Satellite Constellation to study ionosphere disturbance before large earthquakes

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The disturbance caused by large earthquake (M> 6.5) shows different face, depending on the latitude, height of the observation, and local time. For example, data observed with DEMETER (≈710 km) and DMSP (≈840 Km) satellites shows enhanced plasma density over the geomagnetic equator, not over the epicenter for earthquakes occurred in Japan. O^+ density obtained at 300 km with DE-2 (Dynamic Explore -2) shows a feature which is similar to Equatorial Ionization Anomaly (EIA); trough (minimum) over the epicenter and two density peaks both latitude side of the epicenter for the earthquake which occured on16 Oct.1981 (-33.1˚N/-73.1˚E, Ms=7.5, D=33km). O+ density of the trough is almost equal to IRI density, which means that no disturbance is found over the epicenter. Earthquake which occurred on7 June 1981(6.6˚N, -96.15˚E, Ms=7, D=33.8km) shows a peak of O^+ over the epiccenter. According to DMSP-15 satellite, the earthquake which occurred off the coast of Tohoku on 11 March 201138.510˚(38 ˚ 6.2' N and 142. 792˚ E; Depth 29km; Magnitude Mw 9.0, JMA) produced midlatitude trough at the north of Japan, and the trough shifted to the lower latitude as the earthquake day approached. Although effort to accumulate case study of the ionosphere disturbance and to understand the disturbance mechanism are being made, global morphology of ionosphere disturbance and its mechanism are still not clear because number of the earthquakes to be studied is not enough..In order to open a new era toward earthquake prediction, satellite constellation is essential. The satellite constellation covers all glove, increasing the number of large earthquake (M> 6.5) to be studied up to about more than 10 per year. The satellite covers whole disturbed area extending to 80 ˚ in longitude and 40 ˚ in latitude (M ≈6.5). Wide range simultaneous survey by satellites makes us help to find clues to get the mechanism. The mission should be a combination of one small satellite of ~500kg and 6 cubesats (~50 -100kg) distributed every 30 ˚ in longitude . Reaction control system is needed to locate 6 satellites in equal distance along longitude. One key condition which is uniquely fixed is that the space craft is obliged to take the eccentric satellite to have long life time if the satellite needs to go down to 300 km. Common basic instruments accommodated in cubesat are electron density. One of the cubesate might accommodate a topside sounder to measure the height profile when the satellite is in high altitude. Small satellites need to measure in-situ plasma density, electric field, plasma drift, neutral density. To get the wind and atmospheric temperature around the height of 100km, SABAR and TIDI type instruments are needed. These instruments might be able to provide information for the role of internal gravity wave. The mission should be conducted under international collaboration.

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