

# Rapid collaborative knowledge building via Twitter after significant geohazard events

## Supplementary information

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Table S1: time table of main events, informations and preliminary geophysical results about the Palu earthquake and tsunami of September 2018.  
For each subject, we provide links, and posting time (UTC) of a choice of relevant tweets (non exhaustive list).

Important event, information or result	tweeted by	Time UTC	Day UTC	
Foreshock M6.1 (USGS loc and time)		07:00	2018-09-28	
<b>Main shock M7.5 (USGS loc and time)</b>		<b>10:02</b>	<b>2018-09-28</b>	
BMKG first tsunami alert	@infoBMKG	10:07	2018-09-28	<a href="https://twitter.com/infoBMKG/status/1045616058499923968">https://twitter.com/infoBMKG/status/1045616058499923968</a>
BMKG tweet main shock	@infoBMKG	10:09	2018-09-28	<a href="https://twitter.com/infoBMKG/status/1045616401891831808">https://twitter.com/infoBMKG/status/1045616401891831808</a>
Preliminary first motion mechanism: Strike-slip	@ALomaxNet	10:16	2018-09-28	<a href="https://twitter.com/ALomaxNet/status/1045618253652004864">https://twitter.com/ALomaxNet/status/1045618253652004864</a>
USGS tweet main shock	@USGSBigQuakes	10:20	2018-09-28	<a href="https://twitter.com/USGSBigQuakes/status/1045619235718742016">https://twitter.com/USGSBigQuakes/status/1045619235718742016</a>
BMKG release tsunami alert	@infoBMKG	10:36	2018-09-28	<a href="https://twitter.com/infoBMKG/status/1045623296509628416">https://twitter.com/infoBMKG/status/1045623296509628416</a> <a href="https://twitter.com/infoBMKG/status/1045626891808301056">https://twitter.com/infoBMKG/status/1045626891808301056</a>
Strike slip Moment tensor	e.g. @geoscope_IPGP	10:47	2018-09-28	e.g. <a href="https://twitter.com/geoscope_ipgp/status/1045626078314860544">https://twitter.com/geoscope_ipgp/status/1045626078314860544</a>
Seismotectonic context: strike slip rupture on Palu-Koro Fault, a major fault system with ~4cm/yr long term rate (comparable to San Andreas Fault)	several	12:00	2018-09-28	Several tweets between 11:45 and 12:30, e.g. <a href="https://twitter.com/RLacassin/status/1045648266958901248">https://twitter.com/RLacassin/status/1045648266958901248</a> <a href="https://twitter.com/CPGeophysics/status/1045651583206400001">https://twitter.com/CPGeophysics/status/1045651583206400001</a> <a href="https://twitter.com/RLacassin/status/1045650928404221952">https://twitter.com/RLacassin/status/1045650928404221952</a> <a href="https://twitter.com/janinekruppner/status/1045821889640247296">https://twitter.com/janinekruppner/status/1045821889640247296</a>
First viral videos of tsunami in Palu (unverified and validated at this time)	several	12:00	2018-09-28	Several tweets around 11:45-12:00, e.g. <a href="https://twitter.com/pmiichannel/status/1045641182884163584">https://twitter.com/pmiichannel/status/1045641182884163584</a> <a href="https://twitter.com/UKEQ_Bulletin/status/1045642913202475008">https://twitter.com/UKEQ_Bulletin/status/1045642913202475008</a> <a href="https://twitter.com/Ochi_Oc09/status/1045643781742026752">https://twitter.com/Ochi_Oc09/status/1045643781742026752</a>
Confirmation of tsunami, and official validation of viral videos	e.g. @AP quoting Indonesian agency, @janinekruppner, @Sutopo_PN	13:00	2018-09-28	From ~ 13:00 e.g. <a href="https://twitter.com/AP/status/1045661340029849600">https://twitter.com/AP/status/1045661340029849600</a> <a href="https://twitter.com/janinekruppner/status/1045700064243527680">https://twitter.com/janinekruppner/status/1045700064243527680</a> <a href="https://twitter.com/Sutopo_PN/status/1045718740208238592">https://twitter.com/Sutopo_PN/status/1045718740208238592</a> <a href="https://twitter.com/Sutopo_PN/status/1045724373884186625">https://twitter.com/Sutopo_PN/status/1045724373884186625</a>
Seimotectonic map showing past seismicity	@CPGeophysics	15:20	2018-09-28	e.g. <a href="https://twitter.com/CPGeophysics/status/1045694737049563144">https://twitter.com/CPGeophysics/status/1045694737049563144</a>
Tide gauges: very weak signal out of Palu bay - and not working at Pantaloan in the bay itself	e.g. @RLacassin	15:37	2018-09-28	<a href="https://twitter.com/RLacassin/status/1045699078301110274">https://twitter.com/RLacassin/status/1045699078301110274</a> <a href="https://twitter.com/RLacassin/status/1045699548486807552">https://twitter.com/RLacassin/status/1045699548486807552</a>
BMKG press release about tsunami alert and why they ended it	@infoBMKG	00:40	2018-09-29	<a href="https://twitter.com/infoBMKG/status/1045835591319871489">https://twitter.com/infoBMKG/status/1045835591319871489</a>
Synthetic poster about seismotectonic context and seismicity	@patton_cascadia	01:07	2018-09-29	<a href="https://twitter.com/patton_cascadia/status/1045842544729382913">https://twitter.com/patton_cascadia/status/1045842544729382913</a>
