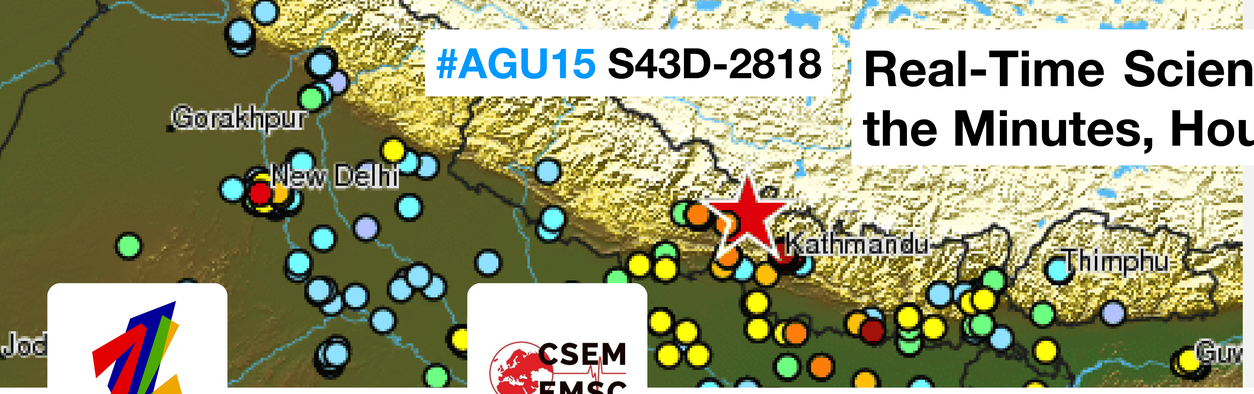

#AGU15 S43D-2818

Real-Time Science on Social Media: The Example of Twitter in the Minutes, Hours, Days after the 2015 M7.8 Nepal Earthquake

Scientific information on disasters such as earthquakes typically comes firstly from official organizations, news reports and interviews with experts, and later from scientific presentations and peer-reviewed articles. With the advent of the Internet and social media, this information is available in real-time from automated systems and within a dynamic, collaborative interaction between scientific experts, responders and the public.

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After the 25 April 2015, M7.8 Nepal (Gorkha) earthquake, Twitter Tweets from earth scientists included information, analysis, commentary and discussion on earthquake parameters (location, size, mechanism, rupture extent, high-frequency radiation, …), earthquake effects (distribution of felt shaking and damage, triggered seismicity, landslides, …), earthquake rumors (e.g. the imminence of a larger event) and other earthquake information and observations (aftershock forecasts, statistics and maps, source and regional tectonics, seismograms, GPS, InSAR, photos/videos, …). The timeline (*right*) shows a very limited selection of such Tweets.

Automated earthquake detection and analysis systems using seismometer networks, such as at the USGS, GFZ, and INGV (Early-est, *right*), can post messages within seconds to minutes of an earthquake occurring. Citizens help seismologists with postings of first hand experiences, but also when using social media and creating heavy traffic at earthquake websites, which seismologists monitor to produce rapid earthquake detections and for gathering early reports of damage and impact. A prime example of this is the EMSC @LastQuake Twitter feed (*right*), an automated "bot" combined with manual commentary, which often posts earthquake detections before those based on seismometer networks.

These posts are followed by input from scientists, which deepens and broadens as more information and analysis results become available. This process can help to rapidly identify areas of likely strong shaking and damage, aftershocks, §landslides, and other effects, and is particularly important for disaster response in areas of poor or lost communications.

In the future (while taking into account security, false or erroneous information and identity verification), collaborative, real-time science on social media after a disaster will give earlier and better scientific understanding and dissemination of public information, and enable improved emergency response and disaster management.

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Timeline | Tweets | Information content

Quake Origin

+10 min

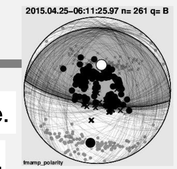
Anthony Lomax @ALomaxNet · Apr 25
EarlyEst @QuakeEarly
mb5.9 Mwp7.4 Mwpd7.5 **#earthquake Nepal** 2015.04.25-06:11:25UTC (28.2,84.6,1km) early-est.alomax.net
→ Automatic location 8min after origin indicates large magnitude of earthquake.

EMSC @LastQuake · Apr 25
Major **#earthquake** shakes **#Nepal** 8 min ago. More info at: emsc-csem.org/Earthquake/ear…
→ Automatic detection 8min after origin based on visits to EMSC web site.

EMSC @LastQuake · Apr 25
Major **#earthquake** shakes **Nepal** 18 min ago. Effects derived from witnesses' reports:
→ Intensity map based on online questionnaire (*final map shown at upper left*).

Dave Petley @davepetley · Apr 25
#nepal #earthquake now on USGS - M=7.5 at c12 km in Central **Nepal**. This is shallow so the impact will be very severe. earthquake.usgs.gov/earthquakes/ev
→ Expert opinion on shaking impact given shallow source depth.

Anthony Lomax @ALomaxNet · Apr 25
@QuakeEarly First-motion mechanism: shallow thrust faulting to North under Himalayas alomax.free.fr/projects/early…
→ Faulting mechanism available, interpretation of faulting type.



Eric Fielding @EricFielding · Apr 25
Early USGS NEIC mechanism for M7.5 **#earthquake** in **Nepal** is shallow strike-slip earthquake.usgs.gov/earthquakes/ev… No PAGER yet.
→ Discussion, interpretation of conflicting mechanism, faulting type.

