"Can't think of anything more to do": Public displays of power, privilege, and surrender in social media disaster monologues

Melissa Bica, Leysia Palen, Jennifer Henderson, Jennifer Spinney, Joy Weinberg & Erik R. Nielsen

Published online: 24 Nov 2021.

Submit your article to this journal ↗

Article views: 10

View related articles ↗

View Crossmark data ↗

Taylor & Francis
Taylor & Francis Group

Check for updates

"Can't think of anything more to do": Public displays of power, privilege, and surrender in social media disaster monologues

Melissa Bica [a,*], Leysia Palen[a,b], Jennifer Henderson[c], Jennifer Spinney[c], Joy Weinberg[b], and Erik R. Nielsen[d]

aDepartment of Computer Science, University of Colorado Boulder, Boulder, Colorado, USA; bDepartment of Information Science, University of Colorado Boulder, Boulder, Colorado, USA; cCooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado Boulder, Boulder, Colorado, USA; dDepartment of Atmospheric Science, Colorado State University, Fort Collins, Colorado, USA

1. Introduction

Disaster events – which can arise from meteorologic, geologic, technologic, or biologic hazards – have long served as sites to investigate socio-behavioral phenomena. Their disruption to and suspension of routines exposes behaviors that we take for granted that serve to maintain social order (Dynes, 1970; Fritz & Mathewson, 1957; Hagar & Haythornthwaite, 2005; Kreps & Bosworth, 1993). The onset of disaster and the shift from normalcy to crisis often leaves people feeling unsure about what might happen next. In this state of uncertainty, people attempt to assess their individual risk and activate their social networks to find information about the dynamic constraints that a disaster can generate for them. For those with access to internet and social media platforms, online activity further enables requests for informational and material support across larger geographical boundaries (Foot & Schneider, 2004; Palen et al., 2010; Palen & Hughes, 2018; Palen & Liu, 2007; Qu et al., 2009; Shklovski et al., 2008; Starbird et al., 2010; Sutton et al., 2008).

But what can people do during disaster situations when the constraining conditions created or exacerbated by hazards multiply and evolve to the point that help offered broadly from others online can do little? Those with small or under-resourced social networks especially might expect little in the way of assistance from posting online about their situation.

Furthermore, analytically, classic social media analysis, which bends to the "tyranny of the tweet" (Palen & Anderson, 2016) by primarily examining tweet-by-tweet posts, is predisposed to finding only these strongly instrumental and straightforward forms of help requests and offers. It begs the question of what is missing from those analyses (Crawford & Finn, 2015): what do people post about if they cannot seek broad assistance, and can this answer help us understand the lived experience of weather disasters? The trouble here is that, even when tweet monologues are taken as the unit of analysis in a majority of disasters, the high volume of Twitter posts and the rarity of high constraint make it hard to identify those experiencing such constraints.

Complex hazards create physical constraints so dynamic and complex that few options exist to maintain personal safety. Though the most vulnerable people experience constraints more than others, the extrinsic constraints of compound weather hazards impose themselves on everyone in their concurrent paths. This means that they constrain the otherwise very large search space of the social media record to help identify those liminal experiences, which can otherwise be drowned out by the onslaught of those seeking and offering instrumental help. These concurrent hazards like
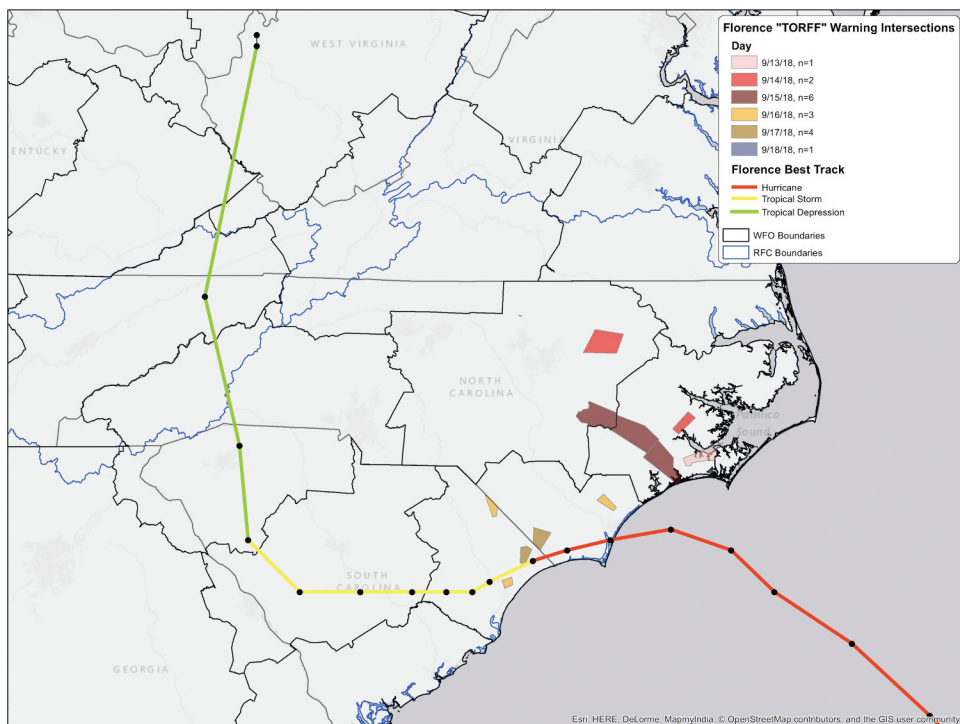
Figure 1. Map of concurrent tornado and flash flooding events (TORFFs) that occurred in the 2018 Hurricane Florence.

those we examine here – hurricanes with embedded tornadoes and flash floods – reveal how some social media users may document their reactions when highly vulnerable to especially constraining experiences. The monologic series of social media posts enable study of those affected over the duration of the hazard and better understand social media expression especially from voices that are otherwise overcome by the highly public and therefore "louder" experiences of disaster.

1.1. *Beyond instrumental use of social media in disaster*

Crisis informatics research has sought to show what kinds of valuable, actionable information can be extracted from social media mining of posts from the public and emergency management during disasters. For instance, research has investigated how social media posts during disasters could be used for gaining situational awareness (Ireson, 2009; Tang et al., 2015; Verma et al., 2011; Vieweg et al., 2010), verifying information (Mendoza et al., 2010; Starbird et al., 2016), solving event-specific problems (Palen et al., 2009; Sarcevic et al., 2012; White et al., 2014; Wong-Villacres et al., 2017), seeking information to reduce uncertainty (Fraustino et al., 2012; Gui et al., 2017), coping with trauma in the aftermath of a crisis (Frey, 2018), and distributing information, especially in the absence of mainstream media coverage of certain communities or populations (Anderson et al., 2016; Shklovski et al., 2008; Simon et al., 2015). The inherent assumption in much of this research is that social media is used instrumentally to achieve these goals. The research hope then is that the data can be mined, collated, and transformed into actionable information.

The case we make in this paper is that, when facing uncertainty, people may find meaning through posting to social media that is different from how research usually frames social media inquiry in disaster situations. When situations become so constrained, such instrumental objectives might not even be possible, resulting in other behaviors that are more clearly on display. To this end, we contribute a rigorous methodological approach for collecting and analyzing social media data

during a disaster event to demonstrate what we see as the real value of such data – learning about the lived experiences of disaster victims – which may be different than what many researchers and data scientists may hope for.

We selected Hurricane Florence as the research event given its multiple co-occurring tornado and flash flood hazards expecting that such high constraints to a relatively localized area might reveal the instrumental information-seeking and -sharing behaviors that many hope to find on social media. Our weather scientist collaborators, like so many others before them, were imagining such a silver bullet from social media mining. Yet our earliest analysis revealed an absence of posts on the topics of evacuation and weather discussed as a specific form of seeking instrumental help. Rather, we found that people affected by the multi-hazard disaster engaged with Twitter as part of their felt experience (McCarthy & Wright, 2004) – as we will describe, those affected described themselves as being stuck and unsure about what to do. They complained about feeling pressured to go to work or school, and about feeling out of control of their own choices because the solutions were so unclear, and because others were differentially impacted. These themes of liminality, power, and control became the organizing ideas of the inductive analysis.

In the conclusion, we will return to the fantasy idea that Twitter and other social media platforms are places to mine data to find clear documentation of thoughtful decision-making and precise status reports during disasters. We hope to promote instead the treatment of social media posts as embedded in the disaster experience and representative of people's lived experiences of disasters.

1.2. *Disaster and individual "constraints"*

We take the various states of being socially, economically and geographically vulnerable, including those newly imposed by a hazard like a hurricane, to be *constraints* (Gross, 1985) on decision-making that a person must optimize to respond adequately to the threat. We do this for two purposes. First, we aim to avoid essentializing vulnerabilities in the people who may possess them. Socio-economic and other vulnerabilities, like other constraints, can be limiting, but they can also lead to creative solutions. By viewing the otherwise classic disaster sociological notion of vulnerabilities (Cutter, 1996) in this way, we do not presume that to be vulnerable yields no paths for solutions. Second, by framing all sorts of limitations as constraints, our analytical treatment neither presumes nor needs to account for (impossibly, for some research) which vulnerabilities may or may not be present. This framing instead allows for investigation of *in situ* expressions via social media of what one does when needing to make difficult decisions under conditions of uncertainty.

The 2018 Hurricane Florence was a multi-hazard event that posed significant constraints on people's behaviors because of the concurrence of tornadoes and flash flooding, known as TORFFs (Nielsen et al., 2015). These multiple hazards gave rise to conflicting instructions to keep safe, for example, to move to higher ground to avoid flash flooding and move to lower ground to avoid tornadoes. Furthermore, constraints due to environmental threats are coupled with other factors that influence people's risk-based decision-making. People process risk and make decisions with many pieces of information through their own social lenses (Eiser et al., 2012). Hurricane evacuation decisions or intentions correspond to a number of individual and household factors, including age (Gladwin et al., 2001; Lazo et al., 2015; Sadri et al., 2017; Sankar et al., 2019), gender (Dash & Gladwin, 2007; Lazo et al., 2015; Morss et al., 2016), features of social networks (Metaxa-Kakavouli et al., 2018; Sadri et al., 2017), source of warning information (Burnside et al., 2007; Hasan et al., 2011), and perceptions of risk or vulnerability (Burnside et al., 2007; Sadri et al., 2017; Solís et al., 2009; Stein et al., 2010). Other research has focused on the preparedness and vulnerability of specific populations, such as students (Collins et al., 2009), the elderly (Wang, 2018), and ethnic minorities (Elder et al., 2007; Reininger et al., 2013).