Hypothetic supershear rupture (will be confirmed later)	@ALomaxNet, @DocTerremoto			<a href="https://twitter.com/ALomaxNet/status/1045921879591198723">https://twitter.com/ALomaxNet/status/1045921879591198723</a> Will be confirmed later, e.g. <a href="https://twitter.com/DocTerremoto/status/1049159918849220610">https://twitter.com/DocTerremoto/status/1049159918849220610</a> and <a href="https://twitter.com/DocTerremoto/status/1052275076412952576">https://twitter.com/DocTerremoto/status/1052275076412952576</a>
Planet lab imagery suggests rupture right in Palu town	@SotisValkan	13:40	2018-09-29	<a href="https://twitter.com/SotisValkan/status/1046031899460857856">https://twitter.com/SotisValkan/status/1046031899460857856</a>
1st rough Planet lab satellite image correlation (SIC) reveals fault rupture in Palu (results will become viral)	@SotisValkan	14:04	2018-09-29	<a href="https://twitter.com/SotisValkan/status/1046037887811121152">https://twitter.com/SotisValkan/status/1046037887811121152</a>
Videos of dramatic surface spreading / liquefaction (will become viral) - and discussion	e.g. @janinekruppner, @patton_cascadia	15:33	2018-09-29	e.g. <a href="https://twitter.com/janinekruppner/status/1046060393871945732">https://twitter.com/janinekruppner/status/1046060393871945732</a> (and following thread) - <a href="https://twitter.com/patton_cascadia/status/1046086847246544901">https://twitter.com/patton_cascadia/status/1046086847246544901</a> <a href="https://twitter.com/davepetley/status/1046651448128417792">https://twitter.com/davepetley/status/1046651448128417792</a>
<b>About 1 day after earthquake, we already know:</b>	Earthquake on Palu-Koro fault system, with sharply localised strike-slip rupture in Palu town itself - Rupture enters the bay N of Palu (but it's uncertain how it prolongates offshore and northward) - Aftershock zone extend for ~150km in N-S direction, main shock near its N tip - Tsunami with run-up of several meters in Palu bay (and not out of the bay), dramatic surface spreading and liquefaction in and SE of Palu town			
State of the art SIC: localized strike-slip rupture in Palu with ~5m of coseismic slip (will become viral)	@SotisValkan	09:52	2018-09-30	<a href="https://twitter.com/SotisValkan/status/1046337001572749313">https://twitter.com/SotisValkan/status/1046337001572749313</a> -
Updated SIC map of rupture in Palu and displacement profile	@SotisValkan	16:10	2018-09-30	<a href="https://twitter.com/SotisValkan/status/1046401895131222017">https://twitter.com/SotisValkan/status/1046401895131222017</a> <a href="https://twitter.com/SotisValkan/status/1046396026435850240">https://twitter.com/SotisValkan/status/1046396026435850240</a>
Polemics in international medias and social networks about tsunami warning	Several	06:00	2018-10-01	e.g. <a href="https://twitter.com/stevenjibbons/status/1046646734993190912">https://twitter.com/stevenjibbons/status/1046646734993190912</a> <a href="https://twitter.com/SquigglyVolcano/status/1046812928488411136">https://twitter.com/SquigglyVolcano/status/1046812928488411136</a> <a href="https://twitter.com/RLacassin/status/1046765896583303168">https://twitter.com/RLacassin/status/1046765896583303168</a>
Geoscientists answer on tsunami warning polemics	Several	09:00	2018-10-01	e.g. <a href="https://twitter.com/ALomaxNet/status/1046655205180403712">https://twitter.com/ALomaxNet/status/1046655205180403712</a> <a href="https://twitter.com/RLacassin/status/1046657674480406528">https://twitter.com/RLacassin/status/1046657674480406528</a> <a href="https://twitter.com/RLacassin/status/1046659678044925952">https://twitter.com/RLacassin/status/1046659678044925952</a> <a href="https://twitter.com/structuregeo/status/1046663126366609408">https://twitter.com/structuregeo/status/1046663126366609408</a>
Satellite imagery: surface spreading / liquefaction (confirmed by video footage), and tsunami impact	e.g. @davepetley @StefLhermite	12:24	2018-10-01	e.g. <a href="https://twitter.com/davepetley/status/1046767725295673344">https://twitter.com/davepetley/status/1046767725295673344</a> <a href="https://twitter.com/StefLhermite/status/1046738656063614978">https://twitter.com/StefLhermite/status/1046738656063614978</a> <a href="https://twitter.com/StefLhermite/status/1046909782915977218">https://twitter.com/StefLhermite/status/1046909782915977218</a>
Map of coseismic displacement now for 20km south of Palu (from Planet lab SIC)	@SotisValkan	17:44	2018-10-01	<a href="https://twitter.com/SotisValkan/status/1046818189349462016">https://twitter.com/SotisValkan/status/1046818189349462016</a> <a href="https://twitter.com/SotisValkan/status/1046671425053093888">https://twitter.com/SotisValkan/status/1046671425053093888</a>
Surface spreading measured with SIC	@SotisValkan	10:09	2018-10-02	<a href="https://twitter.com/SotisValkan/status/1047065964314005508">https://twitter.com/SotisValkan/status/1047065964314005508</a> then, on Oct. 10, <a href="https://twitter.com/SotisValkan/status/1049979122129260544">https://twitter.com/SotisValkan/status/1049979122129260544</a>
Wider SIC map from Sentinel2 imagery: rupture extends >50km south of Palu	@SotisValkan	16:45	2018-10-02	<a href="https://twitter.com/SotisValkan/status/1047165698542383104">https://twitter.com/SotisValkan/status/1047165698542383104</a>

