



Statistical study of the variation of the electron density observed by the ionospheric satellite DEMETER during seismic activity

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DEMETER is an ionospheric micro-satellite launched on a polar orbit at an altitude of 710 km. Its main scientific objective is to study the ionospheric perturbations in relation with seismic activity, and then, its scientific payload allows to measure electromagnetic waves and plasma parameters. In particular, a Langmuir probe surveys the electron density and the electron temperature all around the Earth except in the auroral zones. First the paper will show specific events where the electron density is perturbed prior to large earthquakes above the future epicentre. Although, these examples have been carefully selected (close in time and space to the earthquakes, abnormal variations relative to the background level for the same location, the same local time and the same magnetic activity) it is always possible that the perturbations are due to other natural mechanisms because the ionosphere is highly variable and mainly under the control of the sun. Only a statistical analysis of the data is able to remove this ambiguity. As there are now more than 18 months of data, a statistical study has been set about the variation of the electron density during the seismic activity. The quality of the Langmuir probe data is supervised by comparison with the ion density given by an ion spectrometer. The statistic is done as functions of the geographic position, the local time, and the magnetic activity. Geographical maps with average data are obtained to be used as background levels, and the superposed epoch method is applied to merge the data recorded during seismic activity. Results are presented as functions of the earthquake parameters (magnitude, depth).