

The Production of Earthquake Emergencies: technoscientific earthquake early warning in a social and material world

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RESUMEN

Con el fin de evitar lesiones y salvar vidas, los sistemas de alerta temprana de terremotos, como el Sistema de Alerta Sísmica Mexicano (SASMEX), deben emparar ser oportunos y la detección de riesgos con una difusión eficaz para los usuarios vulnerables. La alerta sísmica hace la sismicidad significativa para sus usuarios de nuevas maneras. Este artículo parte del interés de CTS por cómo los materiales se vuelven significativos para explorar la manera en que la alerta sola se convierte en un tipo de emergencia sísmica. Al analizar etnográficamente una alerta que no advierte movimientos violentos, y la subsecuente discusión pública de sus efectos, mi argumento se desarrolla en el sentido de tomar la producción social de una emergencia seriamente. Al destacar las respuestas y potenciales efectos de esta emergencia sísmica, argumento contra el simple tecno-optimismo para poner de relieve la necesidad de educación para mejorar los alcances de herramientas para salvar vidas como la alerta sísmica. Para convertir las emergencias en oportunidades para los residentes de la Ciudad de México se requiere la introducción de nuevos tipos de estrategias públicas y educación no sólo sobre la alerta, sino sobre las posibilidades y límites de los sistemas tecnocientíficos de prevención de desastres.

Palabras clave: sistema de alerta temprana del terremoto, realismo agencial, producción social de emergencia.

ABSTRACT

In order to prevent injury and save lives, earthquake early warning systems like Mexico's public *Sistema de Alerta Sísmica Mexicano* (SASMEX) must pair timely, effective hazard detection with effective alert dissemination to responsive users. The alert makes seismicity meaningful to its users

in new ways. This article draws on contemporary STS concerns with how materials come to be meaningful in order to reckon with how an earthquake alert comes to be a kind of earthquake emergency. Engaging ethnographically with an alert which did not presage violent shaking, and subsequent public discussion of its effects, I argue for taking the social production of emergency seriously. By highlighting responses to and potential effects of this earthquake emergency, I push back against simple techno-optimism to highlight the necessity of public education to support potentially life-saving tools like the *Sistema de Alerta Sísmica Mexicana*. Making emergencies into opportunities for Mexico City residents may require introducing new kinds of public outreach and education about not just the alert, but about the possibilities and limits of techno-scientific disaster prevention.

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Keywords: earthquake early warning system, agential realism, social production of emergency.

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INTRODUCCIÓN

When loudspeakers warbled their earthquake alarm at 11:44 pm on the evening September 29, 2015, I was in bed but writing emails. The apartment around me was lit entirely by the streetlights out on Plaza Popocatepetl, and then a siren was sounding.

I was up fast. Enrique, on whose inflatable mattress I was staying, called to me from the bedroom down the hall. Was this scheduled?

No, it couldn't be, I told him, grabbing shoes and a coat. Massive public drills happen in Mexico City every year, but for all these may catch people by surprise in the moment, they are well-publicized beforehand. These things take a great deal of preparation behind the scenes, too. I had neither read anything about a drill in the paper nor heard anything from the disaster prevention experts whose work I have been studying as an anthropologist since 2010. I was sure that the earthquake was real.

At the door I met Enrique, and then, a moment later, his wife Beca, holding their two small dogs. We were one broad flight of stairs from the door to the street. The alert stopped, and we paused there.

We waited. The alert should have continued to sound until the quake was over, but the loudspeakers were newly integrated into the public earthquake early warning system and it was possible that they would not follow the same rules that other forms of dissemination did. Regardless, the alert could give us, at the absolute most, a bit over a minute's warning before an earthquake could travel from the most distant of the Sistema de Alerta Sísmica Mexicano sensory field stations all the way to La Condesa in the center of Mexico City. The siren had stopped, though, and I still hadn't felt anything.

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I was visiting Mexico City for a series of meetings and events on seismic engineering and earthquake safety clustered around the thirty year anniversary of the tragic 1985 Michoacán earthquake, a deadly seismic event that not only shook buildings but also resonated through politics, regulation, and disaster prevention policy throughout Mexico. In the evening of September 29 and the days that followed, the alert that sounded from the loudspeakers was a topic of some interest among the "seismic community" (that is the community of multidisciplinary experts concerned with public earthquake risk mitigation) and among ordinary people.

There was indeed an earthquake on the evening of the 29th, an event of magnitude 4.6 about 49 kilometers from the city of Ometepec, Guerrero according to a report from the *Servicio Sismológico Nacional* issued the next day. Measuring earthquakes precisely is not a process that can happen quickly, and though it was small it still triggered the *Sistema de Alerta Sísmica Mexicano*. It was not quite large enough to be felt on the first floor of a building over La Condesa's sensitive soil, but it was perceptible in some parts of Mexico City.

