

Technical Appendix: USGS Numerical Aftershock Analysis for the Magnitude 7.8 Gorkha earthquake in Nepal April 25, 2015; Special report due to the M7.3 aftershock on May 12, 2015 (as of May 13, 2015)

This numerical analysis presents the technical material used to create the “USGS Aftershock Advisory for the Magnitude 7.8 Gorkha earthquake in Nepal April 25, 2015 (as of May 13, 2015)” which focused on the results for the week of May 13 to May 19, rather than the longer time periods shown below.

Method and Parameters:

These calculations were done with the method of Reasenberg and Jones (Science, 1989) using parameters fit to the first 12 days of the sequence for events of magnitude 5 and greater. These parameters are $a=-2.45$, $p=1.23$, $c=0.0155$ days, and $b=1$. The range of expected number of aftershocks is calculated assuming a Poisson distribution and the true range is most likely larger than shown. This analysis sums together the aftershock rates for the Gorkha mainshock and the M7.3 aftershock of May 12, 2015. The same aftershock parameters are assumed for both earthquakes.

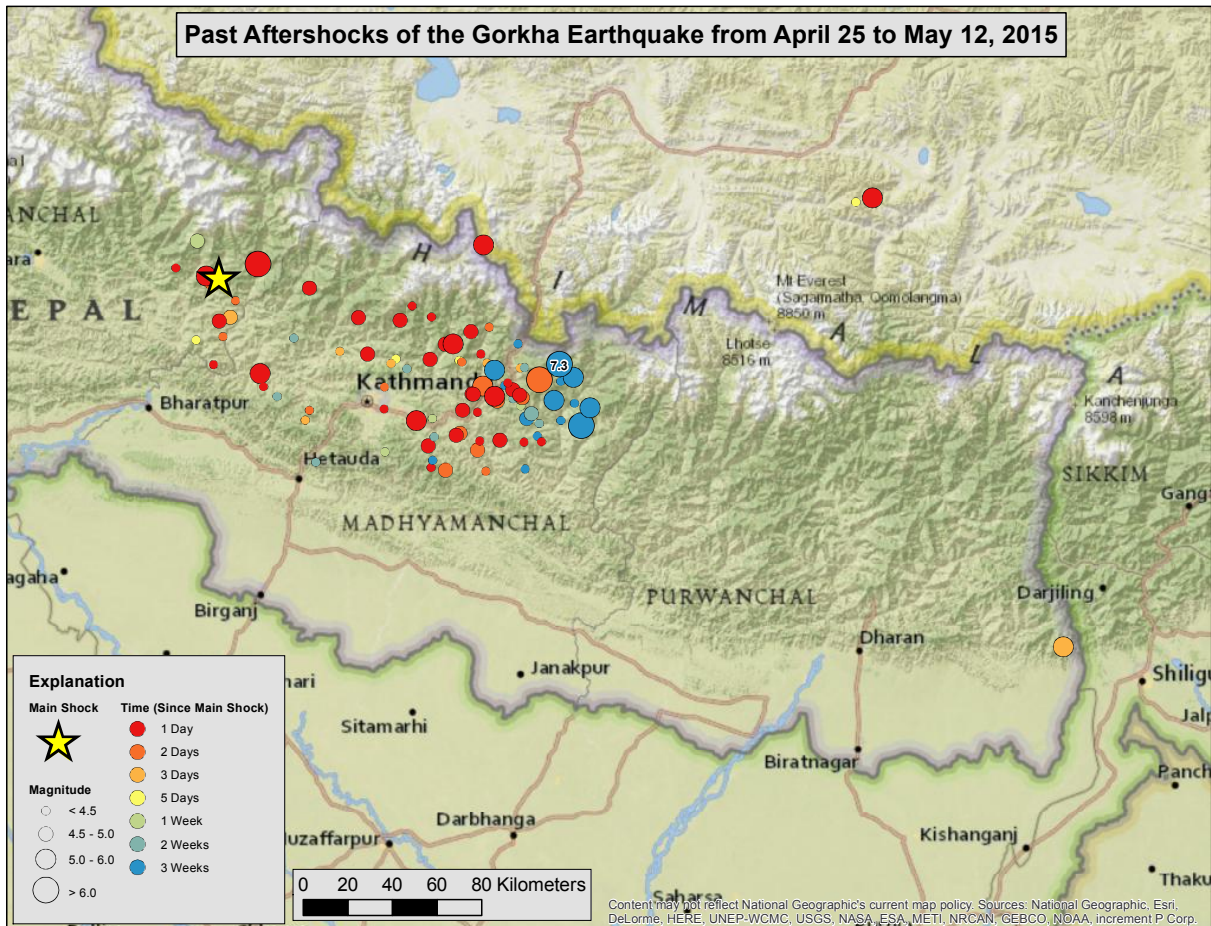
Numerical Expectations and Probabilities:

Note: The expected rate of earthquakes continues to decline throughout the time windows. The probabilities in the longer time windows are higher only because the rates are being summed over a longer time period. These longer periods may be useful when planning recovery and rebuilding projects.

Time Window for Analysis	Magnitude (M) range of aftershocks considered	Range of Expected Number of Aftershocks (95% confidence)	Probability of one or more aftershocks	Probability of no aftershock
1 Week starting on May 13, 2015 to the end of May 19, 2015	M5.0 to M6.0	0 - 4	80%	20%
	M6.0 to M7.0	0 - 1	15%	85%
	M7.0 to M7.8	0 - 0	1%	99%
	$M \geq 7.8$	0 - 0	0.3%	99.7%
1 Month starting on May 13, 2015 to the end of June 12, 2015	M5.0 to M6.0	0 - 6	93%	7%
	M6.0 to M7.0	0 - 2	23%	77%
	M7.0 to M7.8	0 - 0	2%	98%
	$M \geq 7.8$	0 - 0	0.5%	99.5%
1 Year starting at May 13, 2015 to the end of May 12, 2016	M5.0 to M6.0	1 - 9	99%	1%
	M6.0 to M7.0	0 - 2	37%	63%
	M7.0 to M7.8	0 - 1	4%	96%
	$M \geq 7.8$	0 - 0	0.8%	99.2%

In comparison, prior to the recent M7.8 mainshock, this region has experienced about 1 magnitude 5 or greater earthquake per year over the last 20 years.

The expected location of the aftershocks will be in the zone of current activity and at its edges with a few located further away. Currently almost all aftershocks are occurring in a zone extending approximately 200 km away from the mainshock epicenter with a few occurring up to 400 km to the east and southeast. These locations are shown on the map below and are subject to change as new data is collected and analyzed.



This information is preliminary and subject to change as more data becomes available. The USGS will update this analysis for future time periods on or before May 20, 2015.

The text version of this information, focusing on the first week, is available at:

<http://earthquake.usgs.gov/earthquakes/eventproducts/us20002926/aftershock-advisory.pdf>

For more information on the Gorkha earthquake, including updates to this analysis visit:

<http://earthquake.usgs.gov/earthquakes/eventpage/us20002926>

Or, to get the most recent version of this analysis use:

<http://earthquake.usgs.gov/earthquakes/eventproducts/us20002926/aftershock-statistics.pdf>