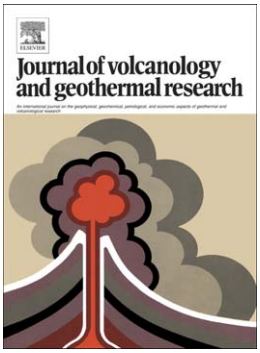

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Paul Lundgren, Alexey Kiryukhin, Pietro Milillo, Sergey Samsonov

PII: S0377-0273(15)00143-2
DOI: doi: 10.1016/j.jvolgeores.2015.05.011
Reference: VOLGEO 5546

To appear in: *Journal of Volcanology and Geothermal Research*

Received date: 22 December 2014
Accepted date: 16 May 2015

Please cite this article as: Lundgren, Paul, Kiryukhin, Alexey, Milillo, Pietro, Samsonov, Sergey, Dike model for the 2012-2013 Tolbachik eruption constrained by satellite radar interferometry observations, *Journal of Volcanology and Geothermal Research* (2015), doi: 10.1016/j.jvolgeores.2015.05.011

Dike model for the 2012-2013 Tolbachik eruption constrained by satellite radar interferometry observations

Paul Lundgren[1]*, Alexey Kiryukhin[2], Pietro Milillo[1,3], and Sergey Samsonov[4]

[1]Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA, 91109, USA
[2]Institute of Volcanology & Seismology FEB RAS, Piip 9, Petropavlovsk-Kamchatsky, Russia 683006
[3]Università degli Studi della Basilicata, Potenza, Italy
[4]Canada Centre for Mapping and Earth Observation, Natural Resources Canada, 560 Rochester Street, Ottawa, ON K1A 0E4 Canada

*corresponding author:
tel: +01-818-354-1795
fax: +01-818-354-9476
email: paul.lundgren@jpl.nasa.gov

Abstract:

A large dike intrusion and fissure eruption lasting nine months began on November 27, 2013, beneath the south flank of Tolbachik Volcano, Kamchatka, Russia. The eruption was the most recent at Tolbachik since the Great Tolbachik Eruption from 1975-1976. The 2012 eruption was preceded by more than six months of seismicity that clustered beneath the east flank of the volcano along a NW-SE trend. Seismicity increased dramatically before the eruption, with propagation of the seismicity from the central volcano conduit in the final hours. We use interferometric synthetic aperture radar (InSAR) to compute relative displacement images (interferograms) for SAR data pairs spanning the eruption. We use satellite SAR data from the Canadian Space Agency's RADARSAT-2 and from the Italian Space Agency's COSMO-SkyMed missions. Data are modeled first through a Markov Chain Monte Carlo solution for a single tensile dislocation (dike). We then use a boundary element method that includes topography to model a distributed dike-opening model. We find the best-fitting dike dips 80° to the