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Ionospheric Perturbations Observed by the Satellite DEMETER in Relation with the 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 wave experiment and a Langmuir probe survey the ionospheric parameters all around the Earth except in the auroral zones. First the paper will show specific events where the intensity of the waves and the electron density are 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 ionospheric parameters during the seismic activity. Electromagnetic waves at frequencies less than 10 kHz and electron density are studied. 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).