Real-World Advances in Forecasting ‘Significant’ Earthquakes (Part 1)
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HIGHLIGHTS:
- Recent studies of pre-seismic signals were combined into one model and put into practice
- Model forecasted the location of nine M6+ earthquakes in a row (one-in-a-million chance)
- 5-25% of active faults were identified (daily) as most at-risk for M6+ earthquakes with 78.9% accuracy

Foreknowledge of earthquakes dates back to the very first recognition of an aftershock that was caused by a preceding large earthquake nearby. Since then, foreshocks and other phenomena like ‘earthquake lights’, ground ion emission, and changes total electron content in the atmosphere (TEC) have been recognized as legitimate precursor events to some large earthquakes, but efforts to determine which earthquakes and signals will lead to larger ones soon afterwards have fallen short, and active earthquake forecasting remains largely outside of the mainstream lexicon of geophysics.

One of the models to demonstrate success in correctly identifying foreshocks and pre-volcanic eruption signals describes how deep earthquakes in the mantle can influence the crust, through a process known as seismic energy transmigration (Blot, 1976; Blot, 1963). Other studies have identified similar patterns in foreshock behavior prior to large seismic events (Choi and Casey, 2015; Gregori, 2015; Blot, Choi and Grover, 2003; Grover, 1974; Grover, 1967) or recognized other patterns in how some earthquakes trigger subsequent events (Giacco et al., 2015; Whiteside and Ben-Zion, 1995).

In addition to subterranean pre-seismic signals, recent studies have identified numerous atmospheric, ionospheric, magnetospheric, and geospace signals that have preceded large earthquakes. Anomalies in charged particle counts, field characteristics and radio signals associated with L-shells have been detected before earthquakes [Hayakawa, 2016; Khachikyan et al., 2014; Fidani et al., 2010], along with other fluctuations of earth’s magnetic field. [Scoville, 2015; Johnston, 1994]. There is a growing body of work on the electromagnetic precursors to earthquakes, and on electric coupling between the ground, atmosphere and ionosphere. [Davidson, Holloman, U-yen, 2015; Davidson, 2015; Pulinets, 2014; Kamogawa, 2013; Namgaladze, 2013; Yao, 2012; Zolotov, 2010; Namgaladze, 2009; Rycroft, 2006; Sorokin, 2006; among others].

Studies of crustal resistivity can give clues to the structure of the fault, and many fault zones contain low resistivity crustal contents. [Iidaka et al., 2015; Morrow et al., 2015; Becken et al., 2011]. Models of the earth’s crust as a capacitor [Namgaladze, 2013; Ustundag et al., 2005; Hill, 1971] allow fluctuations of the planetary global electric circuit (GEC) and magnetic system to complement known mechanisms for the production of electric currents and other
electromagnetic signals before and during earthquakes, specifically via space weather modulation of geomagnetism, ground currents, and various aspects of the GEC. Many of these works, including those previously mentioned on subterranean signals, have been combined to develop the model of forecasting M6 or larger seismicity.

The various models and methods were analyzed in the times since their publication, and some of the most robust factors for forecasting M6 or larger seismic events were selected for real-world testing. These factors, compared against regional earthquake history, include the location of atmospheric pressure systems, 36 hour rainfall, weekly outgoing longwave radiation anomalies (OLR), heliographic longitude of solar coronal holes, and deep earthquakes at depths identified by Blot, which echo the introduction of solar energy into the global electric circuit and the geomagnetic system- we have termed these deep earthquakes “Blot echoes”.

The factors are regularly analyzed, and regions of earth subject to seismic alert are noted on Twitter (Ben@TheRealS0s) and are recorded at QuakeWatch.net. Twitter was chosen to publicly preserve the forecasts, with automatically generated timestamps for each posting by a 3rd party (Twitter), and which was publicly accessible and likely to be seen (the Twitter user has +12,000 ‘followers’ and postings were shared on other social media with ~300,000 unique members, followers, subscribers, etc.). The earthquake forecasting and results are described below, and permanently recorded with daily updates. (Davidson, 2016).