Ken Hudnut @kwhudnut · Apr 25
Shallow M 7.9 (just revised) **earthquake** near Kathmandu, **Nepal**. Interactive map from USGS: earthquake.usgs.gov/earthquakes/ev…
→ Updated, M_{ww} 7.9 magnitude and thrust mechanism from USGS.

+1 hr

Dave Petley @davepetley · Apr 25
Valley-blocking landslides must be a very real worry after the **#Nepal #earthquake** We need to find these quickly as the monsoon approaches
→ Note on expected, important effects of earthquake shaking.

EMSC @LastQuake · Apr 25
Felt **#earthquake** M5.3 strikes 96 km E of #Kathmandu (**#Nepal**) 28 min ago. Please report to: emsc-csem.org/Earthquake/ear…
→ Continuing automatic detection and felt reports from aftershocks.

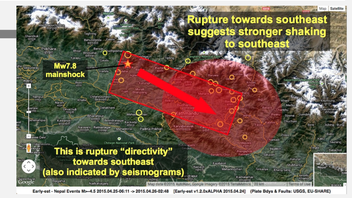
/a @amrit_sharma · Apr 25
VIDEO: Damage after 7.9 **#earthquake** in Kathmandu, **Nepal**. youtube.com/watch?v=1jpaYx…
→ Notifications of videos, first-hand reports – highly valuable for assessing event.

Ken Hudnut @kwhudnut · Apr 25
Nepal M 7.9 **earthquake** - USGS pager v.3 contains initial fatality & economic loss estimates. @USGSBigQuakes @USGS
→ Observation based, semi-automatic earthquake impact assessment available.

EwF @EwFProject · Apr 26
Areas most likely to be affected by landsliding in yesterday's #Nepalearthquake: see ewf.nerc.ac.uk/2015/04/25/nep…
→ Assessment and mapping of landslide hazard due to earthquake shaking.

+1 day

Anthony Lomax @ALomaxNet · Apr 26
Mw7.8 **#Nepal #earthquake** aftershocks suggests rupture zone, directivity and shaking intensity alomax.free.fr/posters/Nepal_…
→ Interpretation of rupture zone, directivity and possible areas of high shaking intensity.



Jascha Polet @CPPGeophysics · Apr 27
Cross-section through Himalayan thrust zone (from Lave et al., 2005), close to **Nepal earthquake**: earthjay.com/earthquakes/20…
→ Background geology and tectonics.

Jascha Polet @CPPGeophysics · Apr 27
Much discussion today: was **Nepal earthquake** repeat of 1833 event? However, clear that large "gap" remains to West. earthjay.com/earthquakes/20…
→ Relationship to previous major events.

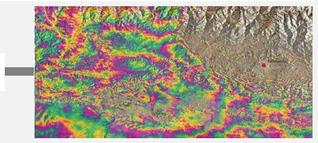
Anthony Lomax @ALomaxNet · Apr 27
Fault offset at 21-31s in drone footage #Kathmandu: could it be? Or large scale slumping? gu.com/p/47q79/stw ????
→ Interpretation of available observations.

Eric Fielding @EricFielding · Apr 28
@rrp447 Yes, it could be years to centuries but we know giant **earthquake** will strike W **Nepal** and N India @ManuelSintubin @TTremblingEarth
→ Respond to fear of more large events, emphasize non-predictability of quakes.

+1 week

Dave Petley @davepetley · Apr 29
#nepal #earthquake We're seeking stories/photos of landslide blocked roads/rivers (inc location, coordinates, geotagged photos) @EwFProject
→ Use of first-hand reports for rapid hazard analysis.

Tim Wright @timwright_leeds · Apr 29
Nepal earthquake on the radar esa.int/Our_Activities… via @esa
→ First InSAR images showing ground displacement.



Mike Oskin @mikeoskin · Apr 30
It's sobering for someone who studies active faults when a 7.8 has no surface rupture. climateandgeohazards.wordpress.com/2015/04/29/fir…
→ Interpretation and implications of results.

Jascha Polet @CPPGeophysics · May 1
Today's **Nepal earthquake** slip model update: added RADARSAT-2 data. Still preliminary. More to follow..
→ Sharing of ongoing rupture slip modeling results using diverse data sets.

+1 month

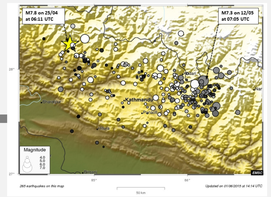
/a @amrit_sharma · May 3
I just published "'Villages completely flattened' in Sindupalchowk District of **Nepal**. But Why?" medium.com/amrit_sharma/v… **#earthquake #nepal**
→ Increasing evidence of strong shaking, devastation to NE of Kathmandu.

Eric Fielding @EricFielding · May 7
New release: NASA ARIA project analysis of radar shows Kathmandu area uplifted 5 feet by Gorkha, **Nepal Earthquake**
→ Interpretation of additional InSAR images.

EMSC @LastQuake · May 12
Powerful #quake shakes **#Nepal** 9 min ago. Damage cannot be excluded. Report info: emsc-csem.org/Earthquake/ear…
→ Automated detection of M7.3 aftershock.

+6 months

EMSC @LastQuake · Jun 25
#Nepal #Gorkha earthquake occurred exactly 2 months ago. More than 300 #aftershocks of magnitude 4 and above recorded
→ Update on earthquake sequence seismicity.



paleoseismicity @paleoseismicity · Oct 28
The latest **SRL** comes with a Focus Section on the 2015 #Gorkha, **Nepal**, #Earthquake srl.geoscienceworld.org/content/current #nepalquake
→ Detailed, peer-reviewed articles on Nepal quake.