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JAMSTEC

Change of the stress regime in the Pacific plate caused by the 2011 Tohoku Earthquake

Overview

After the 2011 M 9.0 Tohoku earthquake, numerous intraplate earthquakes occurred beneath the outer slope of the Japan Trench. JAMSTEC researchers carried out ocean bottom seismograph observations on the outer slope of the Japan Trench from late April to early July 2011, to examine hypocenter distributions and focal mechanisms. This work was supported in part by the Special Coordination Funds for the Promotion of Science and Technology (Ministry of Education, Culture, Sports, Science and Technology, Japan) titled "the integrated research for the 2011 off the Pacific coast of Tohoku earthquake".

The observed results indicate that the stress regime at around 40 km depth in the incoming Pacific plate had changed from compression to tension after the 2011 Tohoku earthquake. This change of the stress regime likely relates to the increased activity of the normal-faulting earthquakes within the Pacific plate after the 2011 M 9.0 Tohoku earthquake.

This study will appear in the *Geophysical Research Letters* on 31 January 2012.

Title: Normal-faulting earthquakes beneath the outer slope of the Japan Trench after the 2011 Tohoku earthquake: Implications for the stress regime in the incoming Pacific plate

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For more information >>

Geophysical Research Letters

<http://www.agu.org/pubs/crossref/2012/2011GL050399.shtml>

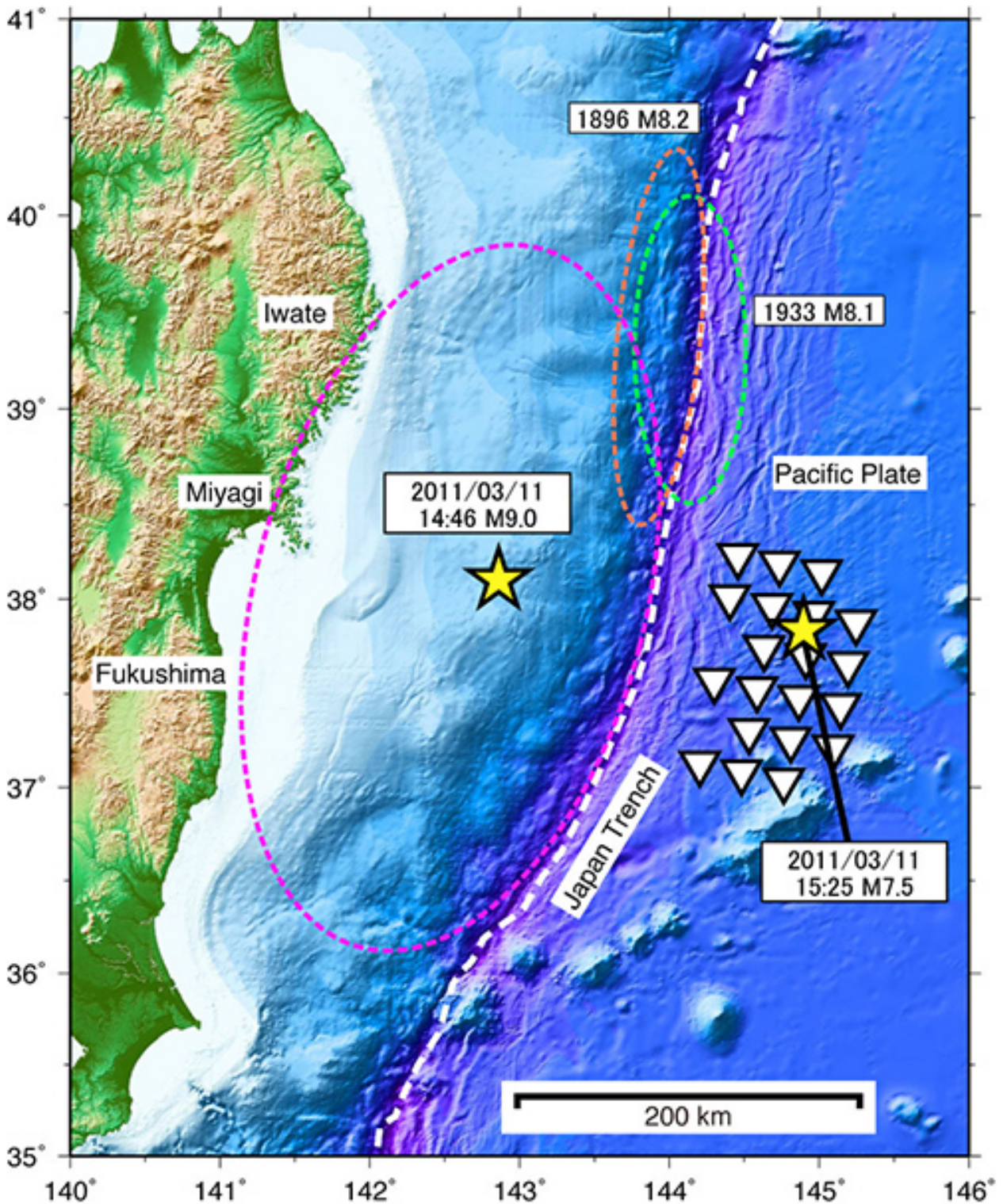


Figure 1. Bathymetric map showing locations of ocean bottom seismographs (inverted triangles).

Epicenters (stars) of the mainshock (M 9.0) and the outer trench slope normal-faulting earthquake (M 7.5) are shown. The dashed circles indicate rupture area of each earthquake.