This research not only considers the collective impact of all constraints – physical hazards and existing social vulnerabilities – on people's actions as they prepared for and responded to the hurricane, but selects *on* them in its research design. By using this extreme situation of concurrent

tornadoes and flash flooding, we can illuminate the more subtle roles digital platforms play in difficult times among those who are more likely to document their dilemmas over time, rather than the usual only-occasional posts. Social media use in the context of crisis and prolonged uncertainty has been explored in the field of human-computer interaction (HCI) in work by Mark, Semaan, and Al-Ani (Al-Ani et al., 2010; Mark & Semaan, 2009). They investigated the use of digital communication technology, particularly blogs, within the highly constrained, uncertain, and dangerous conditions people experienced while living in a war zone. People wrote online "war diaries" which reflected personal narratives of their experiences of the war. The blogs provided a safe way to interact with others amid constraints imposed by physical violence (Al-Ani et al., 2010) and also aided in communicating with broader audiences in "normal" environments outside the war zone (Mark & Semaan, 2009).

As a complement and extension to existing work, this research uses social media monologues by people experiencing a different kind of crisis event. Because retrospective reports of activity are rarely as rich or accurate as real-time reports, our Twitter data collection was designed to find *in situ* accounts of what people did in a multi-hazard hurricane over multiple days. The data set yields rich narratives of personal, lived experiences. In our initial investigations of what people at risk did when facing both flash floods and tornadoes during Hurricane Florence, we found that highly constrained situations seemed to result in different Twitter posting phenomena than other single disaster events, indicating that something socio-behaviorally important may be at work when decision-making becomes highly constrained by concurrent hazards.

1.3. *Situated accounts of liminality*

A framing concept used in this research is *liminality*, which was first theorized by Van Gennep (1960) as a transitional phase during a "rite of passage." Such rites involve a phase of *separation*, upon which normal social structure and order are suspended; a transitional period of *liminality*; and a period of *incorporation* back into society with a new status. Turner (1987) expanded on the notion of liminality as any condition or state that puts a person "betwixt and between" societal norms; it is a feeling and experience associated with ambiguity, uncertainty, transition, and neutrality.

Liminality is characterized by an abeyance of social structure and order (Boland, 2013). Relatedly, disaster events are known to be associated with the breakdown of existing social structures (Fritz, 1961; Mileti, 1999) and the creation of new ones (Jencson, 2001). Disasters arising from natural hazards in particular have been characterized as liminal experiences that emerge as sudden events and can impact whole societies through the disappearance of social distinctions and normal hierarchy (Thomassen, 2012). Though liminality has been used as a conceptual framing for understanding "communitas" amid disasters – e.g., among people during a flood crisis (Jencson, 2001) – here we focus our efforts on other dimensions of liminality in the context of overlapping tornadoes and flash floods in a hurricane event. Namely, we focus on the "betwixt and between-ness" of people's individual experiences as they deal with these multiple, overlapping constraints. We come to understand these liminal experiences through social media posts made during the storm by those affected by it, which we interpret as a type of "performance . . . which not only signifies change but also constitutes transformation" (Boland, 2013, p. 229). As we will describe in the Data Collection and Analysis section, many of the social media monologues we analyzed offer narrative individual accounts of the breakdown of social structures with the onset of Florence; the uncertainty during the height of the storm and impacts of concurrent hazards; and a resolution or return to normalcy of some form once the hazards threats subsided.

HCI research has previously applied the early anthropological frameworks of liminality to social technologies in the context of identity reconstruction. Semaan et al. (2016) found that information communication technologies supported veterans in their liminal experiences transitioning from military to civilian life and ensuing identity crises. Veterans used social media to connect with others in veteran-specific online spaces, to help build support networks, and reestablish a sense of

normalcy during their civilian reintegration. Haimson (2018) found that social media can support people during the liminal experience of gender transition as they reconstruct their identities. He contributes a new perspective to liminality by arguing against the implication of neutrality or lack of identity by the "betwixt and between" framing. Rather, experiences of liminality can lead people to encompass multiple identities.

We use the "betwixt and between" framing of liminality from Turner (1987) as a lens by which to understand the experiences of those impacted by concurrent hazards in a disaster. The experiences of those in Florence's path were liminal in that they were shaped by uncertainty regarding what the storm would do and what they could do to keep safe. The conflicting and constraining nature of the TORFF hazards resulted in challenging decision-making and risk assessment that had no obvious solutions. Yet even when people found themselves lacking the agency to take tangible steps to keep safe, such as evacuation, we learn from their social media posts or "performances" that they remained engaged *to make sense of, and regain control of*, a disorderly and uncertain situation.

This perspective of ongoing performance further maps to a situated action perspective of "getting things done" (Dourish, 2001) where, in practice, people respond to a hazard as it occurs using the skills and resources available to them, adjusting as necessary to account for changes that occur throughout the situation (Suchman, 1987). Though there are traditional and established protocols for how to prepare for disasters arising from events like earthquakes, hurricanes, floods, and tornadoes, such protocols do not well account for individuals' contexts when they are actually faced with a disaster (NDND Baker, 2014). Disaster response can be readily understood in the context of situated action when considering the case of a multi-hazard disaster for which standard protocols conflict even themselves, as was the case with TORFFs in Florence.

This research is an examination of *in situ*, monologic microblog posts by those who experienced the highly constrained multi-hazard events of the 2018 Hurricane Florence. Using liminality as a lens by which to understand people's situations, the empirical analysis of these social media monologues illuminates both the lived experiences of these events, and also what it means to engage with microblog platforms, specifically that of Twitter, as part of the disaster experience.

2. Event description

Hurricane Florence made landfall on Friday 14 September 2018 as a Category 1 storm near Wrightsville Beach, North Carolina, USA (Stewart & Berg, 2019). The storm was a particular challenge to weather forecasters and emergency planners because of complex meteorological inter-actions along the storm's life cycle that affected the certainty of the track forecast (Bosma et al., 2020; Stewart & Berg, 2019). Florence was especially devastating because of its slow forward speed, which meant that in addition to storm surge, persistent rain caused extensive inland and river flooding, breaking multiple flood records set by previous hurricanes. Tornadoes were also an issue, with 44 tornadoes reported across North Carolina, South Carolina, and Virginia, which sometimes occurred with flooding (Stewart & Berg, 2019). See Figure 1 for an overview of Florence's path and TORFF areas.

For those in its path, there were few precedents to use as a guide for how best to prepare for or mitigate Florence's impact. Thus, one constraint faced by residents in areas under threat was having limited or no frame of reference. Plans around evacuation, sheltering in place, preparing one's house, and stocking up on supplies may not have accounted for the unique complexities and uncertainty of Florence. Past hurricane experiences were less useful than they would have been for a more typical hurricane, as many noted in their social media posts, e.g., " . . . We've had hurricanes before, but not like this one – so I don't know at all what to expect, really."

Moreover, when it became clear where the storm would make landfall, it also became clear that its impacts would be devastating. Despite the Saffir Simpson scale rating of a Category 1 at landfall – which accounts only for wind speed and not for other potentially devastating features – the

hurricane created catastrophic impacts due to the extreme precipitation it generated[1] (Paul et al., 2019; Stewart & Berg, 2019). Especially problematic was the combination of flooding and flash flooding caused by storm surge, extreme rainfall, and rivers overtopping their banks with strong winds from the eyewall of the storm and tornadoes. Flooding and tornadoes in the U.S. are warned for through alerts issued by the National Weather Service, which may contain contradictory safety protocols when issued concurrently: for flash flooding, warnings often advise people to move to higher ground and to stay off the roads, while for tornadoes, warnings direct people to shelter in the lowest interior room of a sturdy building or to move to a substantial shelter if outdoors, in a vehicle, or in a mobile home (Henderson et al., 2020; Nielsen et al., 2015). Thus, people may be confused about which actions they should take to stay safe in the presence of multiple, overlapping hazards; this confusion can function as a constraint on risk personalization, decision-making, and response.

A total of 22 deaths were directly caused by Florence, primarily due to flooding, as well as at least 30 additional indirect fatalities (Paul et al., 2019; Stewart & Berg, 2019). Total damage is estimated at $24 billion, which places Florence in the top 10 most costly U.S. landfall tropical systems (Paul et al., 2019; Stewart & Berg, 2019).

3. Data collection and analysis method

For the research design, we focused specifically on those who experienced concurrent TORFF hazards, which determined the rigorous data collection method we used to identify such users and collect their full tweet streams during the study time frame, whether the posts were obviously about the disaster or not.

First, to isolate the people who might have experienced both flash flood and tornado hazards during Hurricane Florence, we collected all tweets from 8 September to 20 September 2018 containing both a tornado-related keyword ("tornado," "funnel cloud") and a flash flood-related keyword ("flood," "flash flood," "storm surge"), including keywords as hashtags (e.g., "#flood"). The date range comprises the two-week period surrounding Florence's landfall on 14 September.

This query resulted in 3725 English-language tweets from 2299 unique accounts. We classified the accounts based on the content of their tweets as being either from a member of the public, from an identifiable authoritative source, or other (unrelated to Florence, bots, etc.). For this classification, we excluded retweets (n = 2803), as these did not include content written by the account user that would help determine their category; this left 815 account users who produced 1160 tweets. Two coders coded the accounts and identified 439 as public, 175 as authoritative, and 201 as other. Our research interest is in people who both personally experienced Florence and wrote about those experiences, and so we focus here on public accounts only.

