

## Sea surface gravity changes observed prior to March 11, 2011 Tohoku earthquake II

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The 2011 Tohoku earthquake occurred via subduction of an oceanic tectonic plate, where we had no historical record of this size of earthquake. We have examined shipboard geophysical observations conducted above the rupture area for any indications before the earthquake. The location of largest slip along the fault surface coincides with gravity changes measured at the sea surface separated by three months all before earthquake. This gravity change cannot be explained by the local gravity gradient due to bathymetry along the cruise tracks. The measured gravity changes can be interpreted either as an uplift of ocean bottom or a density increase along the fault surface of which the time scale of evolution is about three months. This observation may constrain the physical mechanism by which this large and slow slip can be generated along this fault.

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