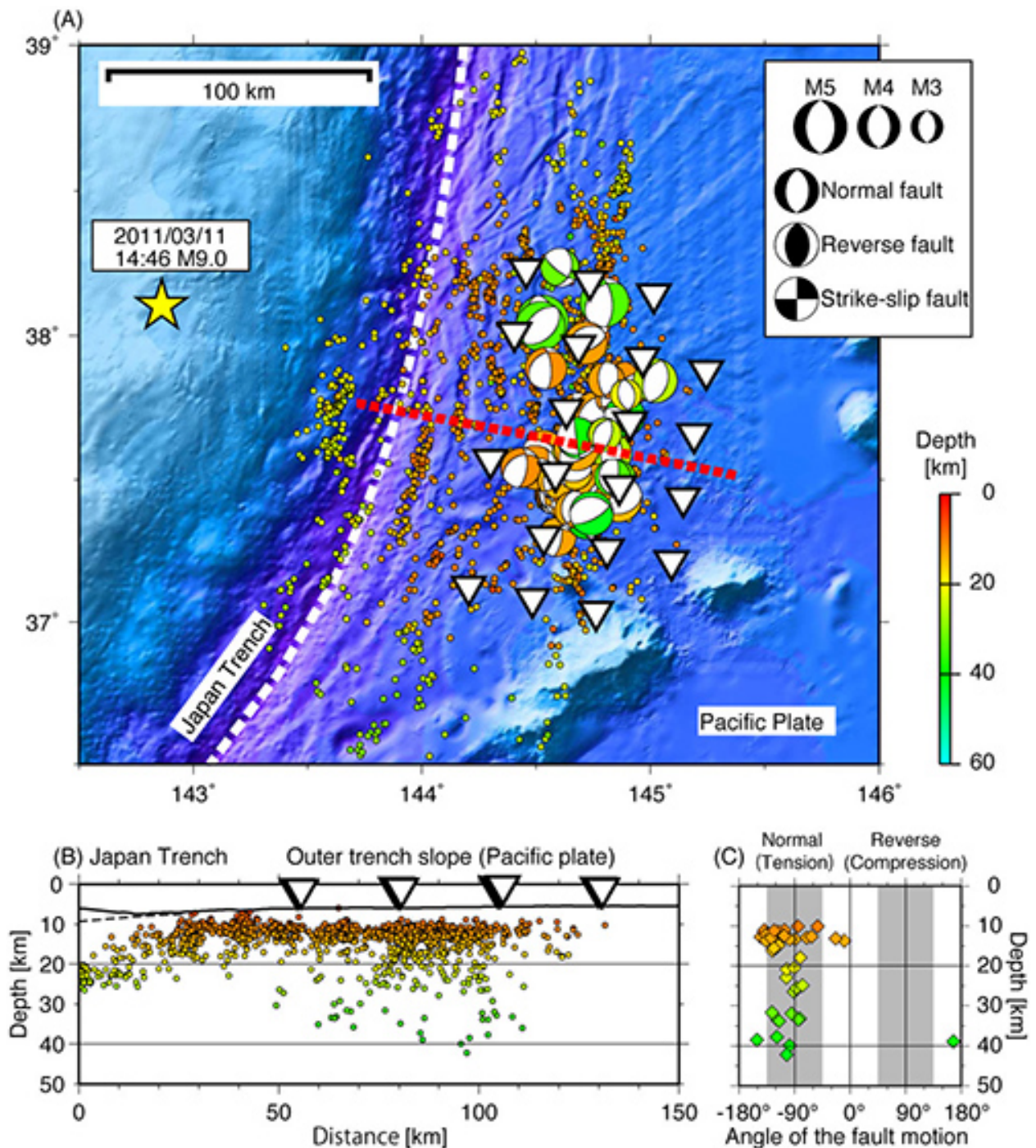


Figure 2. Observed results.

(A): Hypocenter distribution and focal mechanisms obtained from OBS observations. (B): Cross section along the red dashed line in (A). The earthquakes occurred in the Pacific plate at depths shallower than about 40 km. (C): Depth versus angle of the fault motion with respect to the strike. The earthquakes had normal-faulting focal mechanisms (angle near -90°) at all depths.