As an empirical decision following the best practices that our research group have developed to support responsible interpretation of behaviors underlying social media data, our next step was to collect entire contextual tweet streams (Anderson et al., 2019; Bica et al., 2020; Kogan & Palen, 2018; Palen & Anderson, 2016; Starbird et al., 2010), what some linguists call "monologues." Analyzing Twitter monologues versus single tweets overcomes the "tyranny of the tweet" (Palen & Anderson, 2016): the strong tendency, even among interpretive social scientists, to conform the unit of analysis to the single tweet data block in which data are searched and delivered. In contrast, we must assume that Twitterers rarely expect that single tweets stand alone and represent the whole of their views or experiences. Not only do experiences change over time – as is certainly the case in disasters – but it is difficult to understand the tone of a post as it stands alone. However, tone and emotional content can reveal itself by examining a sequence of posts.

---

[1]Although there is no equivalent to the Saffir Simpson scale to quantify and communicate precipitation in hurricanes, researchers have shown how such a scale would more accurately convey the hazards of a hurricane to human life and property, using Florence as one example (Bosma et al., 2020).

The monologues were constructed after the Twitterer was found based on the criteria listed above. We used the Twitter API for data collection for most accounts, and a premium Twitter API for those accounts that had a number of tweets that surpassed regular collection limits. Data could not be collected for 69 accounts because they were deleted, protected, or suspended, and consequently were no longer available. The data collection thus includes every tweet from 370 found public accounts posted during the designated study period, whether they were about the hazard event or not, totaling 48,092 tweets. An additional 19 accounts were removed from analysis as their accounts were deleted, suspended, or made private after data collection, or because further inspection of their tweet streams revealed that they did not post content related to Hurricane Florence despite the initial keyword match. The remaining analysis covers 43,783 original tweets organized in monologues from 351 public Twitter accounts.

We next qualitatively analyzed each Twitterer's monologue. Four of the authors collectively read all the tweet monologues and their associated metadata and collaboratively wrote descriptive summaries for each of them. These summaries were an analytical transformation that, as distilled representations, helped us summarize and organize the data. The practice of writing and analyzing summaries of the monologues yielded a robust and holistic understanding of the speakers and their experiences, including at an emotional level for some. The summaries included, as available: basic details about where the person lived or worked, their lived and emotional experiences of Florence, any decision-making they engaged in, their conversations with others, and what types of information or information sources they referenced or used. We offer one such summary that is exemplary of these kinds of details:

> This speaker is a woman living in Raeford/Rockfish, North Carolina. She is a mom and MBA student. Her story begins by describing **hunkering down at home**. Florence is her **first hurricane** (she is from Kansas/tornado alley originally). Her shed starts losing shingles with consistent rain/wind on 9/14. On 9/15, she experiences flash flood warnings and tornado watches (TORFF). She notes how slowly the storm ("Flo") is moving with a sarcastic hashtag - "#iwalkfasterthanFloismoving". Having not evacuated, she describes being "hunkered down waiting on #Florence to move on" and watching TV. The next day on 9/16, **"Major flooding is now a big concern"** when Florence is categorized as a tropical depression. She had minimal damage compared to neighboring communities, and notes that she is "far more prepped for next time." Later on she describes **returning to normal life**: "Now that the madness has finally let up, AND it's only raining, I can get back to work on my 10 page paper and read." referring to her MBA schoolwork. In her final tweets on 9/17, she notes blocking "sad and heartbreaking" content about drowning pets from both Hurricanes Florence and Matthew two years prior.

At this stage, 142 accounts were excluded from further analysis due to having few, if any, contextual tweets related to their experiences of Florence. This left 209 public accounts with 23,937 tweets for the final stage of analysis and interpretation. These 209 accounts varied in terms of the narrative depth of their tweets related to Florence, with an average of 115 total original tweets per account. Some of these accounts shared highly detailed tweet monologues which read as "story arcs" of their experiences: they documented their pre-storm concerns and planning, their evacuation and other protective decision-making processes (i.e., the threshold of betwixt and between), and some form of a resolution (e.g., whether returning to home, work, or school; noting they are safe; or reflecting on the outcomes of their experience). The user who was the subject of the example summary above falls under this category, for instance. Others shared less comprehensively about their experiences of Florence but posted about specific topics of interest to the research, such as reasons for not evacuating or how they assessed their risk in relation to TORFFs, for instance:

> Im just glad that my home isn't in a flood area. I am worried about the tornado threat that is in the northeast part of the storm!

Examples included in the paper are sampled from all 209 accounts. Though the primary unit of analysis was the full monologue, we include individual tweets to demonstrate portions of the monologues in the Twitterer's own words. Following best research practices regarding the ethical use of public data (Fiesler & Proferes, 2018), we slightly modified the presented tweet texts without

changing original meaning or sentiment to reduce traceability. We pseudonymized Twitter user-names, formatted as @username, using an online username generator to conceal identities.

4. Discussion of findings

Two salient organizing themes emerged from our analysis that further our understanding of the role of social media during difficult and highly constrained experiences of disaster. The first theme is *how power is negotiated* in many of the relationships that are encountered in disasters, which was expressed through statements about *privilege, control, and defensiveness* – the latter of which emerged on the matter of evacuation. These dynamics of power are interpreted as attempts by people to reorganize and reorient themselves in relation to the disaster situation.

The second theme is how social media became a place for *publicly documenting and surrendering to the liminal experience of disaster*, especially because of the audience it provides.

4.1. *Negotiating power*

People used social media during Hurricane Florence to negotiate power, including those in positions of authority and those who expressed disempowerment. For many people, their actions in response to the storm hinged upon decisions made by institutional authorities such as employers and schools. Their lack of power was not only limiting but also dangerous, especially when authoritative decisions conflicted with hurricane safety measures. Other people exercised newly acquired power to establish or regain a sense of control and order in the liminal disaster space, a time when many circumstances are out of one's control.

4.1.1. *Powerlessness in the face of authoritative leadership*
We begin by describing instances in which people expressed powerlessness in relation to the authority of institutions and employers. In particular, we see how students and employees were at the mercy of these authorities when making important decisions about safety during the hurricane. In our sample of Twitter users, people used the social media platform to hold these authorities accountable for clearly articulating plans and guidance, such as whether school or work would be canceled, since they needed clarity on these issues to inform their own actions.

In this category are university students, who often live on campuses in different cities or states than their family homes. Students documented the struggles they faced in relation to their university's decisions about holding classes in the days leading up to the storm and restarting classes after the storm had passed while its impacts were still very much present. @Anne, who attended East Carolina University in eastern North Carolina, a region at high risk during Florence, noted how she could not make her plans regarding evacuation before hearing the official decision of her university:

> All right well I hope if we have to evacuate they'll give us enough time to get our shit together otherwise this will be me before I jump in my car and hit the road [gif of a person hastily packing a suitcase]

In particular, she required significant time to make her evacuation plans because her family's home was a 12-hour drive away. The following day, four days prior to landfall, she tweeted directly to the university, also quoting an official hurricane advisory posted by the U.S. National Hurricane Center, to pressure the university to make a decision about whether classes would be held:

> @EastCarolina please please please make an announcement sooner than later I live 12 hours away in Rhode Island so I have to plan accordingly!!!:)

She found out later that day that classes were canceled, as evidenced by her quote tweet of the university's announcement from its official "alerts" account to which she expressed gratitude: "Praise da lawd." Less than ten minutes later, she posted that she would be driving home immediately:

> Believe me I'm jumping on the highway and getting the hell out of the south

Another student at the same university, @cecilia, expressed similar sentiments before the storm's arrival. She had already planned to evacuate five days in advance of landfall due to the likelihood of flooding:

> It's safe to say I'll be heading home on Wednesday, not sticking around when a hurricane is headed this way, and it floods like crazy here in Greenville

However, the following day she expressed her desire for the university to make an official announcement about holding classes, signaling that perhaps she could not commit to her earlier decision without this information:

> Really wish ECU would make a decision regarding the hurricane.

The official university announcement that classes were canceled came shortly after, and @cecilia retweeted it less than 30 minutes later. Upon this news, she did laundry and packed in preparation to leave for her family home. In response to a friend who showed concern and asked if she was being evacuated, she responded:

> Pretty much! Classes are canceled for the rest of the week and we were told to go home if we can, so that's what I'll be doing tomorrow morning

Though she had already made evacuation plans earlier in the week on which she seemed quite resolute ("It's safe to say … "), it became clear through her narrative that the university's decisions heavily influenced her own felt experiences about what she perceived as a constraint (i.e., that she must go to school), and therefore her evacuation decisions. It was not until learning the official status of classes and that students were encouraged to go home that she could feel at peace with her evacuation decision and leave even earlier than she had originally planned. By publicly calling out the university by name and Twitter handle, this also became a way for @cecilia to regain some control in a situation in which she expressed disempowerment.

4.1.2. *Authoritative decisions that conflict with countermeasures of the hazards*

Officials at schools, universities, and workplaces often must make sweeping decisions that impact a large number of people, which may not be realistic or even safe for everyone. Institutions may see it in their best interest to reopen quickly once a hazard has passed, for instance. Many who experienced Florence reflected on their constrained decision-making as they debated between disobeying official policies to return to school or work at the risk of academic punishment or loss of one's job, and attempting to comply with institutional decisions amid hazardous conditions, such as TORFFs, at the risk of their safety and well-being.

One institution in particular received a great deal of attention in the direct aftermath of the storm. A school district in North Carolina made the decision early on a Monday morning, three days after Florence's landfall, to reopen schools that day. However, the area was experiencing flash flooding and also had a tornado warning in effect. Photos of children standing in the rain waiting for their buses during the tornado warning and videos of school buses driving through flooded roads spread online. Parents, students, and other concerned people began posting to Twitter, questioning and criticizing the school district's choice to hold school under such conditions:

> hey @«school district» don't know if ya'll heard but where i live i'm under a tornado & flash flood warnings. roads by my high school are flooded. thought y'all wanted us to be safe? i'm gonna be late for school because school starts at 9 and this tornado warning is over at 8:45 … . [posted at 8:21AM with a phone screenshot of an emergency alert for a tornado warning]

> @«school district» «name of secondary school» is flooded. Why did you make me drive here?