The goal of this communication is to demonstrate the usefulness of the methods used in these efforts, in the hopes that appropriate authorities may use them to save lives.

Model Testing and Evolution

The forecasting began at 1502 UTC on November 8, 2015, when the following alert was posted: “QUAKE NEWS: OLR earthquake precursors Sumatra, Vietnam, Japan. Chile may have more aftershocks as well.” While Chile might have expected aftershocks from a recent event, model factors suggested that M6 or larger earthquake potential existed at Sumatra, Vietnam and Japan, with a seven day alert period. A M6.6 earthquake struck Sumatra at 1647 UTC on November 8, 2015, just 105 minutes after the posting, and a M6.7 earthquake struck Japan on November 13, 2015, five days after the posting.

The second alert posted on November 10, 2015, stating: “Chile/Peru have OLR anomalies and TEC/Ionospheric anomalies. Local Quake Watch Issued Through November 19th. M5.9 - M6.9.” Two M6.9 earthquakes struck Chile on November 11, 2015. The next three forecasts failed to produce any success; the alerts included Sumatra (November 11, 2015), Central America and China (November 13, 2015), and Greece and Turkey (November 18, 2015).

The sixth forecast placed Southern Central America and Northern South America on alert on November 20, 2015. This was the largest alert zone posted to date. On November 24, 2015, four days later, two M7.6 earthquakes struck Brazil and Peru.
The occurrence of the earthquakes on November 24, 2015 marked the end of our “Two-Week Forecasting Trial Period,” which included the seven days following the final watch, for a three-week results period. Table 1 shows the largest nine seismic events of the three weeks.

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<th>Location</th>
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<td>Brazil</td>
<td>Hit (Forecast 6)</td>
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<tr>
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<td>6.9</td>
<td>Nov.11.2015</td>
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<td>No Above-Ground Signal</td>
</tr>
<tr>
<td>6.7</td>
<td>Nov.13.2015</td>
<td>Japan</td>
<td>Hit (Forecast 1)</td>
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<td>Nov.8.2015</td>
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<td>Nov.9.2015</td>
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</table>

Table 1: The magnitude, date, location, and whether the earthquake was forecast is listed.

The first six forecasts and resulting earthquakes occurred from November 8, 2015 to November 24, 2015, and only used signals above the ground. Two other M6 earthquakes occurred during that time, a M6.1 in Indonesia and a M6.0 in Northern Mariana Islands, and neither was a hit for any forecast made. Six of the seven largest seismic events were forecast. After this time, a nine-month period of re-analysis and inclusion of subterranean factors (Blot echoes) into the model occurred. The model was placed into practice again on August 11, 2016.

On August 11, 2016, the only warning not to appear on twitter occurred. In an episode of the author’s daily YouTube program, titled “Space Weather, Earthquake Watch: S0 News Aug.11.2016”, the southwest Pacific regions were placed on alert. This generally refers to the region of New Zealand, Fiji, Tonga, Samoa, Vanuatu, New Caledonia and far eastern Papua New Guinea. On August 12, 2016, a M7.1 struck New Caledonia and a M6.2 struck Fiji.

The eighth forecast was made September 7, 2016, and for the first time, an alert map was used to visually clarify the regions on alert. The posting can be seen in Figure 1, with all the focus on the northwestern portion of South America. This alert posting was followed two M6 or larger earthquakes in the following seven days.
Ecuador to N.Chile has pre-quake signals, higher chance of M6+ within 7-days. Crude risk-zone pictured.
The ninth forecast occurred on September 15, 2016, was a four-day alert only, and one M6 earthquake struck within the highest alert zone. The alert is pictured in Figure 2.

**Earthquake Alert Zones. 4-day alert only. Areas have OLR & Blot potential. S.Chile/S.Atlantic have OLR only.**

![Alert maps posted September 15, 2016. A M6 struck Vanuatu on September 17, 2016.](image)

There was a \( \sim 14\% \) probability of a M6 or larger earthquake striking the red, orange, or yellow alert zones within four days, and a \( \sim 8\% \) probability of a M6 or larger earthquake striking the red alert zones within four days. This event ended the last testing period of the model. The M6 was the only M6 or larger event of the 4-day alert period. Another short period (25 days) of model re-analysis took place from September 18, 2016 to October 10, 2016, wherein only one alert was posted, on October 1, 2016, and there were no M6 or larger earthquakes successfully forecast.