Important event, information or result	tweeted by	Time UTC	Day UTC	
SIC with Landsat images: confirms sharp rupture extending 65-85km S of Palu	@TTremblingEarth	18:11	2018-10-02	<a href="https://twitter.com/TTremblingEarth/status/1047187334326902785">https://twitter.com/TTremblingEarth/status/1047187334326902785</a>
First INSAR interferogram (from ALOS2 satellite) covering whole rupture	@planet_mech	19:21	2018-10-02	<a href="https://twitter.com/planet_mech/status/1047204981709754368">https://twitter.com/planet_mech/status/1047204981709754368</a>
				<a href="https://twitter.com/planet_mech/status/1047282079229079552">https://twitter.com/planet_mech/status/1047282079229079552</a>
				<a href="https://twitter.com/EricFielding/status/1047287623352553472">https://twitter.com/EricFielding/status/1047287623352553472</a>
				<a href="https://twitter.com/EricFielding/status/1047238304410755072">https://twitter.com/EricFielding/status/1047238304410755072</a>
Aerial video footage of massive surface spreading and destructions SE of Palu	@Sutopo_PN	21:16	2018-10-02	<a href="https://twitter.com/Sutopo_PN/status/1047233769541853184">https://twitter.com/Sutopo_PN/status/1047233769541853184</a>
Tide gauge record in Pantaloan now available. Tsunami 1st arrival only few minutes after earthquake, ~2m height	@marufins @ALomaxNet @RLacassin	12:45	2018-10-03	<a href="https://twitter.com/marufins/status/1047467798996242433">https://twitter.com/marufins/status/1047467798996242433</a>
				<a href="https://twitter.com/ALomaxNet/status/1047478168175763456">https://twitter.com/ALomaxNet/status/1047478168175763456</a>
				<a href="https://twitter.com/RLacassin/status/1047481324733386752">https://twitter.com/RLacassin/status/1047481324733386752</a>
				<a href="https://twitter.com/ALomaxNet/status/1047479081556742144">https://twitter.com/ALomaxNet/status/1047479081556742144</a>
Complete SIC map (Sentinel2 imagery): rupture stepping onshore E of Palu bay; imply complex connection across the bay. Epicenter at N tip of rupture.	@SotisValkan	15:57	2018-10-03	<a href="https://twitter.com/SotisValkan/status/1047515941570007042">https://twitter.com/SotisValkan/status/1047515941570007042</a>
				then, 15 days later a preliminary report is posted: <a href="https://twitter.com/SotisValkan/status/1053238164679204864">https://twitter.com/SotisValkan/status/1053238164679204864</a>
				Report: <a href="https://zenodo.org/record/1467128">https://zenodo.org/record/1467128</a>
Validated INSAR interferogram, and along-track displacement map, covering whole rupture (from ALOS2 satellite)	@GSI_chiriin	09:53	2018-10-05	<a href="https://twitter.com/GSI_chiriin/status/1048149205481472000">https://twitter.com/GSI_chiriin/status/1048149205481472000</a>
				<a href="http://www.gsi.go.jp/cais/topic181005-index-e.html">http://www.gsi.go.jp/cais/topic181005-index-e.html</a>
<b>Known and unknown 8 days after earthquake:</b>	Earthquake ruptured two strands of Palu-Koro fault system for a total length of ~150km. One strand S of Palu bay, with extremely sharp localized surface rupture and sinistral offsets of ~5m. It crosses Palu town and enters the bay to the N. But the rupture does not continue straight northward, but steps eastward to continue inland. Earthquake rupture started to the N at epicenter and propagated unilateral southward, likely at supershear rate. Massive surface spreading is documented from satellite imagery. Tsunami waves hit Palu bay coast few minutes after earthquake. Polemics about a "failed" tsunami warning is vain.			
First results of surface rupture field survey by Indonesian geologists	@pamumpuni	20:42	2018-10-13	e.g. <a href="https://twitter.com/pamumpuni/status/1051211619781361664">https://twitter.com/pamumpuni/status/1051211619781361664</a>
				<a href="https://twitter.com/pamumpuni/status/1050351296111243264">https://twitter.com/pamumpuni/status/1050351296111243264</a>