> @«school district» For The Sake of the students please cancel school, thousands of people are still evacuated, and even more are stuck due to flooding, it could be potentially dangerous for students to go to school, please cancel, for them.

The requirement to go to school constrained students' and parents' choices, resulting in expressions of powerlessness and being coerced by the school district ("Why did you make me drive here?"). By using the @ convention to tweet directly to the school district's account, these instances demonstrate textual acts performed at threshold moments when uncertainty was heightened regarding school closures. By appealing to the district about its decision, these posts attempted to establish a semblance of control in the liminal situation.

These kinds of issues happen not only in the days leading up to a hurricane, but also in its aftermath. For instance, @anne, who wanted to hear her university's official announcement before preparing to evacuate, still faced constraints even after evacuating. As she prepared to return to her campus, all the major roads were closed and/or dangerous to drive through due to tornadoes and flash flooding. The traffic and treacherous drive even made her consider, seemingly in a sarcastic way, that she "could sue [the university] for emotional trauma/distress." The "resolution" for this user was finally returning to school:

> The best part of the 8 hour drive back to school was seeing about a dozen signs in multiple states saying to not travel through North Carolina if at all possible AND to top it off a lovely tornado/flash flood warning [meme of person laughing with caption "I'm in danger"]

We do not know why in one direction the drive took 12 hours, and in the other, eight. It could have been because of traffic or splitting up the drive; it could have also been that her message to the university employed hyperbole to affect change. In this final tweet that discusses her Florence experiences, @anne described the conflict she grappled with about driving back to her school in dangerous conditions. Not only was there signage warning her not to drive where she was headed, but there were concurrent tornado and flash flood warnings issued which made driving even more unsafe.

Similar to @anne, @cecilia also continued to experience constrained decision-making about returning to her university campus. She decided not to risk driving back to make it in time for classes because of bad road conditions from both flooding and heavy traffic, and instead intended to return two days later. Though she was appreciative that her school would excuse her absences, she still was concerned: "I'm tired of feeling so behind in all of my classes." Even with some leniency granted by her university, @cecilia was still in a challenging situation of having to choose between her academic progress and her personal safety in a disaster, illustrating the feelings of powerlessness that can arise from institutional authority during liminal disaster situations.

Workers also conveyed experiencing constraints due to the demands of their employers. @Maggy expressed resistance in reaction to her boss' discussion of upcoming work occurring on the day of landfall, because "there is a full blown hurricane on the way and I am not planning to be at work." On the first workday after the storm, she posted:

> The road I live on is flooded and there's a tornado warning so I told my boss I felt unsafe driving in it and he is really picking me up [gif of person with disgusted expression]

This example demonstrates a reinforcement of the power dynamic. Though @maggy's boss may have felt generous about driving, he seemed to miss her main point, and interpreted her concerns to be a fear of driving herself. Rather, @maggy's concern was being on the road and thereby exposed to the concurrent TORFF hazards – being in a car is explicitly warned against for both the floodwater and tornado risks they both faced. It is also possible that the boss was himself beholden to managers who outranked him and felt compelled to get himself and his staff to work under any circumstances. Even when those in power attempt to establish social order in a liminal situation, it is not always perceived as comforting or desirable. Here, the worker did not desire to go to work but had little choice given the power dynamic. This example also shows the heterogeneity of the liminal experience. The attempt to impose control (by the boss, in this case) may have brought certainty and order to the situation (i.e., a solution for getting to work despite physical hazards), but it did not seem to generate a sense of peace or safety for @maggy. This is distinctive from other studies of social media use in

disaster which often frame social media as facilitating distributed problem solving (Palen et al., 2009; Sarcevic et al., 2012; White et al., 2014; Wong-Villacres et al., 2017).

Other workers had even more unsafe expectations set by their employers. @Wardle lived in North Carolina and worked at a chain restaurant. Days before the arrival of the storm, he expressed concern about the possibility of having to go to work immediately after the hurricane passed, and especially about having to work on "the trailer when it doesn't even have air conditioning and is literally just one big oven." His fear was realized when he was expected to open the restaurant a few days later. When he arrived at work, he found the roof destroyed, food spoiled, and overall "unsanitary and unsafe conditions." Yet, he and the other employees were threatened by the franchise owner to be fired if they did not show up to work:

> Might be getting fired but idc idc I'm pissed the fuck off and just left bc I refused to open the store in the unsanitary and unsafe condition he wanted us to work in

This occurred at a time when the restaurant's employees were affected by evacuation orders, flooding, and tornadoes. @Wardle used social media to document the store's condition and his interactions with the insurance team. Though he did not identify the owner nor the business in his posts, this documentation of events reflected for his social media audience the struggle in dealing with what were perceived as unfair demands of his job. His felt experience of the disaster was shaped by the power of others and perhaps the power he could regain by making his concerns public. It also speaks to an *advocacy* of safety, in this case, a topic we return to shortly.

Similarly, @Cyrus shared about how the retail store at which he worked pressured him to work on the day the storm made landfall, when flooding was a major concern in his area:

> my store wanted to stay open and I was like you realize your manager (ME) lives the farthest away??? I'm not risking my car for the Halloween store bitch

The following day he was asked to assess damage at the store, but did not feel responsible to do so due to his subordinate position as an assistant manager:

> my manager messaged me and said we were asked to go "assess the damage" from the floods and I was like nope!!! I'm just an assistant manager!!

@Cyrus and @Wardle both actively challenged the power differentials being used against them, as described in their posts, in effort to regain control of the situation – to exert power in their own right. As the ones with lesser power in these experiences, both expressed reluctance to put themselves at risk in dangerous conditions.

These excerpts illustrate the ways people confronted employer and institutional demands during the hurricane. Such posts are unlikely to receive actionable suggestions in reply, nor do we assume that those are the goals. Rather, posting such issues aids in the liminal experience by documenting and thereby using the public as witness to what is perceived as unfair. It also marks people's threshold moments of transformation from feeling powerless to recasting their power as they made sense of the situation.

4.1.3. *Advocacy*
The power divide that arose during the hurricane and its aftermath motivated some Twitterers to advocate for those who lacked the power to choose their own safety over their employers' policies. In the previous section, we discussed @Maggy who posted about her unwillingness to go to work because the hazardous conditions of tornadoes and flash floods made her feel unsafe. She additionally posted a series of messages about employees at restaurants and other local businesses, expressing that she found it "selfish" of people in impacted areas to visit these places because that required employees to be at work rather than safely elsewhere:

> To be honest I think it's really selfish for people to go out to restaurants and other places of business right now. Those workers deserve to be inside and safe with their family but as long as you go there they won't get to leave … As long as people come, they have to be at work.

This sentiment echoes her description of her own situation as someone whose concern for her safety amid multiple hazards outweighed her sense of responsibility to go to work that day. We might see both these acts by @Maggy as ways to regain lost power. In her expressions of discontent, she recognized the little power she had in the situation and challenged the structural power differential that existed between herself and her employer. She saw the power differential again in relationships between patrons, servers, and the imperatives of the servers' employers. Her advocacy could also be seen as a form of reorganizing her own liminal experience by taking action to help others while unable to change the course of her own situation.

4.1.4. *Exerting power*

Liminality can give rise to powerlessness, which we have described in the previous subsections. Here we describe how such powerlessness leaves those who are experiencing heightened uncertainty to act in a way that establishes or reestablishes power. Power in this sense is not only ascribed to those in typical positions of authority, like school board members or employers. Rather, we understand that power is about the freedom of choice (Schwartz, 2009). In the case of a disaster during which social roles and structures are known to shift or even disappear (Turner, 1969; Weick, 1993), people experience different levels of autonomy to make choices based on their constraints. Those who find themselves in situations where they have greater autonomy of choice sometimes exert their power to influence the behaviors of others.

The tension between differing power relationships is exemplified by @Sydney. She described her positive experience of being supported by her manager to decide for herself whether to travel for work the week of Florence:

> Boss just messaged me and was like "if you don't want to travel this week, I totally get that." They are forecasting over 15 inches of rain …

Yet just days later, she was upset when others could not conform to her expectations for a timely delivery of a package – an anti-anxiety product for her pet – via Amazon.com before the storm arrived:

> My «items» were scheduled for delivery yesterday from Amazon. They didn't arrive. I was told they'd arrive today or tomorrow. Assuming it won't show by then since their email claims it's due to the hurricane. The package is IN THE NEXT TOWN OVER and has been since yesterday.

> Apparently it's impossible to get my items from the warehouse that is like 9 miles (being overly generous) away. Because of the sunshine we had yesterday and the 12mph winds today. Looking forward to anxious pets because Prime fails to meet their set delivery schedule.

While @Sydney accepted flexibility of the power dynamic with her manager in which she was typically the subordinate, she was not so willing to be flexible with a reversed power dynamic in which she was in the position of power as a consumer. She instead attempted to use her power to pressure or shame a corporation for what she considered to be unsatisfactory service. @Sydney's Amazon experience also shows how posting to social media made more obvious and reinforced the structural power differential that exists in producer/consumer relationships.

An additional complexity of liminality demonstrated by these uses of social media for exercising power in Florence is that people are not isolated to only their own situations, but are made witness to others' experiences as well. This places people in the position of being able to empathetically advocate for others who may be even more constrained. However, there is also demonstration of blind spots in which those experiencing the hazard fail to recognize that others are also highly constrained – blind spots that appear to map to the situational power one feels they have in the dynamic. Social media adds an audience to the liminal experience, making admonishments, mistakes, or defensive performative acts no longer only interpersonal, but potentially highly public, thereby enacting a structural power dynamic. Injustices are admonished, but also newly performed, depending on one's situational power.

