonal electric field. This is similar to the generation mechanism for the prereversal enhancement of the zonal electric field during sunset period. However, this mechanism may explain the enhancement in Sq current around the dawn terminator, but it cannot cause the enhancement in Pc 3 amplitude. The authors need to explain how the neutral winds can give rise to the electric field oscillations at the Pc 3 frequency. I guess that this mechanism is difficult to explain the equatorial enhancement of Pc 3 amplitude, therefore, the authors should suggest other possible mechanism.

Line 11-15 of page 14: The authors described that the Earth-ionosphere waveguide propagation model is inconsistent with the phase lag of Pc 5 pulsations at the dip equator. However, according to Shinohara et al. [1998], the phase lag can be explained by the induction effect of the equatorial enhanced ionospheric current above the good conductor Earth. The source of the equatorial ionospheric current can be the electric field propagating from high latitude by the Earth-ionosphere waveguide mode. On the other hand, it is not clear whether or not the MHD wave propagation model can cause the phase lag at the dip equator.

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Technical corrections:

Line 3 of page 2: internally to the magnetosphere → internally in the magnetosphere

Line 4 of page 6: Please describe the period range of bandpass filter for Pc 3 and Pc 5 pulsations in the text.

Line 8-9 of page 8: Please state the duration of the Pc 3 and Pc 5 events. Is the duration fixed? For example, if Pc 3 pulsations continued during 30 minutes, are they counted as one event?

Subsection 3.2: Was the power spectral analysis applied to bandpass-filtered data? I recommend that the authors explain the analysis procedure made by Roy and Rao [1998] briefly.

Figure 5, 6, 7: In this manuscript, the amplification factor is defined as the amplitude ratio of pulsations at CUI to those at other stations, so greater values than one correspond to equatorial depression and smaller values than one correspond to equatorial amplification. However, this definition is a little bit confusing. In addition, different definition is used in Figure 8. Thus, I suggest that the authors use the amplitude ratio of (other stations)/CUI all through the manuscript.

Figure 10: Please plot the H/D amplitude ratio or the PRM(D)/CUI(H) ratio in this figure.

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