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A preliminary multiparametric and multi-satellite investigation of possible seismic precursors of Mw=7.7 Jamaica earthquake occurred on 28 January 2020

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On 28 January 2020 at 19:10 UTC an Mw 7.7 earthquake occurred in the Caribbean sea, very close to Jamaica Island. The event caused some damage to nearby buildings and a small tsunami of 0.11-meter height as recorded at George Town sea level station, Cayman Islands (USGS).

Although the seismic event occurred in an area mostly occupied by the sea, it would be interesting to investigate possible precursors by the so-called Lithosphere Atmosphere Ionosphere Coupling (LAIC) effects. Several theories support the existence of such type of phenomena basing on pure electromagnetic coupling (e.g. Freund, JAES 2011, Kuo et al., JGR, 2014), or by a chain of processes that starts with the release of some fluids and gas from the lithosphere that could produce an air ionisation and finally a thermal and electromagnetic phenomenon even in the ionosphere (e.g. Pulinets and Ouzounov, JAES 2011). Another possible coupling mechanism between lithosphere and ionosphere proposes the upward propagation of some acoustic gravity waves (e.g. Hayakawa, NHES, 2011).

From the empirical point of view, some authors of this paper have produced in last years evidence for atmospheric and ionospheric precursors (e.g. Marchetti et al., JAES 2020, Piscini et al., Pageoph 2017, Zhu et al. IEEE Access 2019). Statistically, it is proved that the ionosphere is perturbed before several earthquakes (De Santis et al., Scientific Reports 2019).

In this work we analyse the earthquake catalogue searching for an increase of the seismic activity, i.e. a seismic acceleration. . The investigation of a few atmospheric parameters (Aerosol, monoxide carbon and Dimetil Shulfide) does not show clear evidence for anomalies. The reason could be due to the sea location of the event, so the presence of the oceanic water can dilute eventual substances released under the sea at the fault level.

The ionosphere has been investigated by the ESA Swarm constellation and China Seismo

Electromagnetic Satellite (CSES-01) placed in Low Earth Orbits (about 450 ÷ 500 km). These satellites are equipped along with magnetometers and Langmuir Probes to monitor the Earth magnetic field and ionospheric plasma properties. CSES-01, in particular, is a satellite fully dedicated to search for earthquake precursors similarly it was DEMETER satellite. In this work, the extracted anomalies will be discussed with a deeper investigation of the external perturbation to the geomagnetic field by other satellites placed rather far from Earth surface (i.e. geostationary satellites and/or Lagrangian L1 point Sun observatories). In fact, we do not just want to provide evidence for earthquake precursory phenomena but also try to classify some of the anomalies. As it is very difficult (or even impossible) to directly associate an anomaly to an earthquake, we can proceed in a process by exclusion (for example recognising some anomalies as produced by solar micropulsations or other external perturbations).

Finally, we would describe better the mechanism that produces a certain type of anomalies and so, with this further knowledge, it would be possible to extract some more reliable seismo-induced disturbances and perhaps one day even to predict an earthquake.