4.2. *Power and the privilege of choice: evacuation as an illustration*

Evacuation is a primary protective behavior for hurricanes studied by researchers from a range of fields from risk communication to hazards research to behavioral science. Developing an evacuation plan is a primary step in the U.S. National Weather Service's hurricane preparedness program.[2] Because evacuation is clearly an important way to keep safe in a hurricane, it has also become a lightning rod of controversy over how people should respond to disaster events. In the complicated multi-hazard case of Florence, evacuation decisions become even less clear. In particular, there is the assumption that evacuation is an obvious or simple choice for those at risk of a hurricane. This sentiment is reflected in the following post from the data set, which was in response to an article reporting on several deaths during the storm:

> They should've evacuated. How difficult is it to get out of the way of a slow, lumbering giant? They were given enough advance warning, so what gives?

The author of this post, and others who hold similar sentiments, comes from a position of privilege to not only presume that evacuation is the best choice, but that it is even an option in the first place. As we will show throughout this section, evacuation is not as straightforward as it may seem. Evacuation requires resources that not everyone has, including means of transportation and somewhere to stay in a new location. It can also be unclear whether relocation is safer when the hurricane track is not precisely known, as is often the case. While research on hurricane evacuation behavior in the US shows that over 90% of high-risk residents evacuate when public officials are aggressive in risk communication and evacuation notices (E. J. Baker, 1991), the majority of people affected by a hurricane do not evacuate their homes (Hasan et al., 2011; Metaxa-Kakavouli et al., 2018). Evacuation behavior or intention is lower for people or households based on certain factors such as having pets (Bowser & Cutter, 2015), having children (Lazo et al., 2015), and even having a smaller social network size (Sadri et al., 2017). In our data set, many people (for whom we could determine their evacuation status) apparently did not evacuate during Florence even despite mandatory evacuation orders across South Carolina, North Carolina, Virginia, and Maryland (Paul et al., 2019). Here, we present findings to augment prior evacuation decision-making literature with additional factors that add to the complexity of evacuation.

4.2.1. *Evacuation as a privilege*

"*How difficult is it*" to evacuate? Evacuation can involve a range of financial burdens: the cost of gas and hotel room, the cost of supplies to take on the road, the cost of missing work, to name a few. In their posts, people disclosed their financial constraints to evacuating, e.g., "Nope. Evacuation costs money that I do not have." Some tried to bring awareness to the financial burdens afflicting those who were already constrained and unable to evacuate:

> Being from Eastern NC [North Carolina], it makes me angry when people say "Why didn't they just evacuate?!" Eastern NC is mainly rural, swamps and poor. Most people don't have money to leave. #NCwx #HurricaneFlorence

Financial help can enable or create solutions for protective actions – namely evacuation in the case of a hurricane – to distance oneself and one's family from the direct impacts of the disaster. One person, @nelly, used multiple techniques to seek financial help via social media after she and her family decided to evacuate. She attempted to sell a ticket for a concert she could no longer attend to instead use the money for evacuation:

> hi i'm really sad to do this but i need the money to evacuate from the coast because of the hurricane, i'm selling a ticket to a concert in atlanta and have to sell it asap please dm me for a price!!!

---

[2]https://www.weather.gov/wrn/hurricane-preparedness

In addition to disclosing financial struggles, people also used social media to solicit financial aid from others. For instance, @juliana posted days before landfall that despite believing her area was under mandatory evacuation, she could not evacuate due to financial constraints:

> … For those asking why we're still here, because we're just like many others who cannot afford to evacuate. So please keep us in your thoughts.

She then discussed preparations for hunkering down, such as buying food, water, and gas; charging electronics; and making note of shelter information in case they lost power and needed to evacuate. Several hours later, though, she wrote that even though her area was not mandated to evacuate as previously believed, they were encouraged to take precautions because of their proximity to the high-risk coastal area, so she and her family decided to "go further in west to get away from the coast." This led to a change in her decisions as new information led her to reevaluate her physical constraints and safety. Subsequently, @juliana sought help from others to enable this option to evacuate:

> We're preparing to evacuate. If anyone can help out with gas, hotel, etc. My cashapp is «anonymized». Thanks in advance. I'll update once we make it out from the coast.

By providing her "cashapp," which refers to her username for an instant mobile payment service, she left open the range of possibilities for how others could support her. Even though she noted specific needs like gas and hotel costs, she asked for cash to be sent via the payment service which offered the most flexibility to cover the range of needs she and her family might have faced during uncertain times. We cannot know based on the public tweet data whether anyone sent her money; however, she reported being "on our way out" and "headed to a hotel" later that same day, leaving us to assume that her family acquired the means to evacuate.

Though having financial means is a precondition to evacuate in the first place, meeting this condition alone does not necessarily mean a person will evacuate. In the event of Hurricane Florence, the ability to evacuate is a privilege that only some people are able to afford as the result of a decision-making process which involves many other situational factors.

4.2.2. Evacuation as a situational decision-making process

"What gives?" Despite a plethora of research devoted to modeling people's evacuation behavior as reviewed above, the decision to evacuate from the decision-maker's point of view is not a simple formula, but rather a social process (Drabek, 1999) – a complex and situational weighing of risks. Hazards researchers have been implored to understand how people come to risk conclusions as a result of interpreting different kinds of risk messaging and information (Dash & Gladwin, 2007). In addition to financial costs, which generally exist for anyone who evacuates, the decision to evacuate is also influenced by risks and constraints that pertain to individual contexts, such as health factors or prior experience at an evacuation shelter (Bowser & Cutter, 2015; Demuth et al., 2016; Huang et al., 2016; Lazo et al., 2015). Accusatory posts that ask, "what gives?" of people who decide not to evacuate provoke responses which deflect judgment and indicate that their situations dictate their choices.

@Jarley is an expert on coastal climate risk who also lived in an at-risk region in the Carolinas and faced highly constrained decision-making during Florence. She first reprimanded those who shamed others for deciding not to evacuate:

> And for the love of god, people outside of the areas impacted, don't evacuation- or decision-shame. People make decisions based on many factors and your twitter feed isn't one of them.

Days later, she experienced firsthand this sort of shaming as she considered her options for evacuating or sheltering in place. Her posts indicate that she was shamed by people who expected her to unequivocally make evacuation decisions precisely because of her authoritative status and expertise about hurricane risk. In response, she posted:

> […] I'm being shamed by people who have never lived on the coast for not evacuating yet and scorned by neighbors because I *might* be evacuating. Social ties, y'all.

> Why people do what they do may seem completely absurd if you're not from their world. I'd like to NOT leave for many reasons unless things look really dire. But I worry not leaving will deem me a hypocrite to my constituents.

In these posts, @Jarley emphasized what research has also seen: that decisions are personal and based on interpretations of risk in the context of their own "world," or "social lenses" (Dash & Gladwin, 2007). The betwixt and between, unstructured nature of experiencing a disaster makes decision-making even more complex. @Jarley later posted her decision to not evacuate as part of a long thread, explaining that her "reasoning is complex and incorporates a huge amount of local knowledge and experience." This included knowledge of the area's tolerance for rain based on her experience with Hurricane Matthew in 2016 as well as her own compromised health vulnerability that made it difficult to be away from home for a long duration. Finally, she wrote on behalf of herself and other non-evacuees to justify not evacuating as an informed decision:

> Let me reiterate that: I know the risks in staying and I am assuming them. I've prepared the best I can and will re-evaluate as needed. Most people won't explicitly state that, but that is in fact what they are doing.

Similar sentiments were expressed by @UniSally, but in regard to her parents' (who lived separately from her) choice not to evacuate. In response to a post reprimanding those who planned not to evacuate in Florence because they survived previous hurricanes, she wrote: "My parents live in Wilmington and didn't leave. It's going to be a long few days" (Wilmington was directly hit at landfall). Her response served to deflect judgment by exposing the true, situated nature in which people make decisions, some of which may not adhere to official orders. It also seemed to appeal to the other person's emotions by personalizing the issue with the example of her parents, thereby challenging the stereotype of *people who don't evacuate* as foolish or ignorant. This emotional appeal appeared to be effective in that the other person then showed compassion – "Oh how scary! I hope they are ok." – and even reflected on her own parents' flooding from Hurricane Irma the year prior.

Deflecting judgment can have useful personal consequences in that one's decision to not evacuate becomes a more viable and socially acceptable option, reducing one's own uncertainty about what to do. As in these examples, this behavior could itself be seen as a form of public shaming in response to others' shaming, but done in the name of public good rather than to make people feel badly for their decisions or actions. By contextualizing the experiences and constrained decision-making involved in disaster, deflecting judgment thus also serves both to enlighten others as to the realities of disaster response on the ground, and to combat assumptions and stereotypes that negatively portray people who are already facing challenging circumstances. In addition, the emotional support that can arise as a by-product from exchanges with others about not evacuating may be a form of unexpected help. We learn more about the ways in which people experience liminality in disaster, in this case by defending situational decision-making even in the face of pressure from others to act differently.

4.3. *Documenting and surrendering to the experience*

As a final contribution to an understanding of the liminal experience of disaster, we saw that some in our data set took to social media to document their status, actions, or preparations. In doing so, they implied that they had exhausted all their planning and preparations, and there was nothing more they could do amid the high constraints they faced from both social and environmental factors. There were no requests to be made. Thus, rather than striving for specific outcomes – like guidance from leaders, offers of assistance, or even empathy – these posts seem to achieve something different: they candidly address the ambiguity they are facing and surrender to the experience over which the posters have little control and few options.

Some of the posters who externalized their experiences had never been through hurricane events before, as gathered through summarizing their monologues. One such poster, @Betty, perhaps

because of this lack of hurricane experience, was frequently asked for status updates by others throughout the event. She discussed her risk assessments and uncertainty about the storm, for instance, in this post in response to a friend who asked how she was doing:

> So far, so good. I'm expecting we'll lose power sometime tomorrow and that it will maybe be restored sometime early next week. It doesn't take very strong wind to knock down power lines around here. I'm thankful we have generators. As far as the rain goes I live on a hill, but I figure that the creek that runs through the property will overflow before the storm's over.