Link to tweets from 2018 Sept 28 to Oct 5	
<b>Ampuero P.</b>	<a href="https://twitter.com/search?q=(from%3AAdocterremoto)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3AAdocterremoto)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Daryono D.</b>	<a href="https://twitter.com/search?q=(from%3ADaryonoBMKG)%20until%3A2018-10-08%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3ADaryonoBMKG)%20until%3A2018-10-08%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Desianto F.W.</b>	<a href="https://twitter.com/search?q=(from%3ATDesiantoFW)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3ATDesiantoFW)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Elliott A.</b>	<a href="https://twitter.com/search?q=(from%3ATTremblingEarth)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3ATTremblingEarth)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Fielding E.</b>	<a href="https://twitter.com/search?q=(from%3AEricFielding)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3AEricFielding)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Gabriel A.A.</b>	<a href="https://twitter.com/search?q=(from%3Ainseismoland)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3Ainseismoland)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Gombert B.</b>	<a href="https://twitter.com/search?q=(from%3ABaptisteGomb)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3ABaptisteGomb)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Gurney J.</b>	<a href="https://twitter.com/search?q=(from%3AUKEQ_Bulletin)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3AUKEQ_Bulletin)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Hudnut K.</b>	<a href="https://twitter.com/search?q=(from%3Akwhudnut)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3Akwhudnut)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Krippner J.</b>	<a href="https://twitter.com/search?q=(from%3AjanineKrippner)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3AjanineKrippner)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Lacassin R.</b>	<a href="https://twitter.com/search?q=(from%3ARLacassin)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3ARLacassin)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Muh Ma'rufin Sudiby</b>	<a href="https://twitter.com/search?q=(from%3Amarufins)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3Amarufins)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Lomax A.</b>	<a href="https://twitter.com/search?q=(from%3Aalomaxnet)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3Aalomaxnet)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Pamumpuni A.</b>	<a href="https://twitter.com/search?q=(from%3Apamumpuni)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3Apamumpuni)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Patton J.</b>	<a href="https://twitter.com/search?q=(from%3Apatton_cascadia)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3Apatton_cascadia)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Petley D.</b>	<a href="https://twitter.com/search?q=(from%3Adavepetley)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3Adavepetley)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>
<b>Valkanotis S.</b>	<a href="https://twitter.com/search?q=(from%3ASotisValkan)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live">https://twitter.com/search?q=(from%3ASotisValkan)%20until%3A2018-10-05%20since%3A2018-09-28&amp;src=typed_query&amp;f=live</a>

Table 2: Non exhaustive list of academic or citizen scientists involved in geophysical discussions on twitter about the Palu earthquake and tsunami. For each person, the respective link uses twitter search syntax to give access to her/his tweeter feed in the days after the earthquake (from 2018 Sept28 to Oct05). These threads include exchanges between scholars, but also explanations toward the public and media people (including local people in Indonesia).