In the days which followed, people discussed what this event could mean. The earthquake itself, that is, the material release of energy in Guerrero that resonated through soils and the techno-scientific

earthquake early warning system was present in these reflections, but so were other kinds of threats mediated by this alert broadcast. Some were stories about immediate concerns, about fright and disturbed sleep. But others were about longer-term consequences of this kind of alert communication, considered in reference to not just one quake, but to Mexico's ongoing seismicity and the large temblors that were surely coming. Some suggested that this alert could be a kind of drill; productive of future safety. Others, however, made references to "the boy who cried wolf", the fable about a small boy who warns a village of a wolf when there is none, and who suffers when at last a wolf finally does visit him. I was struck by not just the high stakes of an event in which little, materially, happened, but the proliferation of meaning that the alert of the 29th took on. Although public earthquake early warning is potentially life-saving, this technoscientific means of preventing seismic hazards from becoming disasters has other effects too.

As an ethnographer of seismicity, I have come to regard knowledge and practice around seismic phenomena in the context of their social production. This, for me, means not just the ways that people build in earthquake zones and are put at new kinds of risk. This kind of social production (sometimes "construction") has been deployed in policy-making as a goad for thinking through the conditions of possibilities of disaster (Oliver-Smith, 2002; Tierney, 2007). Instead of following this logic, in this article I explore the implications of understanding emergency, often just one moment in the sweep of a disaster, as a complex relation of disturbance and danger, the connections between which are constituted materially and socially.

Disaster studies scholar Virginia García Acosta (2002) has described disasters as "social laboratories" (p. 65) in which, through the mixing of metaphorical reagents and crises of heat or pressure, facts of social life can come to be revealed. In this case, it seems appropriate to turn tools that have so illuminated laboratories as spaces of practice on them. If meaning and event are to be linked as in a laboratory, then it is not surprising that analytics borrowed from science and technology studies

might be productively brought to bear on issues, more properly the disciplinary territory of disaster studies.

By “analytics of science and technology studies”, here, I am thinking particularly of emphasis on and inquiry into the practices of production of meaning and event. Various approaches to this have been advanced in turns toward the practices of meaning making, each with their own complex empirical implications, but here I am guided by how Karen Barad has articulated an approach to the entanglements of meaning and matter in her work on quantum physics. As Barad (2007) put it: “What is needed is an analysis that enables us to theorize the social and the natural together, to read out best understandings of social and natural phenomena through one another in a way that clarifies the relationship between them” (p. 25).

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Indeed, in this context, Barad’s agential realism, her always-already-ethically implicated onto-epistemological framework, is particularly *a propos*. She not only addresses the social construction of knowledge and what comes to count as fact, but a commitment to realism, “the serious business and related responsibility involved in truth hunting” (2007, p. 43) which in the case I describe here comes to an issue of not just how to make sense of the alert of the 29th, but how real human lives could be put in danger or protected in the context of the *Sistema de Alerta Sísmica Mexicano* and Mexico City’s potentially life-saving public broadcast of the alert.

In this article, I consider the various material and social systems which framed the communication of the alert on September 29th and the public arguments which developed around the event, focusing on the various real social effects that it might be understood to have. With reference to Barad’s focus on the practices by which the material world is made meaningful, I suggest that it may be possible to understand the communication of the alert as itself a kind of earthquake emergency, even though the earthquake that happened that night barely shook Mexico City. Indeed, I will argue that it is more than possible to do so, that this way of thinking about the alert and the concerns which

were articulated around it may be a productive strategy for seriously engaging with the urgency that attended the presences and absences of earthquakes the night of the 29th and contextualizing the very different kinds of ways people have described the potential effects of the night's alert. This offers a conceptual approach to earthquake early warning that runs contrary to a techno-optimistic expectation that social response to the alert can be anticipated and that user's experiences of material hazards can be controlled for through technology, the multiplicity and unpredictability of their needs and vulnerabilities either ignored or designed away. I suggest here that responses to the alert are necessarily complex, and that its meaning should be understood to be produced in practice with technology and in the (often threatening) material world.

