

# Abilities of DEMETER Satellite in Observation of Physical Signatures Perturbation of Ionosphere Associated with Seismic Activities

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## Abstract

Earthquake is one of the most horror natural hazards that cause a lot of damage. So, humans always have been looking for approaches to predict it so that they can reduce its damage. For this purpose, a wide range of researches have been done in a number of fields. Although some researches have been claimed to reach hopeful results in prediction of a few earthquakes, no general and proved methods have offered for it, yet.

On the other hand, applications of remote sensing techniques are being developed because of its advantages (e.g. wide cover, short period of updating, high resolution data and on-time processing methods). In this direction, recently many researches have been trying to use abilities of this technique for earthquake prediction. Earthquake clouds, measurement of temperature anomalies, ground surface displacements and ionospheric perturbations can be enumerated.

Among the above-mentioned earthquake precursors, ionospheric perturbations are so promising. DEMETER (Detection of Electro-Magnetic Emissions Transmitted from Earthquake Regions) satellite was launched on 29 June 2004, in a polar and circular orbit with an altitude 710 km, with the aim of collecting a number of ionospheric parameters to study the relations between their perturbations with seismic

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activities. The scientific payload of DEMETER is composed of several instruments which provide a nearly continuous survey plasma, waves and energetic particles:

- *IMSS*, a search-coil magnetometer, measures three field magnetic components in a wide frequency range.
- *ICE*, the electrical field instrument, measures the three components of the electric fields.
- *ISL*, the Langmuir probe instrument is designed to measure the electron density of plasma, electron temperature and the potential of the satellite.
- *IAP*, the thermal ion spectrometer, measures the ion density, compositions, temperature and flow velocity.
- *IDP*, a high energy particle detector, measures high energy electrons and protons.

Data are collected by this satellite in two “Survey” and “Burst” modes to record universe low bit rate and high bit rate data above seismic regions, respectively. The main advantage is covering nearly all the globe’s active seismic regions very quickly.

In this paper, DEMETER satellite and its mission are introduced and abilities in observation of physical signatures of ionosphere associated to seismic activities are considered for some recent Iran’s earthquakes. Results of this research can answer the question that if DEMETER data can be use for any kind of earthquake in all over the world?