In this post, @Betty provided both the problems or constraints she expected to face – losing power, an overflowing creek – as well as her capacity to adapt to these problems – having generators, living on a hill – leaving little room for suggestion or input from others. We know from her other posts that her lack of experience with hurricanes had her feeling that Florence was "kind of scary" and that she acknowledged the high level of uncertainty about the storm. Despite facing such uncertain and dangerous conditions, @Betty's intent of posting to social media as understood from the above post seemed to be the documentation of her risk assessment and preparation rather than a request for help. She understood and accepted the risks she faced, knowing she was ready as she could be to face what was to come.

Another person, @Pyegrave, had just moved to North Carolina three months prior to Florence and thus declared himself a "novice" at hurricanes. He similarly posted in detail about his household's preparations, risk interpretations, and actions taken. In one post, he included a photo of his supply of backup food, water, and power to ask his social media audience: "Am I doing this right?" Even in seeking reassurance, he was simultaneously externalizing the extent to which he had already prepared, as opposed to genuinely asking for help. In doing so, he was reflecting the complexity of the liminal situation – at that point in his preparation, any further level of safety he might have achieved was anyone's guess.

Others were even more candid in their expressions of surrendering to the liminal experience. @Smith posted at length about the constraints he faced in trying to evacuate his home. As a young college student, he lived at home with his parents and thus did not have autonomy in deciding whether to evacuate. He posted to social media in detail about his parents' decision not to evacuate and the position in which that left him:

> yeah but I have nowhere to go. All of my family is in NC, it's a little short notice for hotels, and the furthest family member from the coast is still in the extreme zone … **I legit don't know where to go**. And I'd have no one to go with me.

Consequently, he received an offer for lodging with another person, but he could not accept it due to situational constraints:

> I highly doubt my mom would allow it since she has no clue who you are, she wouldn't even let me stay at a friend's she knows because she didn't want to "give his parents the responsibility to look after you," but thanks anyway.

We come to understand him posting about his situation not necessarily as a way to request help, although such offers of help or encouragement may have been beneficial. Instead, such posting behavior seems to serve the purpose of personally documenting, coming to terms with, or even surrendering to a difficult set of circumstances. Social media serves as the platform by which to do so in front of a large audience. The significance of social media in this context is further exemplified by @Bella. She presented herself as both well-informed (e.g., by being aware of rainfall projections) and well-prepared (e.g., by gathering gallons of bottled water). Although she was "more than a little freaked out" about the storm, she was ready for it:

> … We've got gas, propane, food, water, Gatorade … Washed all the clothes, our stove and oven are gas, stocked up our meds. **Can't think of anything more to do.**

Documenting these liminal experiences of not knowing what to do or where to go can be seen as ordering and imposing some control over situations that are uncertain, making them more tangible as a public record. The statements by @Smith, "I legit don't know where to go," and @Bella, "Can't think of anything more to do," each demonstrate how posting to social media can be an important step in the liminal experience of a disaster. These situations can cause people to feel stuck, uncertain, and unsure if there are any additional or better actions to take in preparation for a hazard that itself is uncertain, yet potentially very dangerous. Perhaps others' responses to their posts will help or provide clarity, or perhaps the poster knows that they could not receive help even if offered. Even when there is no specific instrumental intent – such as asking for money, enabling options, rationalizing decisions – the act of posting to social media can perhaps help with reorganizing oneself in relation to an uncertain experience, and thereby impose some degree of control over the disorderliness of the situation. In a state of liminality when there is nothing left to do or to ask others to get ready for the storm, publicizing dilemmas to an audience is still *something* to do.

5. Reflections and conclusions

Our approach enabled an interpretation of people's documented, moment-to-moment experiences of and responses to the 2018 Hurricane Florence as expressions of liminality, or small "performances" (Boland, 2013) of transformation throughout the larger experience of disruption. Amid such conditions, people who analytically emerged on social media as storytellers of their situations actively prepared for and responded to the disaster and recorded these actions. In such times, social media posting may be seen as expressions of what it means to be liminal, shedding new light on human behavior in disaster which can sometimes be disregarded as irrational or nonsensical. We briefly summarize these themes:

- Through the monologues of students and workers who found themselves particularly powerless during the storm, we found the **negotiation of power differentials** to be one way of demonstrating liminality through social media. People used social media to directly interface with institutional authorities, demanding and advocating for responsible decision-making, especially around opening and closure of work and school, as critical factors in making their own decisions about what to do to keep safe amid multiple constraints and risks.
- The specific issue of **evacuation** could be understood as both a privilege requiring not only financial means, but also a personal decision requiring a complex and situational weighing of risks. Social media was used to solicit financial aid to enable evacuation and other protective actions and to deflect judgment if not evacuating.
- Finally, social media was used during the storm to **document and publicize the experience**, particularly when left without other options of what to do or where to go. Documenting experiences seems to be a way of contributing to a collective record of what the unfolding event is like from multiple vantage points, especially for those who are new to such hazards. Public posting might be an attempt to include others into what is otherwise an isolating experience.

This research enlightens the role of social media in helping people to reorganize and reorient themselves in the "betwixt and between" nature of the liminal disaster event; to regain a sense of control in a disorderly and uncertain situation.

An additional contribution of this research is showing what value lies in data collected from Twitter and other social media platforms during disasters, differently from what much previous has attempted. Social media monologues reflect people's felt experiences of disasters, which, in the case of the concurrent hazards in Hurricane Florence, encompassed concerns about evacuating amid conflicting hazards warnings, frustration with institutional authorities, and feelings of having run out of ideas for how to keep safe. On the other hand, social media behavior does *not* tend to conform to what data scientists or emergency managers might hope for: clear decision-making, addresses of

evacuation locations, or other data that can be processed by machine learning algorithms to make sense of what people do in disasters.

The value of social media data during disasters is rather its contribution to the heritage of disasters (Liu, 2012) – the stories and felt experiences that can only be shared by those who endured the events. Thus, we also make a methodological contribution with this research in demonstrating thoughtful yet rigorous qualitative analysis techniques to make full and responsible use of Twitter data during disaster. Our research attention as crisis informatics researchers should be beyond the unfettered fantasy of mining and extracting from social media data, and reading it instead for what the authors intend in their posts: narrative, first person accounts of what it is like to go through a trying, and sometimes hopeless, experience.

Social media is currently the site of troublesome and persistent mis- and disinformation campaigns, and so it is natural to view these platforms as problematic for these reasons. Yet, we also know that they can serve as important sites that enable those who are grappling with the challenges of liminal experiences of crisis to reach out to the public sphere. Many posts express helplessness, surrender, and powerlessness while also affording an audience to provide support or lend an ear. Even response-less posts may serve the purpose of documenting experiences and serve to mark otherwise undefined days. The mis- and disinformation messages we are experiencing in the American context aggressively seek publicity, and if they are successful, can distort the information space. Those messages that instead express the alone-ness of liminality are the messages-in-a-bottle floating at sea. They may be less seen, but are potent not just upon being found but also in the hopefulness of their casting.

Disclosure statement

Funding

Notes on contributors

Melissa Bica, PhD (melissa.bica@colorado.edu, www.melissabica.com) is a computer scientist with an interest in social computing and human computer interaction; she is a User Experience Researcher at Yahoo. She was a PhD candidate in the Department of Computer Science at the University of Colorado Boulder at the time this article was written.

Leysia Palen, PhD (palen@colorado.edu, https://cmci.colorado.edu/~palen/) is a computer and information scientist with an interest in human computer interaction, computer supported cooperative work, and crisis informatics; she is a Professor of Computer Science and Professor and Founding Chair of the Department of Information Science at the University of Colorado Boulder.

Jennifer Henderson, PhD (jen.henderson@ttu.edu, www.jenhenderson.com) is a hazards geographer who co-produces knowledge with experts in climate and weather contexts about compound risks; she is an Assistant Professor in the Department of Geosciences at Texas Tech University where she oversees the Risk and Equity in Disasters (RED) Lab.

Jennifer Spinney, PhD (jspinney@yorku.ca; www.spinneywx.com) is an environmental anthropologist who examines the cultural, social, linguistic and behavioral dimensions of hazards and disasters; she is an Assistant Professor in the Department of Disaster and Emergency Management at York University.

Joy Weinberg (jowe0387@colorado.edu) is a product marketing consultant at Digibee, a tech company offering Hybrid Integration Platform services; she has a BA in Information Science with an interest in User Experience Design, and minors in Technology, Arts, and Media (TAM) and Journalism from the University of Colorado Boulder.

Erik R. Nielsen, Ph.D. (ernielsen@tamu.edu) is an interdisciplinary atmospheric science researcher with an interest in human-computer interaction as it applies to compound meteorological risk experience; he is an Instructional Assistant Professor in the Department of Atmospheric Sciences at Texas A&M University.

ORCID

Melissa Bica 🆔 http://orcid.org/0000-0003-0197-5224

References

Al-Ani, B., Mark, G., & Semaan, B. (2010). Blogging in a region of conflict: Supporting transition to recovery. *Proceedings of the 28th International Conference on Human Factors in Computing Systems* (pp. 1069–1078). ACM. https://doi.org/10.1145/1753326.1753485

Anderson, J., Casas Saez, G., Anderson, K., Palen, L., & Morss, R. (2019). Incorporating context and location into social media analysis: A scalable, cloud-based approach for more powerful data science. *Proceedings of the 52nd Hawaii International Conference on System Sciences* (pp. 2274–2283). IEEE Computer Society Press. https://doi.org/10.24251/hicss.2019.275

Anderson, J., Kogan, M., Bica, M., Palen, L., Anderson, K., Stowe, K., Morss, R., Demuth, J., Lazrus, H., Wilhelmi, O., & Henderson, J. (2016). Far far away in far rockaway: Responses to risks and impacts during hurricane sandy through first-person social media narratives. In *Proceedings of the 13th international conference on information systems for crisis response and management*. ISCRAM Association.

