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Statistical investigation of the ionospheric density recorded by DEMETER in the magnetically conjugated areas of earthquake epicenters

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There is a link between the two hemispheres of the Earth due to the magnetic field lines, and waves which are emitted in a hemisphere have a tendency to propagate along these magnetic field lines to be observed in the opposite hemisphere. It means that a perturbation observed in a hemisphere may have its counterpart in the opposite hemisphere close to its magnetically conjugated point. In this paper we will check if perturbations around the magnetically conjugated points of the earthquake epicenters could be observed. In a first step, ionospheric density peaks are automatically searched in the complete DEMETER data set (6.5 years). Then perturbations during large geomagnetic activity are eliminated. In a second step we search if a perturbation could be attributed to an earthquake, and if there are perturbations in the magnetically conjugated area of this earthquake epicenter. The outputs of this statistical analysis as function of the earthquake magnitude are the number of good detections (one perturbation corresponds to one earthquake), the number of false alarms (one perturbation but no earthquake), and the number of bad detections (no perturbation but one earthquake). As it was expected, the ratio between the number of earthquakes with good detections and the total number of earthquakes is less than the same ratio calculated in the epicenter hemisphere but this ratio also increases with the earthquake magnitude. This means that it is possible to check perturbations in the conjugated region of the seismic areas. This could be useful because a satellite does not stay a long time above epicenter areas.