Acta Geologica Sinica (English Edition), 2019, 93(supp.2): 73–74

Crustal Deformation and Seismicity of Northeast China Following the 2011 Tohoku Mw9.0 Earthquake from GPS Measurements

MENG Guojie[1, *], SU Xiaoning[1], YU Jipeng[1], Shestakov NIKOLAY[2,3], Takahashi HIROAKI[4] and Ohzono MAKO[4]

[1] *Institute of Earthquake Forecasting, China Earthquake Administration, Beijing 100036, China*
[2] *Far Eastern Federal University, Vladivostok 690068, Russia*
[3] *Institute of Applied Mathematics, Far Eastern Branch of Russian Academy of Sciences, Vladivostok 690091, Russia*
[4] *Institute of Seismology and Volcanology, Hokkaido University, Sapporo 0600810, Japan*

Citation: Meng et al., 2019. Crustal Deformation and Seismicity of Northeast China Following the 2011 Tohoku Mw9.0 Earthquake from GPS Measurements. *Acta Geologica Sinica* (English Edition), 93(supp.2): 73–74.

Abstract: Using the GPS observations on northeastern China and southeast of Russian Far East over the period of 2012 –2017, we derived a velocity field within the ITRF2014, by fitting GPS time series with a multi-term functional model incorporating annual and semi-annual signals, linear trend as well as offsets. We subsequently transformed the velocity field into a Eurasia-fixed velocity field and analyzed its spatial characteristics. By taking the multi-scale spherical wavelet approach, we calculated strain rate tensors and analyzed the spatial distribution of various resolving scales. Meanwhile we investigated the contribution due to the post-seismic relaxationof the Mw 9.02011 Tohoku, Japan earthquake. The results show thatthe velocity field relative to the Eurasian plate generally moved southwestward. The movements between Yilan-Yitong Fault and Nenjiang Faultis characterized by clockwise rotation, but other regions moves southeastward with a good consistency in orientation and an increase in

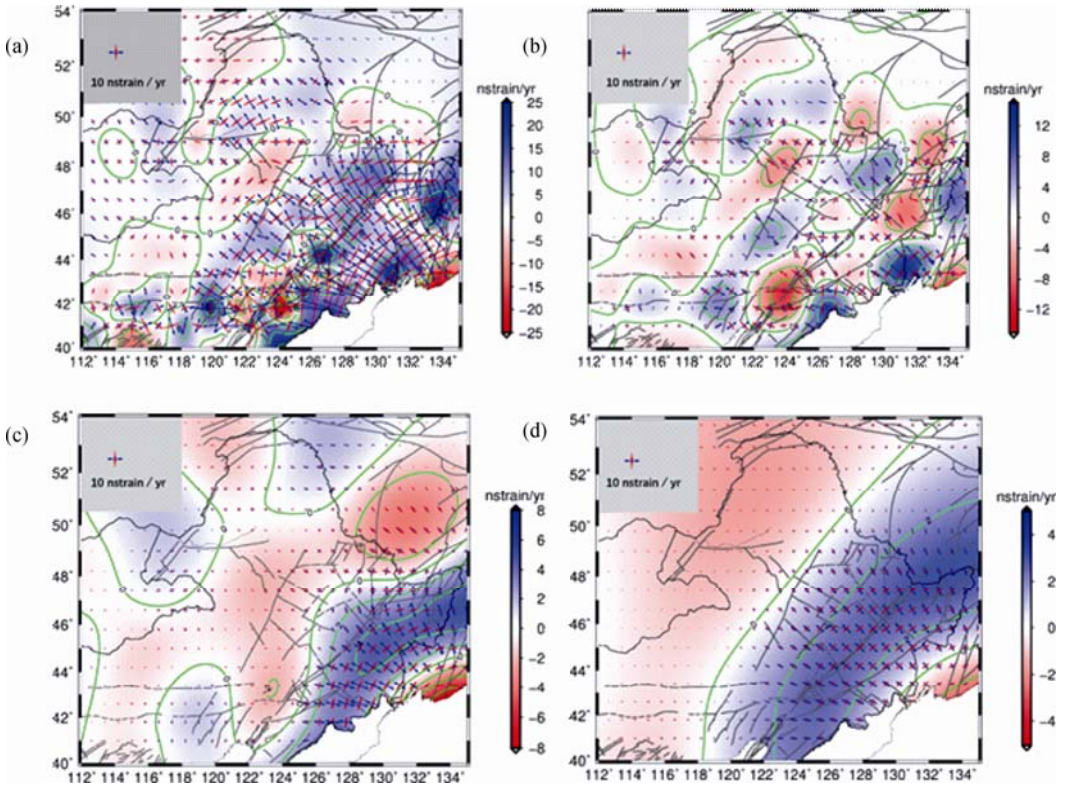

Fig. 1. Multi-scale principal strain rate and dilation rate.
(a) Scales 2-9; (b)Scale 6; (c)Scale 5; (d) Scale 4. Dilation rate is colored in scale; Unit in the color bar is nano-strains per year. Conjugate arrows represent principal strain rates.

* Corresponding author. E-mail: mgj@cea-ies.ac.cn

http://www.geojournals.cn/dzxbcn/ch/index.aspx; https://onlinelibrary.wiley.com/journal/17556724

intensity east of Mishan-Dunhua Fault.The motions for the Dunhua-Mishan Fault and the Yilan-Yitong Fault arecharacterized by extensions of 3.96±0.04mm/yr and 0.71±0.05mm/yr, respectively. The fault-parallel motion is negligible for the two faults. Principal strain rates were dominated by NW-SE extension and NE-SW compression. The dilation rates show that it is undergoing compression for the southern portion of Yilan-Yitong Fault, northern end of the Nenjiang Fault and thesoutheast of Russian Far East. The deformations were generally oriented SE due to the post-seismic viscoelastic relaxation of the 2011 Mw 9.0 Tohoku earthquake, inversely proportional with the epicentral distances. The corresponding principal strain rates were also characterized by NW-SE extension and NE-SW compression. The dilations were characterized as contraction for the southern segment of the Yilan-Yitong Fault and the Mishan-Dunhua Fault, the northern end of the Nenjing Fault and Russian Far East. Localized maximum shear rates were identified around the southern borderland between northeastern China and the southeast of Russian Far East. After the subtraction of the contribution due to the viscoelastic relaxation from the observed velocity, the principal strain rates were also characterized by NW-SE extension and NE-SW compression. The dilation rates were significant in the southern end of the Yilan-Yitong Fault and the Mishan-Dunhua Fault, over the Second Songhuajiang Fault and the southern borderland between northeast China and Russian Far East. The maximum shear rates are still significant for the above regions, indicative of fast and continuing strain buildup there.

Key words: Northeast China, multi-scale spherical wavelet, strain rate field, the 2001 M_w 9.0 Tohoku earthquake, post-seismic viscoelastic relaxation.

Acknowledgements: This work is granted by the National Natural Science Foundation of China (Nos. 41874024 and 41604007)

About the first author

MENG Guojie, male, born in 1969 in Zhumadian City, Henan Province; PhD; graduated from Institute of Geophysics, China Earthquake Administration; Research Professor of Institute of Earthquake Forecasting, China Earthquake Administration. He is now interested in the study on active tectonics and earthquake deformation process. Email: mgj@cea-ies.ac.cn; phone: 010-88015434, 15201618069.