Baker, E. J. (1991). Hurricane evacuation behavior. *International Journal of Mass Emergencies and Disasters*, *9*(2), 287–310. https://training.fema.gov/emiweb/downloads/ijems/articles/hurricane%20evacuation%20behavior.pdf

Baker, N. D. (2014). Role of explicit and implicit practices in the production of situated preparedness for disasters. *Natural Hazards Review*, *15*(4), 13. https://doi.org/10.1061/(ASCE)NH.1527-6996.0000127

Bica, M., Weinberg, J., & Palen, L. (2020). Achieving accuracy through ambiguity: The interactivity of risk communication in severe weather events. *Computer Supported Cooperative Work*, *29*(5), 587–623. https://doi.org/10.1007/s10606-020-09380-2

Boland, T. (2013). Towards an anthropology of critique: The modern experience of liminality and crisis. *Anthropological Theory*, *13*(3), 222–239. https://doi.org/10.1177/1463499613496731

Bosma, C. D., Wright, D. B., Nguyen, P., Kossin, J. P., Herndon, D. C., & Shepherd, J. M. (2020). An intuitive metric to quantify and communicate tropical cyclone rainfall hazard. *Bulletin of the American Meteorological Society*, *101*(2), E206–E220. https://doi.org/10.1175/BAMS-D-19-0075.1

Bowser, G. C., & Cutter, S. L. (2015). Stay or go? Examining decision making and behavior in hurricane evacuations. *Environment: Science and Policy for Sustainable Development*, *57*(6), 28–41. https://doi.org/10.1080/00139157.2015.1089145

Burnside, R., Miller, D. S., & Rivera, J. D. (2007). The impact of information and risk perception on the Hurricane evacuation decision-making of greater New Orleans residents. *Sociological Spectrum*, *27*(6), 727–740. https://doi.org/10.1080/02732170701534226

Collins, A., Cramer, S., Norlund, J., Simms, J. L., Kusenbach, M., & Tobin, G. A. (2009). *Shooting at hurricanes: Disaster (Mis)perceptions and (Un)preparedness of Florida undergraduates* (Issue July). University of South Florida REU Hurricane Study. https://www.researchgate.net/publication/228385470

Crawford, K., & Finn, M. (2015). The limits of crisis data: Analytical and ethical challenges of using social and mobile data to understand disasters. *GeoJournal*, *80*(4), 491–502. https://doi.org/10.1007/s10708-014-9597-z

Cutter, S. L. (1996). Vulnerability to environmental hazards. *Progress in Human Geography*, *20*(4), 529–539. https://doi.org/10.1177/030913259602000407

Dash, N., & Gladwin, H. (2007). Evacuation decision making and behavioral responses: Individual and household. *Natural Hazards Review*, *8*(3), 69–77. https://doi.org/10.1061/(ASCE)1527-6988(2007)8:3(69)

Demuth, J. L., Morss, R. E., Lazo, J. K., & Trumbo, C. (2016). The effects of past hurricane experiences on evacuation intentions through risk perception and efficacy beliefs: A mediation analysis. *Weather, Climate, and Society*, *8*(4), 327–344. https://doi.org/10.1175/WCAS-D-15-0074.1

Dourish, P. (2001). Where the action is: The foundations of embodied interaction. *MIT Press*. http://books.google.com/books?id=-TRWc0PA9e4C&pgis=1

Drabek, T. E. (1999). Understanding disaster warning responses. *The Social Science Journal*, *36*(3), 515–523. https://doi.org/10.1016/S0362-3319(99)00021-X

Dynes, R. R. (1970). *Organized behavior in disaster*. Heath Lexington Books. https://books.google.com/books/about/Organized_Behavior_in_Disaster.html?id=V2QcAAAAMAAJ

Eiser, J. R., Bostrom, A., Burton, I., Johnston, D. M., McClure, J., Paton, D., van der Pligt, J., & White, M. P. (2012). Risk interpretation and action: A conceptual framework for responses to natural hazards. *International Journal of Disaster Risk Reduction*, 1(1), 5–16. https://doi.org/10.1016/j.ijdrr.2012.05.002

Elder, K., Xirasagar, S., Miller, N., Bowen, S. A., Glover, S., & Piper, C. (2007). African Americans' decisions not to evacuate New Orleans before Hurricane Katrina: A qualitative study. *American Journal of Public Health*, 97(S1), S124–S129. https://doi.org/10.2105/AJPH.2006.100867

Fiesler, C., & Proferes, N. (2018). "Participant" perceptions of Twitter research ethics. *Social Media and Society*, 4(1), 1–14. https://doi.org/10.1177/2056305118763366

Foot, K. A., & Schneider, S. M. (2004). Online structure for civic engagement in the September 11 web sphere. *Electronic Journal of Communication*, 14(3–4), 1–10. http://www.cios.org/EJCPUBLIC/014/3/01435.html

Fraustino, J. D., Liu, B., & Yan, J. (2012). *Social media use during disasters: A review of the knowledge base and gaps*. National Consortium for the Study of Terrorism and Responses to Terrorism. https://www.start.umd.edu/sites/default/files/files/publications/START_SocialMediaUseduringDisasters_LitReview.pdf

Frey, E. (2018). Victims' use of social media during and after the Utøya terror attack: Fear, resilience, sorrow and solidarity. In H. Hornmoen & K. Backholm (Eds.), *Social media use in crisis and risk communication* (pp. 43–62). Emerald Publishing Limited. https://doi.org/10.1108/978-1-78756-269-120181007

Fritz, C. E. (1961). Disaster. In R. K. Merton & R. A. Nisbet (Eds.), *Contemporary social problems*. Harcourt.

Fritz, C. E., & Mathewson, J. H. (1957). Convergence behavior in disasters: A problem in social control: A special report prepared for the committee on disaster studies. In *National Academy of Sciences National Research Council*. National Academy of Sciences - National Research Council. https://archive.org/stream/convergencebehav00fritrich/convergencebehav00fritrich_djvu.txt

Gladwin, C. H., Gladwin, H., & Peacock, W. G. (2001). Modeling hurricane evacuation decisions with ethnographic methods. *International Journal of Mass Emergencies and Disasters*, 19(2), 117–143. http://www.ijmed.org/articles/479/download/

Gross, M. D. (1985). *Design as Exploring Constraints*. Massachusetts Institute of Technology.

Gui, X., Kou, Y., Pine, K. H., & Chen, Y. (2017). Managing uncertainty: Using social media for risk assessment during a public health crisis. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 4520–4533). ACM. https://doi.org/10.1145/3025453.3025891

Hagar, C., & Haythornthwaite, C. (2005). Crisis, farming & community. *The Journal of Community Informatics*, 1(3), 41–52. https://pdfs.semanticscholar.org/9126/862dd9287790f1b58d9eec8a20d2a025f4da.pdf

Haimson, O. L. (2018). Social media as social transition machinery. *Proceedings of the ACM on Human-Computer Interaction*, 2(CSCW), 1–21. https://doi.org/10.1145/3274332

Hasan, S., Ukkusuri, S., Gladwin, H., & Murray-Tuite, P. (2011). Behavioral model to understand household-level hurricane evacuation decision making. *Journal of Transportation Engineering*, 137(5), 341–348. https://doi.org/10.1061/(ASCE)TE.1943-5436.0000223

Henderson, J., Nielsen, E. R., Herman, G. R., & Schumacher, R. S. (2020). A hazard multiple: Overlapping Tornado and flash flood warnings in a national weather service forecast office in the Southeastern United States. *Weather and Forecasting*, 35(4), 1459–1481. https://doi.org/10.1175/waf-d-19-0216.1

Huang, S. K., Lindell, M. K., & Prater, C. S. (2016). Who leaves and who stays? A review and statistical meta-analysis of hurricane evacuation studies. *Environment and Behavior*, 48(8), 991–1029. https://doi.org/10.1177/0013916515578485

Ireson, N. (2009). Local community situational awareness during an emergency. *2009 3rd IEEE International Conference on Digital Ecosystems and Technologies* (pp. 49–54). IEEE. https://doi.org/10.1109/DEST.2009.5276763

Jencson, L. (2001). Disastrous rites: Liminality and communitas in a flood crisis. *Anthropology and Humanism*, 26(1), 46–58. https://doi.org/10.1525/ahu.2001.26.1.46

Kogan, M. (2017). *Emergent forms of online sociality in disasters arising from natural hazards* [Ph.D. Dissertation]. University of Colorado Boulder. *ProQuest Dissertations and Theses*. https://scholar.colorado.edu/csci_gradetdshttps://scholar.colorado.edu/csci_gradetds/156

Kogan, M., & Palen, L. (2018). Conversations in the eye of the storm: At-scale features of conversational structure in a high-tempo, high-stakes microblogging environment. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (pp. 1–13). ACM. https://doi.org/10.1145/3173574.3173658

Kreps, G. A., & Bosworth, S. L. (1993). Disaster, organizing, and role enactment: A structural approach. *American Journal of Sociology*, 99(2), 428–463. https://doi.org/10.1086/230270

Lazo, J. K., Bostrom, A., Morss, R. E., Demuth, J. L., & Lazrus, H. (2015). Factors affecting hurricane evacuation intentions. *Risk Analysis*, 35(10), 1837–1858. https://doi.org/10.1111/risa.12407

Liu, S. B. (2012). Socially distributed curation of the bhopal disaster: A case of grassroots heritage in the crisis context. In E. Giaccardi (Ed.), *Heritage and social media: Understanding and experiencing heritage in a participatory culture*. Routledge.