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If an alert about the occasional earthquake that one doesn't feel is the price that Mexico City and the other user communities of the *Sistema de Alerta Sísmica Mexicano* pay for a speedy, public warning of oncoming earthquake, it is relevant to confront the radically different ways that such alerts become meaningful. Unfortunately, public discourse seems to focus largely on the technology of the alert, suggesting that the troubling potentials of such events are either negligible or that they can be entirely designed away with refinements to the alert. In this paper I explore a third option: by highlighting the productive trouble that this event made for many Mexicans, I suggest that disaster prevention should be imagined as a site for more than technoscientific intervention. Instead, as a social, material, and technical issue, it should be considered in the context of diverse practice and meaning-making that will always exceed any system designers' plans. I use the language of emergency to bring attention to these practices and the diverse meaning they produce. Debates about the effects of "crying wolf" indicate that emergencies like that of the 29th can have serious implications, but put far too much onus on the earthquake early warning system's function and the possibilities of technoscientific refinements to transform social relation to material threat, neglecting, for example, public education and other kinds of actions in the social world of Mexico City.

This article has three sections. In the first, I situate the complex work of meaning-making which happened around the communication of the alert in the context of emergency, demonstrating the utility of an ethnographic focus on the production of emergency and engaging it with a few of the theoretical and ethical implications of doing so. In the second, I discuss how social as well as material and technical elements work in the context of an earthquake early warning system which both provides new ways of keeping people safe from earthquakes and makes new kinds of emergency possible. In the third, I discuss in detail the ways in which the alert of the 29th might be productively understood as an earthquake emergency. Here, I emphasize various discursive works connecting the communicative event of the 29th to potential material consequences. I take debates about the alert of the 29th to be an essential part of sorting its meaning out. In this case, as in Barad's, "*we are a part of the nature that we seek to understand*" (2007, p. 67), or, rather, part of the emergency that many of us in Mexico City both experienced on the 29th and subsequently reflected upon.

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While this article only focuses on a single occurrence, it evaluates this case in-depth with attention to details informed by over 17 months of ethnographic and archival research. The event was unique, but the implications that the concerns articulated around it may have for public safety are far from isolated. In such individual experiences and interactions around an earthquake emergency, it is possible to interrogate practices and investigate the ways that emergencies can be understood to have effects. I work in the rich tradition of critical field-based ethnographic research developed in cultural anthropology (Gupta, Ferguson and Marcus, 1998), which resonates with certain efforts in science and technology studies to interrogate practice (Pickering, 1992), particularly work like that of Barad, which Hannah Knox and Tone Huse (2015) have considered "post-constructivist" in its efforts to "understand the entanglement of ideas, matter, and technology through the study of situated practices" (p. 8). I make use of several auto-ethnographic vignettes (Reed-Danahay, 1997) to illustrate the event of the 29th,

and my approach to the communicative acts generated around the event is informed by critical discourse analysis. Critical discourse analysis proposes that communicative acts should be considered as “embedded in more general patterns of human meaningful action”, (Blommaert and Bulcaen, 2000, p. 461), and I give them context in both studies of emergency communication and in research into the nature of emergency. Similarly, the ethnographic vignettes I use describe a lived experience of the event, opening it up for analysis. Using these means, I describe the event itself and responses to it with an analysis which takes communicative acts as social phenomena; any knowledge or reflections regarding which are situated in the social and political world (Haraway, 1988) of emergencies, early warning practices, and research communities which extend through and outside Mexico City. These entangle researchers from around the world and, as earthquake early warning systems proliferate, the wellbeing of publics around the world too.

Though earthquake disaster or even earth motion may not be immediately forthcoming, and though communicating alerts of the type that happened on September 29th may simply be part of a speedy, sensitive and public earthquake early warning system, their implications can make them, for some, emergencies in their own right. Here, I document how this new public broadcast of the *Sistema de Alerta Sísmica Mexicano* occasions opportunities to think through the stakes of alerting and the insufficiency of focus on the material world and technoscientific interventions alone to reckon with complex emergencies. I also offer a provocation for further research in both treatments of emergency in science and technology studies and disaster studies.

EMERGENCIES ARE NOT DISASTERS

The language of emergency is easy to deploy here but necessary to unpack in order to attend ethnographically to the ways that the alert of September 29th could be a matter of such different kinds of experience.

Kathleen Tierney (2007), a sociologist of disaster, breaks the predominant model down simply: “Disasters are characterized as having a beginning (the period of onset), a middle (the emergency period), and ultimately an end (when social life returns more or less to normal and when recovery takes place)” (p. 509).

These stages can be mapped on to earthquake action in relatively straightforward ways. When plates or faulting slips, the period of onset has begun. The emergency period may include the moment the quake is felt, as stable ground turns vibratory and structures resonant, and its aftermath, as injured are rescued and treated. The end of a disaster is time for rebuilding, healing (perhaps with preparation for the next disaster) and so forth. An earthquake early alert can be properly conceived of as a tool built in a recovery period of use in an emergency period; designed after the 1985 quake to intervene on users in just “one moment”, one moment in a long string of them, each of which allow opportunities for choices that may diminish risk, as Dr. Sergio Puente Aguilar, a researcher and professor at the *Centro de Estudios Demográficos, Urbanos y Ambientales* at *El Colegio de México* and the author of a number of works on risk in urban Mexico (Puente Aguilar, 1999, 2013), explained to me in 2014.