On October 11, 2016, the model began providing two to five day alert periods, and began updating the alert zones almost daily, seeking only M6 or larger main earthquakes that the USGS also considers to be 'significant', per their published definition. After posting alerts for two to seven day periods in the first year of forecasting (November 8, 2015 - November 7, 2016), year two sought to make constant account of risk potential by posting alerts every 4 to 24 hours. Once a M6+ earthquake occurs, only the most-recently posted alert would count as the alert for the time of the earthquake. This 'most-recent' rule was employed to simplify understanding of which areas of earth were on alert and which were no longer at risk. With this method, it would theoretically be possible to put Washington D.C. on alert, have five M5.9 earthquakes strike, a
M6.4 in Georgia, and then 1 hour after the alert is lifted, a M6.6 occurs in D.C., and our model would technically have zero success for the period. This restrictive view of success was made to remove any question as to whether a forecast was successful. A practical difference between years one and two is that year one comprised of specific predictions of a M6 or larger earthquake to occur, and year two has sought to post the most at-risk areas each day, regardless of magnitude prediction that day.

The following figures and explanations detail each M6+ “significant” earthquake that occurred from October 15, 2016 through December 20, 2016, some other notable earthquakes in the period, and a summary of the results. The information is communicated as the model progress dictates; the occurrence of an earthquake, followed by the comparison with the most recent alert regions.

October 15, 2016 - M6.3 in Papua New Guinea: Hit (1 for 1)

Figure 3: Location of M6.3 earthquake on October 15, 2016 (top), most-recent official alert map posted (middle), and the highly active seismic areas not on alert at that time (bottom). The alerted regions comprised ~25% of the ring of fire, and ~10% of earth’s most active faults. Notable regions not on alert (in white): Japan, Banda Sea region, most of South America, the islands of the southwest Pacific Ocean (Fiji, Tonga, Vanuatu, Solomon Is., Samoa, Kermadec Is., New Caledonia). This earthquake struck the northernmost fault of Papua New Guinea.
October 17, 2016 - M6.8 in Papua New Guinea: Miss (1 for 2)

Figure 4: Location of M6.8 earthquake on October 17, 2016 (top), most-recent official alert map posted (bottom). This was a “mini-watch” map, and while no official redline map had yet been posted since the previous map, Papua New Guinea was not included in this forward-looking map, and therefore counts as a miss. Of note, the previous earthquake (M6.3 in same region) was deep enough to count as a Blot echo for this event, but other regions of the world had similar/stronger signals, it was determined (incorrectly) that the M6.3 had relieved the pressure in the region. This earthquake struck the fault lines running along the southern coast of Papua New Guinea.
October 19, 2016 - M6.6 in Indonesia: Hit (2 for 3)

Figure 5: Location of M6.6 earthquake on October 19, 2016 (top), most-recent official alert posted (bottom). Notable regions not on alert: Japan, the entire Americas, the islands of the southwest Pacific. These countries cover ~10% of the ring of fire.

On October 18, 2016, there was only one region of the world displaying pre-seismic signals (similar to the alert posted September 7, 2016), and no map was posted.