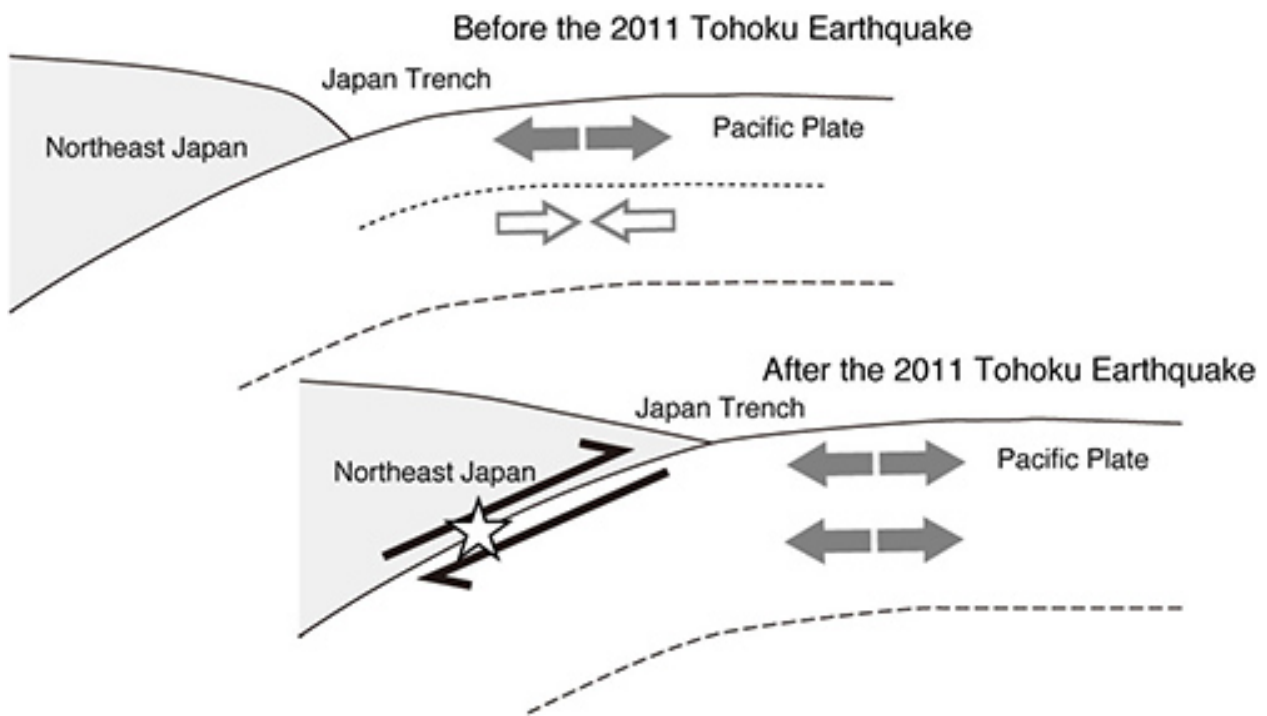


Figure 3: Comparison of the stress regime in the Pacific plate before and after the 2011 Tohoku Earthquake.

Before the 2011 earthquake, stresses in the Pacific plate were tensional in the upper layers of the oceanic lithosphere and compressional beneath. On the other hand, the tensional stresses extend to depths of about 40 km after the 2011 earthquake.

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