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# Rapid collaborative knowledge building via Twitter after significant geo-hazard events

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Table S1: Time table of main events, information and preliminary geophysical results about the Palu earthquake and tsunami of 28 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 (@nnn refers to twitter account) | Time posted (hh:mm UTC) | Day posted (UTC) | |
|---|---|---|---|---|
| | | | | |
| **Foreshock M6.1 (USGS loc and time)** | | 07:00 | 28.09.2018 | |
| **Main shock M7.5 (USGS loc and time)** | | 10:02 | 28.09.2018 | |
| **BMKG first tsunami alert** | @infoBMKG | 10:07 | 28.09.2018 | https://twitter.com/infoBMKG/status/1045616058499923968 |
| **BMKG tweet main shock** | @infoBMKG | 10:09 | 28.09.2018 | https://twitter.com/infoBMKG/status/1045616401891831808 |
| **Preliminary first motion mechanism: Strike-slip** | @ALomaxNet | 10:16 | 28.09.2018 | https://twitter.com/ALomaxNet/status/1045618253652004864 |
| **USGS tweet main shock** | @USGSBigQuakes | 10:20 | 28.09.2018 | https://twitter.com/USGSBigQuakes/status/1045619235718742016 |
| **BMKG cancel tsunami alert** | @infoBMKG | 10:36 | 28.09.2018 | https://twitter.com/infoBMKG/status/1045623296509628416 |
| | | | | https://twitter.com/infoBMKG/status/1045626891808301056 |
| **Strike-slip Moment tensor** | e.g. @geoscope_IPGP | 10:47 | 28.09.2018 | e.g. https://twitter.com/geoscope_ipgp/status/1045626078314860544 |
| **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 | 28.09.2018 | Several tweets between 11:45 and 12:30, e.g. https://twitter.com/RLacassin/status/1045648266958901248 |
| | | | | https://twitter.com/CPPGeophysics/status/1045651583206400001 |
| | | | | https://twitter.com/RLacassin/status/1045650928404221952 |
| | | | | https://twitter.com/janinekrippner/status/1045821889640247296 |
| **First viral videos of tsunami in Palu (unverified and unvalidated at this time)** | several | 12:00 | 28.09.2018 | Several tweets around 11:45-12:00, e.g. https://twitter.com/pmiichannel_/status/1045641182884163584 |
| | | | | https://twitter.com/UKEQ_Bulletin/status/1045642913202475008 |
| | | | | https://twitter.com/Ochi_Oc09/status/1045643781742026752 |
| **Confirmation of tsunami, and official validation of viral videos** | e.g. @AP quoting Indonesian agency, @janinekrippner, @Sutopo_PN | 13:00 | 28.09.2018 | From ~ 13:00 e.g. https://twitter.com/AP/status/1045661340029849600 |
| | | | | https://twitter.com/janinekrippner/status/1045700064243527680 |
| | | | | https://twitter.com/Sutopo_PN/status/1045718740208238592 |
| | | | | https://twitter.com/Sutopo_PN/status/1045724373884186625 |
| **Seimotectonic map showing past seismicity** | @CPPGeophysics | 15:20 | 28.09.2018 | e.g. https://twitter.com/CPPGeophysics/status/1045694737049563144 |
| **Tide gauges: very weak signal out of Palu bay - and not working at Pantaloan in the bay itself** | e.g. @RLacassin | 15:37 | 28.09.2018 | https://twitter.com/RLacassin/status/1045699078301110274 |
| | | | | https://twitter.com/RLacassin/status/1045699548486807552 |
| **BMKG press release about tsunami alert and why they ended it** | @infoBMKG | 00:40 | 29.09.2018 | https://twitter.com/infoBMKG/status/1045835591319871489 |
| **Synthetic poster about seismotectonic context and seismicity** | @patton_cascadia | 01:07 | 29.09.2018 | https://twitter.com/patton_cascadia/status/1045842544729382913 |
| **Supershear rupture hypothesized (will be confirmed later)** | @ALomaxNet, @DocTerremoto | | | https://twitter.com/ALomaxNet/status/1045921879591198723 |
| | | | | Will be confirmed later, e.g. https://twitter.com/DocTerremoto/status/1049159918849220610 |
| | | | | and https://twitter.com/DocTerremoto/status/1052275076412952576 |
| **Planet Labs imagery suggests rupture right in Palu town** | @SotisValkan | 13:40 | 29.09.2018 | https://twitter.com/SotisValkan/status/1046031899460857856 |
| **1st rough Planet Labs satellite image correlation (SIC) reveals fault rupture in Palu (results will become viral)** | @SotisValkan | 14:04 | 29.09.2018 | https://twitter.com/SotisValkan/status/1046037887811121152 |
| **Videos of dramatic surface spreading / liquefaction (will become viral) - and discussion** | e.g. @janinekrippner, @patton_cascadia | 15:33 | 29.09.2018 | e.g. https://twitter.com/janinekrippner/status/1046060393871945732 (and following thread) - |
| | | | | https://twitter.com/patton_cascadia/status/1046086847246544901 |
| | | | | https://twitter.com/davepetley/status/1046651448128417792 |
| **About 1 day after earthquake, we already know:** | 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 | 30.09.2018 | https://twitter.com/SotisValkan/status/1046337001572749313 - |
| **Updated SIC map of rupture in Palu and displacement profile** | @SotisValkan | 16:10 | 30.09.2018 | https://twitter.com/SotisValkan/status/1046401895131222017 |
| | | | | https://twitter.com/SotisValkan/status/1046396026435850240 |
| **Discussion in international media and social networks about a "failed" tsunami warning** | Several | 06:00 | 01.10.2018 | e.g. https://twitter.com/stevenjgibbons/status/1046646734993190912 |
| | | | | https://twitter.com/SquigglyVolcano/status/1046812928488411136 |
| | | | | https://twitter.com/RLacassin/status/1046765896583303168 |
| **Geoscientists explain that tsunami warning was very difficult in the case of the Palu earthquake** | Several | 09:00 | 01.10.2018 | e.g. https://twitter.com/ALomaxNet/status/1046655205180403712 |
| | | | | https://twitter.com/RLacassin/status/1046657674480406528 |
| | | | | https://twitter.com/RLacassin/status/1046659678044925952 |
| | | | | https://twitter.com/structuregeo/status/1046663126366609408 |
| **Satellite imagery: surface spreading / liquefaction (confirmed by video footage), and tsunami impact** | e.g. @davepetley @StefLhermite | 12:24 | 01.10.2018 | e.g. https://twitter.com/davepetley/status/1046767725295673344 |
| | | | | https://twitter.com/StefLhermitte/status/1046738656063614978 |
| | | | | https://twitter.com/StefLhermitte/status/1046909782915977218 |
| **Map of coseismic displacement now for 20km south of Palu (from Planet Labs SIC)** | @SotisValkan | 17:44 | 01.10.2018 | https://twitter.com/SotisValkan/status/1046818189349462016 |
| | | | | https://twitter.com/SotisValkan/status/1046671425053093888 |