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No new map, global factors are moderate only. Minor blot activity in Philippines/Indonesia.
October 21, 2016 - M6.2 in Japan: Hit (3 for 4)

Figure 6: Location of M6.2 earthquake on October 21, 2016 (top), most-recent official alert map posted (bottom). The alerted regions covered ~12% of the ring of fire. Notable regions not on alert: Philippines, most of South America, the islands of the southwest Pacific Ocean (Fiji, Tonga, Vanuatu, Solomon Is., Samoa, Kermadec Is.), most of Indonesia.
Figure 8: Location of M6.6 earthquake on October 30, 2016 (top), most-recent official alert map posted (bottom). The alerted regions covered ~20-25% of the ring of fire, and ~12% of the most active fault worldwide. Notable regions not on alert: Japan, most of Indonesia, North and Central America, the islands of the southwest Pacific. This map was the first use of the alert star (pictured over Italy), which is meant to signify not-only pe-earthquake signals, but an actual prediction that a M6+ earthquake was likely in that area.
November 4, 2016 - M6.3 in Chile: Hit (5 for 6)

Figure 9: Location of M6.3 earthquake on November 4, 2016 (top), most-recent official alert map posted (bottom). The blue arrows were not on alert at the time, but were alerts for future migration of the smaller alert star (important for next earthquake). The primary alerted region was Chile. The alert stars covered ~5% of the ring of fire. Notable regions not on alert: Japan, Sumatra, North and Central America, the islands of the southwest Pacific. The earthquake struck within the orange star radius of the primary alert zone.
November 12, 2016 - M6.1 in Japan: Hit (6 for 7)

Figure 10: Location of M6.1 earthquake on November 12, 2016 (top), most-recent official alert map posted (bottom). The alerted regions covered ~20% of the ring of fire. Notable regions not on alert: The Philippines, Indonesia, Papua New Guinea, the Americas.

The largest alert star posted in this map (November 11, 2016) was over Japan and far-eastern Russia. This region was the migrated potential seen with the blue arrows in the previous map. The smaller alert star was north of New Zealand.
November 13, 2016 - M7.8 in New Zealand: Hit (7 for 8)

Figure 11: Location of M7.8 earthquake on November 13, 2016 (top), most-recent official alert map posted (bottom). The alerted regions covered ~10-15% of the ring of fire. Notable regions not on alert: Japan, The Philippines, Indonesia, Papua New Guinea, most of the Americas.

This earthquake struck the secondary alert star posted in the previous map. It is noteworthy that the second largest seismicity of the day (outside of New Zealand) was a M5.7 (reported as high as M6.2) in portion of the alert zone covering Argentina.
November 16, 2016 - M5.7 in Indonesia: ‘Significant Earthquake’ in Alert Zone

Figure 12: Location of M5.7 earthquake on November 16, 2016 (top), most-recent official alert map posted (bottom). This earthquake was not part of the model because it did not meet the threshold magnitude of M6+, but it was the largest seismic event for a few days before and after that was not an aftershock of the New Zealand M7.8 on November 13, 2016, and the USGS has defined this event as a "significant earthquake." Notable regions not on alert: Southern Japan, The Philippines, Papua New Guinea, the islands of the southwest Pacific, South America, North America.
Figure 13: Location of M6.4 earthquake on November 20, 2016 (top), most-recent official alert map posted (middle), and the previous alert map (bottom). The red-alerted regions covered ~15-20% of the ring of fire. Notable regions not on alert: Japan, most of Indonesia, the islands of the southwest Pacific. This instance, while a success for the model, exemplifies the need for improvement as consecutive M6+ earthquakes struck within 48 hours of posting an alert star in the region, and the region remaining on alert the following day, but without the alert star.
Figure 14: Location of M6.9 earthquake on November 21, 2016 (top), most-recent official alert map posted (bottom). The red-alerted regions covered ~20% of the ring of fire. Notable regions not on alert: Sumatra, The Philippines, the islands of the southwest Pacific, South America.
November 24, 2016 - M7.0 in El Salvador: Hit (10 for 11)
November 25, 2016 - M6.6 in Tajikistan: Miss (10 for 12)

Figure 15: Location of M7.0 earthquake on November 24, 2016 (top), most-recent official alert map posted (bottom). The alerted regions covered ~20-25% of the ring of fire. The blue arrow, as before, noted areas looking ahead for the coming days, rather than current alerts. Notable regions not on alert: Indonesia, Papua New Guinea, Vanuatu, New Zealand.

