

Relations between wide-area gravity changes and earthquake activity

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We made gravity time series over the world every one month from 2002 to 2014 based on data of the satellite gravity mission GRACE (Gravity Recovery and Climate Experiment). To investigate relations between gravity change and seismic activity, four observation areas (Red Sea, Chile, Tibet and Alaska) were selected. Using seismic activity data of these areas, We counted the earthquake occurrence numbers every one month. A correlative analysis of the gravity changes and the earthquake number of times enabled us to find out that there is a weak correlation between the gravity changes and the earthquake number of times only for the Alaska area. We owed the correlation to some mechanisms of the gravity change leading to the earthquake occurrence in Alaska. Referring to a preceding study about induced earthquakes (Ellsworth, 2013), We investigate two typical mechanisms (fault stress changes due to surface loads by fluid mass increases or reduces in fault friction due to fluid pressure injection). As a result, we consider that the reduction of fault friction by the fluid pressure injection caused the earthquakes, particularly in the northern area of Alaska (>63N) where strike-slip fault mechanisms dominate.

Keywords: Gravity, Seismicity, Induced earthquake, Surface load, Pore fluid pressure