The moment at which the earthquake early warning is designed to become really useful to users is sudden. The earthquake early warning itself as encountered by most users is just as much a result of the energy of earth motion through soil as the shaking that people feel seconds after it, that is mediated through a technoscientific system. Its affordances along with issues like users’ locations, their experiences, their capabilities and vulnerabilities, and their knowledge about what to do when alerted frame the conditions of possibility for how the sudden noise of loudspeakers on the night of the 29th and the action across the city in the seconds after it can be understood.

Tierney herself highlights the limitations of this three-step process for thinking about recurrent disasters and the conditions, structures and forces that make disasters possible and channel their effects. The way

that these steps chop up events and foreclose causality is analytically troublesome. Neither complex (Fortun, 2001; Petryna, 2006) events, anticipatory work (Collier and Lakoff, 2008; Anderson and Adey, 2011; Deville, Guggenheim and Hrdlicková, 2014; Choi, 2015) nor the larger-scale logics that frame their fearsomeness and both enable and foreclose possible responses (Massumi, 2005; Davis, 2007; de Goede and Randalls, 2009; Masco, 2014) can be easily accommodated here.

26 In some ways, though, isolating “emergency” from other stages of event and from the disaster it may be part of, the three-step model has real utility, especially in reference to the alert of the 29th. Emergency is not disaster; though we might understand their relation to be that of a material upset made meaningful. The two co-occur¹, and can be challenging to separate conceptually or practically (Guggenheim, 2014; Redfield, 2010) Craig Calhoun (2010) points out that while emergency is “a sudden, unpredictable event emerging against a background of ostensible normalcy, causing suffering or danger and demanding urgent response” (p. 30), it is also hard to get traction on what else it is and may be. “‘Emergency’ is now the primary term for referring to catastrophes, conflicts, and settings for human suffering”. Calhoun understands it to have “rough cognates such as ‘disaster’ and ‘crisis’”, but he writes: “Use of the word focuses attention on the immediate event, and not on its causes” (*ibid*).

My effort to consider the complex production of emergency resonate with recent work on disaster which has suggested that emergencies and the disasters might be considered sites of emergence in upheaval, of new publics (Tironi, 2015) and new configurations of technical infrastructure (Kane, Medina and Michler, 2015), or “trickster” environments (Barrios, 2015). Here, through events that disturb normal

¹ The threshold at which emergency becomes disaster is, for Adi Ophir (2010), ambiguous for several reasons: “because it is not clear where exactly the line should be drawn... because the line may be crossed at any given moment due to accumulation or acceleration... because it is never certain whether identifying, determining, or declaring the threshold is a matter of recognizing a fact or fulfilling a duty” (p. 72).

arrangements of agents and material conditions, life, technologies, institutions, and ideas may be transformed. These events and the disasters that they are incorporated into are social, but not purely social.² While my reading of emergency resonates strongly with their work on complex material, technical and social events, I want to point out that the responses to the alert on the evening of the 29th suggest that the disturbances, upheaval, and danger—the meaningful material danger—that an emergency may present need not be laminated in time, evident and immediate. As I do so, I highlight the affordances (Gibson, 1977) of earthquake early warning technologies for not just new ways of doing earthquake safety, but also in the production of new kinds of earthquake emergencies as people consider the stakes of new kinds of encounters with earthquakes through alert communication. That this is not the same as new kinds of earthquake disasters, far from it. The new mode of publicly broadcasting the *Sistema de Alerta Sísmica Mexicano* can mean new earthquake emergencies, but also offers new opportunities to forestall disasters. Taking advantage of such opportunities will require serious attention to how material, social and technoscientific factors produce emergencies together.