The Tajikistan area had been on alert from November 22-23, 2016, but the maximum alert time after pre-seismic signals was exhausted and the region was taken off-alert too soon.
December 1, 2016 - M6.2 in Peru: Notable, but not 'Significant'

Figure 16: Location of M6.3 earthquake on December 1, 2016 (top), most-recent official alert map posted (bottom). The alerted regions covered ~20% of the ring of fire and ~12-15% of the active faults worldwide. Notable regions not on alert: Indonesia, The Philippines, Papua New Guinea, North and central America, northern South America.

The primary alert star was unsuccessful, but the M6.3 struck northern portion of second-highest alert zone in South America.
December 5, 2016 - M6.3 in Indonesia: Hit (11 for 13)

Figure 17: Location of M6.3 earthquake on December 5, 2016 (top), most-recent official alert map posted (bottom). The alerted regions covered ~20% of the ring of fire. Notable regions not on alert: Papua New Guinea, Japan, South America.
December 6, 2016 - M6.5 in Indonesia: Miss (11 for 14)

Figure 18: Location of M6.5 earthquake on December 6, 2016 (top), most-recent official alert map posted (bottom). The alerted regions covered ~20% of the ring of fire. Notable regions not on alert: Japan, North and Central America, Sumatra, Fiji, Tonga, Samoa, Kermadec Is.
December 8, 2016 - The Four Largest Earthquakes of one Alert Period with High Magnitude
M5.2 in Chile (Below Magnitude Threshold)
M5.9 in China (Below Magnitude Threshold)
M6.5 in California, USA - Hit (12 for 15)
M7.8 in Solomon Is. - Miss (12 for 16)

Figure 19: Official location (USGS records) of the four largest main earthquakes of the alert period covering approximately the first half of December 8, 2016, marked as white stars, on the most-recent official alert map posted. Notable regions not on alert: Japan, The Philippines, Mexico to Northern Chile, the islands of the southwest Pacific.

The M7.8 earthquake in the Solomon Is. was outside of the earthquake alert zone; it was the largest magnitude event and the nearby alert was orange only (the 2nd highest level of alert). The M6.5 location in California was first put on alert in the previous posting, on December 7, 2016. The previous day, in an addendum to the December 6, 2016 posting, California was noted for having above average seismic signals. When considering the largest four earthquake zones of the day, they almost exactly match the alert zones, and here the primary difference between year one and two is expressed. Instead of making official predictions of M6 or larger earthquakes (like year one), year two marks the areas where the pre-seismic signals are strongest each day, regardless of maximum magnitude forecast, and here we find four alert zones roughly also representing the four highest seismically active zones of the day. California’s first ever red-alert occurred this day (they had received a few orange and yellow alerts for smaller magnitudes) and the second time was only days later on December 14, 2016, five hours before a M5.0 struck north of San Francisco, and which the USGS labeled as a ‘Significant Event’.
Figure 20: Location of M7.9 earthquake on December 17, 2016 (top), most-recent official alert map posted (bottom). The red-alerted regions covered ~15% of the ring of fire. Yellow replaced orange color for visible aesthetics, green lines note above-average risks, albeit unlikely to produce damaging earthquakes. Notable regions not on alert: Japan, the Philippines, Mexico to Peru, Sumatra. The earthquake struck the center of the red alert in the western Pacific; lower-level magnitude and non-damaging but above-average earthquake warnings existed at the yellow and green regions. Note: Hawaii, which had never been represented on an alert-map before, had not seen an earthquake above M3.3 in a month when a M3.8, 3.6, and 4.5 struck within three days of the posting of this alert map.
December 18, 2016 - M6.1 in Micronesia (Aftershock); M6.4 in Brazil - Hit (14 for 18)

Figure 21: Location of the M6.4 that struck Brazil on December 18, 2016 (right), and the most recent alert map and summary explanation posted (left). The red alert zone covered 5-10% of the ring of fire.

Most-Recent Alert Map
M7.9 in PNG today could trigger seismic activity for days across white oval region. GEC potentially irrelevant, expect high activity all week. Focus comes to South America and Central America. Red = M6+ risk. Yellow = M5.5 - M6.5 risk. Green = Above average quake risk, unlikely to be damaging.