| Important event, information or result | Tweeted by (@nnn refers to twitter account) | Time posted (hh:mm UTC) | Day posted (UTC) | |
|---|---|---|---|---|
| **Surface spreading measured with SIC** | @SotisValkan | 10:09 | 02.10.2018 | https://twitter.com/SotisValkan/status/1047065964314005508 |
| | | | | then, on Oct. 10, https://twitter.com/SotisValkan/status/1049979122129260544 |
| **Wider SIC map from Sentinel2 imagery: rupture extends >50km south of Palu** | @SotisValkan | 16:45 | 02.10.2018 | https://twitter.com/SotisValkan/status/1047165698542383104 |
| **SIC with Landsat images: confirms sharp rupture extending 65-85km S of Palu** | @TTremblingEarth | 18:11 | 02.10.2018 | https://twitter.com/TTremblingEarth/status/1047187334326902785 |
| **First INSAR interferogram (from ALOS2 satellite) covering whole rupture** | @planet_mech | 19:21 | 02.10.2018 | https://twitter.com/planet_mech/status/1047204981709754368 |
| | | | | https://twitter.com/planet_mech/status/1047282079229079552 |
| | | | | https://twitter.com/EricFielding/status/1047287623352553472 |
| | | | | https://twitter.com/EricFielding/status/1047238304410755072 |
| **Aerial video footage of massive surface spreading and destruction SE of Palu** | @Sutopo_PN | 21:16 | 02.10.2018 | https://twitter.com/Sutopo_PN/status/1047233769541853184 |
| **Tide gauge record in Pantaloan now available. Tsunami 1st arrival only few minutes after earthquake, ~2m height** | @marufins<br>@ALomaxNet<br>@RLacassin | 12:45 | 03.10.2018 | https://twitter.com/marufins/status/1047467798996242433 |
| | | | | https://twitter.com/ALomaxNet/status/1047478168175763456 |
| | | | | https://twitter.com/RLacassin/status/1047481324733386752 |
| | | | | https://twitter.com/ALomaxNet/status/1047479081556742144 |
| **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 | 03.10.2018 | https://twitter.com/SotisValkan/status/1047515941570007042 |
| | | | | then, 15 days later a preliminary report is posted: https://twitter.com/SotisValkan/status/1053238164679204864 |
| | | | | Report: https://zenodo.org/record/1467128 |
| **Validated InSAR interferogram, and along-track displacement map, covering whole rupture (from ALOS2 satellite)** | @GSI_chiriin | 09:53 | 05.10.2018 | https://twitter.com/GSI_chiriin/status/1048149205481472000 |
| | | | | http://www.gsi.go.jp/cais/topic181005-index-e.html |
| **Known and unknown 8 days after earthquake:** | 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. Rupture does not continue straight northward, but steps eastward to continue inland. Earthquake rupture started to the N at hypocenter and propagated southward, likely at supershear rate. Massive surface spreading is documented from satellite imagery. Tsunami waves hit Palu bay coast few minutes after earthquake. Tsunami warning was very difficult in the case of the Palu earthquake | | | |
| **First results of surface rupture field survey by Indonesian geologists** | @pamumpuni | 20:42 | 13.10.2018 | e.g. https://twitter.com/pamumpuni/status/1051211619781361664 |
| | | | | https://twitter.com/pamumpuni/status/1050351296111243264 |