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THE *SISTEMA DE ALERTA SÍSMICA MEXICANO* AND EARTHQUAKES

The *Sistema de Alerta Sísmica Mexicano*, Mexico's official earthquake early alert network and, at the time of this writing, the only one recognized by the Mexican government, comprises nearly one hundred sensory stations stretched along seismically active areas of south and central Mexico, radio repeater stations and central computers in six population centers (Mexico City, Morelia, Puebla, Chilpancingo, Acapulco and Oaxaca). Sensory stations, equipped with fast-acting algorithms,

² See Rodríguez-Girault, *Tirado and Tironi*, 2014, on the topic of how much the social has come to frame the definition of a disaster.

use changes in movement at the very first part of earthquakes to project the size that those quakes are likely to grow to, semi-integrated into a growing number of dissemination systems. They send signals racing across the expanse of Mexico, reaching vulnerable cities before the quakes can and giving users there seconds of valuable “advantage time”. The system has been astoundingly successful at doing so. The *Sistema de Alerta Sísmica Mexicano* has experienced only one missed event and one false alert in its long history, both of which happened in the first years it was operational (Espinosa Aranda *et al.*, 2009).

28 However, parsing seismicity is challenging. The alert signal is not sent out based on a precise measurement, but rather a quick analysis. “It’s not very accurate. We know. Everybody knows!” explained one expert to a room of international peers visiting for a conference in september 2015, only days before the alert that I began this piece by describing. While it has been demonstrated to function reliably and is constantly refined, the system’s algorithms have not privileged exactitude (Iglesias, Singh, Ordaz, Santoyo and Pacheco, 2007). Making distinctions between moderately-sized and small earthquakes, that is, distinguishing between earthquakes that the Mexico City government has decided to broadcast the alert for and those it has decided not to alert, is challenging.

Earthquakes are complicated events, and the numbers that are attached to their magnitude, especially early on, are taken by geophysicists as provisional (Lampland, 2010), that is, most likely close to the magnitude at which they will be assessed at, and standing in for them until final calculations can be made. This was indeed the case on the evening of the 29th, as the *Servicio Sismológico Nacional* made an original estimate of magnitude 4.8 and later revised it down to 4.6 (as the Excelsior reported on september 30, see Páramo, 2015). The *Sistema de Alerta Sísmica Mexicano*’s numbers are more provisional still; so much so that, while its alerts are designed around target magnitudes determined by Mexico City (“Preventative alerts” are issued Mexico City for events forecast to be, roughly, between magnitude 5 and 6, and “public

alerts” are issued for events of around magnitude 6 and up), they are rarely discussed in these numeric terms. The *Centro de Instrumentación y Registro Sísmico* (CIRES), a non-profit which has developed and maintained the *Sistema de Alerta Sísmica Mexicano* since it began to issue alerts in 1991, instead automatically broadcasts simple warnings to users based on their best algorithmic estimates of whether the earthquake will be moderate or intense. As magnitude is exponential, the difference between a magnitude 4.6 and a magnitude 5 earthquake is much smaller than the difference between a magnitude 5 and magnitude 5.4. More accurate distinctions would take time. When an earthquake is moving at the speed of sound from its epicenter toward a vulnerable population, time is of the essence.

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The stakes of alerting are high. Alerts make it possible for people to take action that could include evacuation, taking shelter or pulling over in a car. Though it is difficult to collect data about lives that have not been lost and injuries that have not been suffered, studies of the Northridge and Loma Prieta quakes in California in 1989 and 1993 indicate that more than half of the injuries sustained came from non-structural elements falling (Shoaf *et al.*, 1998; Porter *et al.*, 2006), which are difficult indeed to regulate even with the best norms.

Earthquake injuries do come when buildings collapse, which can take minutes of sustained shaking, but they are also occasioned by much more rapid threats. The system’s utility is, then, a matter of the speed at which the alert can be disseminated, especially given the variety of activities users may be in the middle of when they are alerted to an oncoming quake and the variety of built environments they may occupy. By evacuating or taking shelter immediately upon hearing the alert, or at least taking steps toward this action before the shaking can do real damage to the built environment, people in earthquake-prone areas can avoid encounters with the materials around them at speeds and angles that they might rather avoid.

Alerting experts often emphasize the advantage of disseminating substantial amounts of information to publics via multiple sources to ad-

dress their various needs and preferences (Mileti and Sorensen, 1990; Sorensen, 2000), the particularly short timeframe available for earthquake early warnings can curtail options.³ People hearing the alert often do not know what the best actions to take in the seconds before an earthquake might be, or understand what it is that the *Sistema de Alerta Sísmica Mexicano* does. While significant planning was done in the early days regarding how to produce a “seismic culture”⁴, education about the earthquake early alert has only been introduced spottily.

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Earthquake early warning systems are remarkable tools, and Mexico was the first in the world to issue its alerts to a general public. It was developed in the wake of the disastrous 1985 earthquake, when the possibility of a massive seismic event was looming over Mexico.