Last Updated: December 17, 2016 1:00 PM
Figures 22: Location of M6.7 earthquake on December 20, 2016 (top), most-recent official alert map posted (bottom). The alerted regions covered <20% of the ring of fire, and ~15% of the active faults worldwide. Notable regions not on alert: Sumatra, the islands of the southwest Pacific, central and southern Chile, Central and North America.

Results Summary
Alert zones consistently covered 5-25% of the ring of fire and most-active fault zones. 78.9% of the M6+ earthquakes struck the most recently-alerted regions (15 for 19). By putting regions of this size on alert, daily, we should have successfully forecast 2 to 5 of the 19 earthquakes by
random chance. It can certainly be said that commitment of resources and dissemination of official warnings by local governments is not yet viable, but no such claim is made. We claim to have taken one step in the right direction of determining which subterranean and atmospheric signals may be seismic precursors, and in being able to place certain regions of earth on alert with significantly better accuracy than one might expect via random luck. M6+ earthquakes have been correctly forecast in North America, Central America, South America, Europe, Asia, and Oceania. It may be said that the model has forecast the 5-25% of earth’s most active faults most likely to have the largest earthquakes, each day, with 78.9% accuracy.

How do we know if this result is significant? We want to evaluate the success rate (two options: success, failure) given the probability of success by random; this is a binomial probability calculation, like flipping a coin. If alert zones covered 50% of the active faults zones it would be like flipping a coin, and the chances of getting 15 ‘heads’ out of 19 coin flips is <1%. If the upper limit of alert coverage (25%) is used, there is <0.0001% probability of getting 15 of 19. The actual average alert zone coverage was 17%, having <0.00001% probability of having 15 successes out of 19 by random luck.

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<thead>
<tr>
<th>Magnitude</th>
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<th>Alert Zone/Not in Alert Zone</th>
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Table 2: The magnitude, date, location, and whether the region was placed on alert in the most recent posting, for the 19 largest main earthquakes from October 15, 2016 through December 20, 2016.

**Discussion**

The model is not a static formulation; as time and observations pass, the globally applicable rules begin to take slightly different form based on the region and the type of pre-seismic signal observed (OLR, pressure, Blot echoes, etc.). The United States foreshocks do not appear to be as deep as in other places in the world, the Middle East often must wait 2-3 days longer than the ring of fire for the same types of pre-seismic signals to produce a rupture- just as two examples. While civil and government actions like pre-quake evacuations and commitment of resources can not be recommended based on these forecasts at this time, the first steps toward main shock foreknowledge are taken.

In the future, in much of the same manner in which a hurricane warning is disseminated, resources are put in place, and people are evacuated, one day residents of a city will receive an earthquake warning, and when it happens proper authorities will be in place, coordinating a safe and orderly evacuation from a potential tsunami. This may be long into the future, but at some point the first step had to be taken. The importance of seismic forecasting is evident in the death tolls tallied in the worst events, and the practical implication of this forecasting model and others is the reduction of natural hazard risk to life- eventually.

