Phenomena observed before slow slip events starting on 29 January 2011 prior to the 2011 Tohoku-Oki earthquake

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1. Introduction

It is shown that the preparation process of the earthquake in the title was consisted of three stages (Sue, 2017). As a further study, events before 29 January 2011 when slow slip of the continental crust started, are investigated.

2. Observation: Following phenomena were observed.

2.1 Vibration

2.1.1 The number of F-net stations with missing data started to increase on 22 December 2010. From 3 to 18 January, they reached 3. It became the maximum of 4 on 14 January. They are located in the Central district and north of Japan (Sue, 2017).

2.1.2 The number of low frequency earthquakes beneath Mt. Hakone showed most in January 2011 in the past 10 years. They occurred largely from 2 to 20 January with a peak on 10 January. No volcanic activities followed (Ishikawa, 2015).

2.1.3 The original records of geomagnetic fields at Esashi have indicated that there were clear unusual behaviors of diurnal variations from 4 to 14 January (Xu, et al., 2013).

To summarize, it is assumed that certain type of vibration existed from 3 to 18 January.

2.2 GNSS data band pass filtered for 20 to 150 days show that, there were southward and upward movements of wide area in Japan from 23 December 2010 to 5 January 2011, then westward and downward from 5 to 23 January 2011 (Chen, et al., 2014).

2.3 The advancement of the Pacific plate observed at GNSS station on the Chichijima island accelerated after the M7.4 earthquake near the island on 22 December 2010, then slowed down and finally stopped till 27 January 2011 (Takeda, 2012).

3. Discussion

3.1 Phenomena shown above appeared immediately before slow slip events of the impending earthquake, so they seem to be part of earthquake generation process.

3.2 Movements of the Tohoku region after 29 January 2011 will also be discussed.

References

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