At first there were twelve stations, arrayed across an area that geophysicists understood to be not only seismically active but likely to produce the next big one, a portion of the Guerrero coast that included the so-called “Guerrero Gap”, which was overdue for quake. More user populations have been added since, and after tsunamis and earthquakes in Chile and Haiti in 2010 and Japan 2011, the network of the system been developed further. It now includes almost one hundred sensory stations, and can detect earth motion in southern and central Mexico quickly and alert cities aside from Mexico City.

Even as she supported the earthquake early warning system, long-time public safety researcher and advocate Elia Arjonilla Cuenca was critical of the way that the *Sistema de Alerta Sísmica Mexicano* (then called the *Sistema de Alerta Sísmica*) was deployed by the state with little attention to its use. In the only systematic study of its effective use, she argued that earthquake early warning was a great tool but necessitated

³ In fact, the amount of information that can be communicated by sirens makes this more of an “alert” than a “warning”, the latter can be understood to contain more information (Sutton, Hansard and Hewitt, 2011). I do not parse this difference here, but note it for curious readers.

⁴ This concept was discussed at length in a set of meetings regarding the possible use of the Mexican earthquake early warning system; see Instituto Javier Barros Sierra, 1992.

“solid planning and preparation on the part of the community”⁵ (1998, p. 3), suggesting training users about how to act in case of an alert. This requires institutional support and coordination. Community preparation without support runs the risk of simply serving to, as Jesus Maria Macías Medrano (1999) puts it, “transfer the responsibility of the authority for the protection of life and property of the society to the disaster threat to the population at risk” (p. 7).

At this writing, the *Sistema de Alerta Sísmica Mexicano* is designed and maintained by CIRES to simply broadcast an alert signal based on the specifications of the governments in its user communities. This leaves the question of means of dissemination open. Modes of dissemination, and users, have been proliferating over recent years: at this point, there are many ways to receive the alert. TV and radio stations get messages, and many rebroadcast them, and a designated NOAA receiver has been made available to many by the city and federal governments on a large scale.

Relatively few had access to earthquake alert receivers until quite recently, in 2010, when funding from the Mexico City and federal government allowed the distribution of nearly 90,000 of them throughout the area (Suarez, Novelo and Mansilla, 2009). Now there are not only the several hundred large scale radio receivers that CIRES technicians themselves keep up in schools and government offices, but other official equipment around the city too. There are more of any number of other types for sale directly and second-hand. Even lower-cost radio receivers are in production.⁶ Cell-phone apps pass along the message or receive information from parallel sensory systems (although not via broadcast, and sometimes with significant lag).

⁵ “Sólida planeación y preparación por parte de la comunidad”.

⁶ These are sold at ever-more-affordable but still prohibitive costs (as of June 2015, price might range from \$1300 for a new radio and installation to \$100 USD for a used off-brand receiver, though a home receiver to be priced at about \$25 is currently in the works).

It was only as of september 19, 2015 that 8,200 loudspeakers across Mexico City were integrated into the alert network, programmed to interrupt any other programming to blast a grating warble and a recorded voice through the air telling all of us, even those without our televisions on or specialized receivers, in very simple terms, that an earthquake was on the way.

That they did, ten days later at 11:44 pm. In the context of serious seismic hazard and in the wake of limited public education, a loud siren and digitized voice gave us an “*Alerta Sísmica*”. It was an earthquake emergency, with seismic causes and a range of potential consequences in our lives.

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EARTHQUAKE EMERGENCY

The emergency on the night of the 29th was not an earthquake. We were not thrown off balance by the upheaval of what we had thought solid, not knowing when it would stop or in what condition the material of our lives would be when it did. Something happened, however; something made possible by the earthquake early warning system and experienced in different ways.

As we waited at the top of the stairs after the siren stopped, my hosts Enrique and Beca teased each other about their bedtime rituals: about how hard she'd been to rouse from sleep and how he'd been awake, still dressed, still on the internet. Our frantic action had ended abruptly with the sound of the alert from the loudspeakers. The dogs, who liked being carried but perhaps not that much or both at once, squirmed. Eventually, Beca was done. “Take the keys and tell us what you find out”, she said, and, sensibly, went back into her apartment with Enrique and the dogs. They shut the door behind them.

Down on the plaza in front of their house, I found a handful of people talking. They were gathered near the central fountain in little groups, away from buildings and lit greenly by bright streetlights fil-

tering through the canopy of trees. Against the white of the fountain's arches, their outlines were visible to me, even blind as I was without my contact lenses.

"I suppose there has been an earthquake", a young woman in pajamas told me. "When we came down, the water in the fountain was rippling". Another was more skeptical. "It's rippling", she said, adjusting her short blue dress, "from the wind". Indeed, there was a light breeze, and the water on the surface of the fountain reflected light back.