**Others’ Efforts and the Need for Consolidated Forecasting**

It is paramount that more of an effort is made to bring seismic forecasting into the mainstream discourse. There are already numerous individuals making public forecasts using various methods, and collectively driving public awareness of the reality of seismic forecasting- even if academia has presented a virtually impenetrable wall. Often this is the result of choosing to practice forecasting, often independently, rather than waiting for the slow grind of academia to give a stamp of approval. This is the case for our model; apart from the principles used to gauge the significance of ‘Blot echoes’, it is generally accepted that human monitoring and understanding of electromagnetism as it pertains to earthquakes is not yet reliable.
Another example of ongoing practice outside the mainstream is Shanmuga Sundaram (India), who uses cloud cover/sunlight to indicate coming activity in the mantle. His alerts are posted at earthquake.itgo.com. A number of forecasters’ identities are not known as their predictions only appear on anonymous social media and other websites: “E.D.G.” forecasts at-risk longitudes using electromagnetic pre-seismic signals; his work is found at earthquake-research.com/edg/Data.html. Another anonymous forecaster, “Hook Echo”, closely monitors Blot echoes (plus.google.com/u/0/117300779230803580292) and has demonstrated proficiency at identifying foreshocks in South America, Japan, and in the regions of Indonesia, Papua New Guinea, and the islands of the southwest Pacific. Michael Janitch, also known online as “Dutchsinse”, makes seismic forecasts using a very similar method of foreshock analysis to the Blot method (twitter.com/dutchsinse & Dutchsinse YouTube channel). Janitch has had noteworthy success in both identifying foreshocks that lead to later seismic events, and in dissemination of the information to a wide audience. In addition to individuals, there are numerous organizations dedicated to creating similar models and undertaking similar studies, like the International Earthquake and Volcano Prediction Center (IEVPC). Two notable earthquake forecasters on YouTube have the user-identities “dcsymbols” and “solarwatcher”, and they include celestial and solar mechanics in their forecasting techniques, as well as terrestrial phenomena. Both our model and one proffered by Dr. Kongpop U-yen (Kongpop U-yen YouTube channel) have demonstrated proficiency in using solar and celestial mechanics to determine the times when earth is most-likely to have damaging earthquakes, especially M6.5 and larger.

Currently, most efforts to publish Blot-related studies appear in the New Concepts in Global Tectonics Journal at NCGT.org, including several works not mentioned here, but the publication of atmospheric, ionospheric, and magnetospheric pre-seismic signals is spread across various outlets like Icarus, The Journal of Atmospheric and Solar-Terrestrial Physics, Advances in Space Research, and numerous specialty journals of the American Geophysical Union.

The forecasters are as scattered and unconnected as the publications on above-ground pre-seismic signals. The methodologies used to forecast, and keep track of forecasts/results, lack both homogeneity and a common posting location that would foster a more-complete picture of the global efforts to forecast seismicity. Currently, such a collaboration is hindered by language barriers, lack of similarity in models used, the mixture of governmental, volunteer, and private industrial sectors in which the forecasters operate, and a generally inexplicable amount of negativity exchanged between individuals who follow and prefer only one forecaster, which has severely tainted dissemination efforts on social media.

The Streak
From October 19, 2016 to November 24, 2016, nine consecutive M6+ main earthquakes struck the most recently-posted alert zones. While the forecast maps posted during that time covered enough area to forecast one or two of those earthquakes by random luck, nine in a row is extremely significant. If you are flipping a coin, there is less than a 0.002% probability of getting...
nine “heads” in a row by random chance; rather than a 50/50 chance of success, each of these earthquakes struck alert zones covering 5-25% of the active faults of earth. At the highest end of that range, if all nine events struck alert zones covering 25% of the faults, the probability of getting nine in a row is \((.25^9) = 0.0000038\). The actual average coverage of active faults was ~17%, and there was less than 1 in one million chance of this result by random luck.

**Future Implementations**
The model currently relies on human application of different methods, and combining the results, which takes three to six hours depending on the reliability of the data. To reduce this burden, and offer a more real-time picture of earth’s seismic risks, hourly automation of the process is currently in programming phase (December 2016) and expected to begin producing its first results in 2017. The goal is to reduce human error and apply the model regularly and consistently upon implementation.

The new home of daily alert postings is The Disaster Prediction App (application for iOS and Android) and will eventually be replaced there by the automated forecasting program.

Part 2 of this work will describe the method in full, with examples of how specific earthquakes were determined to be coming to certain areas of the world, and will first be presented at Observing the Frontier 2017 in Albuquerque, New Mexico.

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Acknowledgements: The author would like to further acknowledge “Hook Echo” for helping introduce Blot’s work to us; the ‘echo’ portion of ‘Blot Echoes’ not only described the mantle response to the electric conditions beneath the ground, but nicely honors the individual who brought these works to our attention. Since original publication, the identify of “Hook Echo” has come to be known as Scott C. Windbiel. The automated forecasting program is being developed by 9 RESE’.
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