Table S1

| | Link to tweets from 2018 Sept 28 to Oct 5 |
|---|---|
| **Ampuero P.** | https://twitter.com/search?q=(from%3Adocterremoto)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Daryono D.** | https://twitter.com/search?q=(from%3ADaryonoBMKG)%20until%3A2018-10-08%20since%3A2018-09-28&src=typed_query&f=live |
| **Desianto F.W.** | https://twitter.com/search?q=(from%3ATDesiantoFW)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Elliott A.** | https://twitter.com/search?q=(from%3ATTremblingEarth)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Fielding E.** | https://twitter.com/search?q=(from%3AEricFielding)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Gabriel A.A.** | https://twitter.com/search?q=(from%3Ainseismoland)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Gombert B.** | https://twitter.com/search?q=(from%3ABaptisteGomb)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Gurney J.** | https://twitter.com/search?q=(from%3AUKEQ_Bulletin)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Hudnut K.** | https://twitter.com/search?q=(from%3A%40HudnutKen)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Krippner J.** | https://twitter.com/search?q=(from%3AjanineKrippner)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Lacassin R.** | https://twitter.com/search?q=(from%3ARLacassin)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Muh Ma'rufin Sudibyo** | https://twitter.com/search?q=(from%3Amarufins)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Lomax A.** | https://twitter.com/search?q=(from%3Aalomaxnet)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Pamumpuni A.** | https://twitter.com/search?q=(from%3Apamumpuni)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Patton J.** | https://twitter.com/search?q=(from%3Apatton_cascadia)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Petley D.** | https://twitter.com/search?q=(from%3Adavepetley)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |
| **Valkaniotis S.** | https://twitter.com/search?q=(from%3ASotisValkan)%20until%3A2018-10-05%20since%3A2018-09-28&src=typed_query&f=live |

Table S2: 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 tweet's 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).

# Table S2