A magnitude 4.8 earthquake originating in Guerrero might just have made the water in the fountain on top of one of the most sensitive soils in the city ripple. The material truth of earth motion alone, however, was not enough to account for the responses I saw when I returned to my inflatable mattress and laptop. There, I scanned Twitter and Facebook messages for more responses, reading about how people had become bodily caught up in the *Sistema de Alerta Sísmica Mexicano*.

Communications scholars have documented how social media can function as a platform for resource mobilization within communities. Not only is social media increasingly a means for communication by authorities (Sutton *et al.*, 2014, 2015), they provide a community means of sharing information that could mean the difference between life and death (Starbird and Palen, 2010), and filling gaps in information communicated by official media (Sutton, Hansard and Hewett, 2011). Social media can even support forms of self-care for resilience during and after events (Kaufmann, 2015). Indeed, while no single hash tag surfaced that evening as a locus for tweets, I found many messages in response to tweets from official business and NGO accounts affiliated with earthquake early warning, visible to anyone watching the lively feeds and offering commiseration.

Many referenced the scare of the alert. "Fuckin fright!!!"⁷ one wrote, appending a photo of an adorably horrified-looking child. "I just about

⁷ "Pinche susto!!!".

died of a heart attack in my BB's arms"⁸, another wrote. Tweets may have been hyperbolic, but their expressions reflected an understanding of unpleasant physical stress.

Others posted pictures of bloodshot cartoon eyes, of frightened cartoon characters in bed, of bread rolls they would eat ("pa'l susto"). People were frightened of seismicity, and understood encounters with this fright to have consequences even without any physical shaking. According to the *Secretaría de Protección Civil del Distrito Federal* (as reported in Páramo, 2015) there were no injuries or damages that could be attributed to the quake, but the fright of it was serious to some. Perhaps this response could be related to past experience with earthquakes; if this is the case, the nation and the city in particular have provided residents with many experiences to motivate ongoing trauma. Alert responses, however, can be tricky to parse. While previous experiences can lead to better awareness and preparation, they can also be associated with avoidance or unwarrantedly optimistic assessment of safety (Laneros-Mugica, Urbina-Soria and Alcántara-Ayala, 2016).

There was some discussion of preparation and training on Twitter. "Anyway, it can work like a drill", wrote one person. "Every false alert should be an opportunity to practice a successful evacuation in case an earthquake happens, I don't know why they just complain!"⁹. The sentiment was not uncommon. The alert, here, was made part of a regimen of training for speed and organization in evacuation; an opportunity to rehearse for a more dangerous earthquake, running through the physical steps and the tension of an unexpected experience so that, in the future, one is more likely to know what to do and, moreover, to be able to do it confidently. Drilling, rehearsals or practices of this sort have come to be understood as a way that people can make themselves ready for an otherwise unpredictable emergency, and be ready to avoid the worst of its potential effects (Davis, 2007; Anderson and Adey, 2011).

⁸ "Pues casi muero de un infarto abrazada a mi BB".

⁹ "¡Como sea sirvió de simulacro, cada alerta fallida debería ser motivo oportuno para simular una huida exitosa en caso de sismo, no sé por qué sólo se quejan!"

Taking advantage of alerts in this way has been recommended for years by early warning experts (Mileti and Sorensen, 1990; Goltz and Florez, 1997; Sorensen, 2000).

The issue of the earthquake yet to come came up in other ways too. “They need to recalibrate the system”, Enrique told me over coffee in the morning, “or no one will trust the alert”. A post on the Facebook wall of the earthquake early warning mobile phone application Sky Alert was in agreement. It read: “Me, I left the house when I heard alarm. I think it’s unwise for the government and that company to make panic with a tremor of 3 degrees. I figure the joke, ‘is crying wolf’, After all this, they’ll lose credibility...”¹⁰. An article in the spanish newspaper *El País* recounted similar concerns (Navarrete, 2015). Their earthquake emergency might have implications in a large quake that has not yet happened, but is very likely to happen sometime soon. The emergency would blossom into disaster when Mexico City experienced a large earthquake and people, expecting another misfire, neglected early warnings and came to be hurt because of it.

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Emergency responses, especially responses to quick-moving hazards like earthquakes, are generally understood to work best when they are trained into the body and come to entail simple and unconfused physical reactions to certain stimuli. This is one of the reasons that drilling and similar exercises have come to be so important in emergency preparation. It provides an opportunity to rehearse crisis, to condition embodied and mental responses, and to encounter tools and techniques of safety intimately (Davis, 2007; Lakoff, 2008; Anderson and Adey, 2011). In this context, an alert like that of the 29th could interfere with effective responses to future earthquake early warnings or, just as easily, it could facilitate them.