Mark, G., & Semaan, B. (2009). Expanding a country's borders during war: The internet war diary. *Proceedings of the 2009 ACM SIGCHI International Workshop on Intercultural Collaboration* (pp. 3–12). ACM. https://doi.org/10.1145/1499224.1499228

McCarthy, J., & Wright, P. (2004). Technology as experience. *Interactions*, *11*(5), 42–43. https://doi.org/10.1145/1015530.1015549

Mendoza, M., Poblete, B., & Castillo, C. (2010). Twitter under crisis: Can we trust what we RT? *1st Workshop on Social Media Analytics*, *1060*, 71–79. https://doi.org/10.1145/1964858.1964869

Metaxa-Kakavouli, D., Maas, P., & Aldrich, D. P. (2018). How social ties influence hurricane evacuation behavior. *Proceedings of the ACM on Human-Computer Interaction*, *2*(CSCW), 122. https://doi.org/10.1145/3274391

Mileti, D. (1999). *Disasters by design: A reassessment of natural hazards in the United States*. Washington, DC: Joseph Henry Press. https://doi.org/10.17226/5782

Morss, R. E., Demuth, J. L., Lazo, J. K., Dickinson, K., Lazrus, H., & Morrow, B. H. (2016). Understanding public hurricane evacuation decisions and responses to forecast and warning messages. *Weather and Forecasting*, *31*(2), 395–417. https://doi.org/10.1175/WAF-D-15-0066.1

Nielsen, E. R., Herman, G. R., Tournay, R. C., Peters, J. M., & Schumacher, R. S. (2015). Double impact: When both tornadoes and flash floods threaten the same place at the same time. *Weather and Forecasting*, *30*(5), 1673–1693. https://doi.org/10.1175/WAF-D-16-0151.1

Palen, L., & Anderson, K. M. (2016). Crisis informatics–New data for extraordinary times. *Science*, *353*(6296), 224–225. https://doi.org/10.1126/science.aag2579

Palen, L., Anderson, K. M., Mark, G., Martin, J., Sicker, D., Palmer, M., & Grunwald, D. (2010). A vision for technology-mediated support for public participation & assistance in mass emergencies & disasters. *Proceedings of the 2010 ACMBCS visions of computer science conference* (pp. 1–12). British Informatics Society Ltd. http://dl.acm.org/citation.cfm?id=1811182.1811194

Palen, L., & Hughes, A. L. (2018). Social media in disaster communication. In H. Rodríguez, W. Donner, & J. E. Trainor (Eds.), *Handbook of disaster research* (2nd ed., pp. 497–518). Springer International Publishing. https://doi.org/10.1007/978-3-319-63254-4_24

Palen, L., & Liu, S. B. (2007). Citizen communications in crisis: Anticipating a future of ICT-supported public participation. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 727–736). ACM. https://doi.org/10.1145/1240624.1240736

Palen, L., Vieweg, S., Liu, S. B., & Hughes, A. L. (2009). Crisis in a networked world: Features of computer-mediated communication in the April 16, 2007, Virginia Tech event. *Social Science Computer Review*, *27*(4), 467–480. https://doi.org/10.1177/0894439309332302

Paul, S., Ghebreyesus, D., & Sharif, H. O. (2019). Brief communication: Analysis of the fatalities and socio-economic impacts caused by hurricane florence. *Geosciences (Switzerland)*, *9*(2), 58. https://doi.org/10.3390/geosciences9020058

Qu, Y., Wu, P. F., & Wang, X. (2009). Online community response to major disaster: A study of Tianya forum in the 2008 Sichuan earthquake. *Proceedings of the 42nd Annual Hawaii International Conference on System Sciences* (pp. 1–11). University of Hawaii at Manoa, Association for Information Systems IEEE Computer Society Press. https://doi.org/10.1109/HICSS.2009.330

Reininger, B. M., Raja, S. A., Carrasco, A. S., Chen, Z., Adams, B., McCormick, J., & Rahbar, M. H. (2013). Intention to comply with mandatory hurricane evacuation orders among persons living along a coastal area. *Disaster Medicine and Public Health Preparedness*, *7*(1), 46–54. https://doi.org/10.1001/dmp.2012.57

Sadri, A. M., Ukkusuri, S. V., & Gladwin, H. (2017). The role of social networks and information sources on hurricane evacuation decision making. *Natural Hazards Review*, *18*(3), 04017005. https://doi.org/10.1061/(ASCE)NH.1527-6996.0000244

Sankar, A. R., Doshi, P., & Goodie, A. (2019). Evacuate or not? A POMDP model of the decision making of individuals in hurricane evacuation zones. *Proceedings of the Conference on Uncertainty in Artificial Intelligence (UAI)* (p. 10). Morgan Kaufmann Publishers Inc. www.coast.noaa.gov/states/fast-facts/

Sarcevic, A., Palen, L., White, J., Starbird, K., Bagdouri, M., & Anderson, K. (2012). "Beacons of hope" in decentralized coordination: Learning from on-the-ground medical Twitterers during the 2010 Haiti earthquake. *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (pp. 47–56). ACM. https://doi.org/10.1145/2145204.2145217

Schwartz, B. (2009). *The paradox of choice: Why more is less, revised edition*. HarperCollins e-books. https://www.google.com/books/edition/The_Paradox_of_Choice/g422yyua-P8C?hl=en&gbpv=0

Semaan, B. C., Britton, L. M., & Dosono, B. (2016). Transition resilience with ICTs: "Identity awareness" in veteran re-integration. *Conference on Human Factors in Computing Systems - Proceedings* (pp. 2882–2894). ACM. https://doi.org/10.1145/2858036.2858109

Shklovski, I., Palen, L., & Sutton, J. (2008). Finding community through information and communication technology in disaster response. *Proceedings of the ACM Conference on Computer Supported Cooperative Work* (pp. 127–136). ACM. https://doi.org/10.1145/1460563.1460584

Simon, T., Goldberg, A., & Adini, B. (2015). Socializing in emergencies - A review of the use of social media in emergency situations. *International Journal of Information Management*, *35*(5), 609–619. https://doi.org/10.1016/j.ijinfomgt.2015.07.001

Solís, D., Thomas, M., & Letson, D. (2009). Determinant of household hurricane evacuation choice in Florida. *Journal of Development and Agricultural Economics*, *2*(3), 188–196. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1808017

Starbird, K., Palen, L., Hughes, A. L., & Vieweg, S. (2010). Chatter on the red: What hazards threat reveals about the social life of microblogged information. *Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work* (pp. 241–250). ACM. https://doi.org/10.1145/1718918.1718965

Starbird, K., Spiro, E., Edwards, I., Zhou, K., Maddock, J., & Narasimhan, S. (2016). Could this be true? I think so! Expressed uncertainty in online rumoring. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (pp. 360–371). ACM. https://doi.org/10.1145/2858036.2858551

Stein, R. M., Dueñas-Osorio, L., & Subramanian, D. (2010). Who evacuates when hurricanes approach? The role of risk, information, and location. *Social Science Quarterly*, *91*(3), 816–834. https://doi.org/10.1111/j.1540-6237.2010.00721.x

Stewart, S. R., & Berg, R. (2019). *Hurricane florence*. National Hurricane Center Tropical Cyclone Report. https://www.nhc.noaa.gov/data/tcr/AL062018_Florence.pdf

Suchman, L. A. (1987). *Plans and situated actions: The problem of human-machine communication*. Cambridge University Press.

Sutton, J., Palen, L., & Shklovski, I. (2008). Backchannels on the front lines: Emergent uses of social media in the 2007 Southern California Wildfires. In *Proceedings of the 5th international ISCRAM conference, May* (pp. 624–632). ISCRAM Association.

Tang, Z., Zhang, L., Xu, F., & Vo, H. (2015). Examining the role of social media in California's drought risk management in 2014. *Natural Hazards*, *79*(1), 171–193. https://doi.org/10.1007/s11069-015-1835-2

Thomassen, B. (2012). Revisiting liminality: The danger of empty spaces. In H. Andrews & L. Roberts (Eds.), *Liminal landscapes: Travel, experience and spaces in-between* (1st ed., pp. 21–35). Routledge. https://doi.org/10.4324/9780203123164

Turner, V. W. (1969). *The ritual process: Structure and anti-structure. The Ritual Process: Structure and Anti-Structure.* Aldine Publishing Company. https://doi.org/10.4324/9781315134666

Turner, V. W. (1987). Betwixt & between: The liminal period in rites of passage. In L. C. Mahdi, S. Foster, & M. Little (Eds.), *Betwixt & between: Patterns of masculine and feminine initiation* (pp. 3–19). Open Court Publishing Company. https://books.google.com/books?hl=en&id=Y0h0OEe19pcC&oi=fnd&pg=PA3&dq=turner+betwixt+and+between&ots=FphHP0SXAm&sig=__ZwTQZYIPc2PW6SC2xDUNfe4Co#v=onepage&q&f=false

van Gennep, A. (1960). *The rites of passage*. University of Chicago Press. https://doi.org/10.4324/9781315017594

Verma, S., Vieweg, S., Corvey, W. J., Palen, L., Martin, J. H., Palmer, M., Schram, A., & Anderson, K. M. (2011). Natural language processing to the rescue?: Extracting "situational awareness" Tweets during mass emergency Sudha. In *Proceedings of the fifth international AAAI conference on weblogs and social media*. AAAI. http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.371.9621

Vieweg, S., Hughes, A. L., Starbird, K., & Palen, L. (2010). Microblogging during two natural hazards events: What Twitter may contribute to situational awareness. *Proceedings of the 28th International Conference on Human Factors in Computing Systems* (p. 1079). ACM. https://doi.org/10.1145/1753326.1753486

Wang, C. (2018). Bracing for hurricanes: A qualitative analysis of the extent and level of preparedness among older adults. *The Gerontologist*, *58*(1), 57–67. https://doi.org/10.1093/geront/gnx187

Weick, K. E. (1993). The collapse of sensemaking in organizations: The Mann Gulch disaster. *Administrative Science Quarterly*, *38*(4), 628–652. https://doi.org/10.2307/2393339

White, J. I., Palen, L., & Anderson, K. M. (2014). Digital mobilization in disaster response: The work & self-organization of on-LIne pet advocates in response to hurricane sandy. In *Proceedings of the 17th ACM conference on computer supported cooperative work & social computing* (pp. 866–876). ACM. https://doi.org/10.1145/2531602.2531633

Wong-Villacres, M., Velasquez, C. M., & Kumar, N. (2017). Social media for earthquake response: Unpacking its limitations with care. *Proceedings of the ACM on Human-Computer Interaction*, *1* (CSCW), 32: 1–32:22. https://doi.org/10.1145/3134747