Public earthquake early warnings use technoscientific means to give users a chance for speedy action in the case of quakes. If people are

¹⁰ “Yo sí salí de casa al escuchar la alarma. Creo que es imprudente que el gobierno y esta empresa generen pánico con un temblor de 3 grados. Se me figura al chiste de ‘allí viene el lobo’. Después esto perderá credibilidad...”

not interested in taking that action, then the value of the “advantage” they provide decreases tremendously. With the loudspeaker broadcast, Mexico City provided a new way for many to make use of the *Sistema de Alerta Sísmica Mexicano*.

Considering the story of the boy who cried wolf, CIRES director, Juan Manuel Espinosa Aranda, commented: “That’s an important metaphor, but it’s the human condition. [Triggering the alert] was warranted because we do not control the phenomenon, because we have no certainty that all the structures of the city are safe”¹¹ (Páramo, 2015b). Broadcasting the alert could make a tremendous difference for Mexico City residents in dangerous places. The algorithms of the *Sistema de Alerta Sísmica Mexicano* have been refined, and in an earthquake of similar magnitude to that of the 29th which happened on march 23rd of 2016¹², no alert was issued.

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However, refinements can only do few to control for many ways that a technoscientific intervention into users’ encounters with seismic Mexico can be experienced. Even the moderately-sized earthquakes that Mexico City has chosen to alert its population of might be felt strongly in the areas of the city with the most sensitive soil, and less strongly in those built on hard rock. Any alert will intervene in the lives of Mexico City residents; this general broadcast is particularly promising because it is available to so many. The ways that it is taken up and related meaningfully to the material world, however, is a matter of diverse practice rather than an automatic effect of the technology.

CONCLUSION

A massive earthquake has not, at the time of this writing, struck Mexico City, and so my final thoughts on earthquake emergency are partial,

¹¹ “Esa es una metáfora importante, pero es una condición humana. Se justifica [el disparo de la alerta] porque el fenómeno no lo controlamos, porque no tenemos la certeza de que todas las estructuras de la ciudad son seguras”.

¹² A magnitude 4.9 quake which happened at 6:29 pm.

informed by promises and threats of future seismic events, preparation or loss of trust in the alert, and the frights and unpleasant visions of neighbors in their pajamas that people complained of after the alert of the 29th.

On the 30th of september, at UNAM's Engineering Institute, everyone was talking about the evening's loud interruption and the effects that an alert for an unfelt earthquake on this scale could cause, or had already caused. I had only just left there when loudspeakers sounded again. It was 12:25 in the afternoon, and out of the Metrobus window I watched people file out of government buildings when they were warned of what turned out to be a magnitude 5.5 quake which, though certainly of a size which Mexico City wanted to alert people of, was difficult to feel in many places around the city. "The alert went well", Carlos Valdes, director of CENAPRED commented (and was quoted in the digital periodical *Animal Político*, 2015), though a friend told me privately that the responses that they saw were mixed; that he had seen a coffee shop full of people barely look up.

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By suggesting that alerts constitute emergencies produced through social practice in the context of technoscientific tools and material threats, I mean to offer an alternative to techno-optimistic approaches to seismic disaster prevention which suggest that the technology of the earthquake early warning alone will save lives and can be made to transform users' experiences of seismicity simply, without causing other kinds of challenges for them.

If any encounter with the alert is understood as an emergency, we can better think about these challenges, including the ongoing threat of violent earthquake, the promise of new opportunities to evacuate or take cover before the danger, the experience of a late-night shock, and the real capabilities and limitations of technoscience in the face of complex, unpredictable, ongoing seismicity. The alert is not simply a communicative act, but one part of a complex of meaningful social, technical and material events around seismicity that Mexico City residents experience. Taking encounters with earthquake emergencies in all their forms

seriously is not only a new way to engage with the technologically-mediated production of meaning. It also points to the necessary messiness of technoscientific interventions into disaster prevention, especially those interventions designed to be accessible to diverse publics, and indicates the need for further research and public education not just about emergency procedures and the threats of the material world, but also about all the affordances of this or any technology in the place of simple techno-optimism.

38 Enrique messaged me on WhatsApp soon after the earthquake of the 30th to joke about my anthropological interest in seismicity and my obvious fascination with the events that were unfolding during my visit. “You are now the principle suspect of producing earthquakes! I am sure you are playing with the thingie to see how we, your lab rats, react!” García Acosta (2002) suggested that we think about disaster as a social laboratory. If an emergency can be a social laboratory too, then I am, in my encounters with the alert, as much a lab rat—or rather, as much a part of a complex material, technological and social system of practice by which meaning is made—as he.

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