

#fukushima Five Years On: A Multimethod Analysis of Twitter on the Anniversary of the Nuclear Disaster

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This article examines how the fifth anniversary of the Fukushima Daiichi nuclear disaster was commemorated on English-speaking Twitter in March 2016. By combining social network analysis and critical discourse analysis, a research design is developed that can be applied to study the structure of actors and interpretative resources invoked in the crafting of communal remembrance of a disruptive, global media event. In the study, we explore the most visible actors and the most dominant meanings in the #fukushima stream. According to our analysis, the most significant players were the mainstream media and other established organizations. While most of the retweeted messages contained a ritual element of collective memory work, grief, and observance, another prominent feature was the strongly politicized discourse surrounding the aftermath of the disaster.

Keywords: multimethod, Twitter, hybrid media, social network analysis, critical discourse analysis, Fukushima Daiichi

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March 11, 2016 marked five years since the 9.0 magnitude earthquake and subsequent tsunami struck the northeastern coast of Japan's main island, severely damaging the Fukushima Daiichi nuclear power plant 240 kilometers north of Tokyo. From the first tremors of the earthquake to the ongoing remembrance, the media coverage of the threefold disaster has played out in transnational communication networks where legacy media coverage overlaps with the new platforms and practices of social media. In this new kind of evolving media environment, the inherited platforms, brands, forms, and genres of mass media and the emerging modes and affordances of social media platforms interact (Chadwick, 2013; Harder, Paulussen, & Aelst, 2016). This rapidly changing landscape now constitutes a new kind of environment where the meanings of controversial issues and dramatic events are negotiated across national and institutional boundaries. Media research is only beginning to make sense of the consequences of the new dynamics that are in play.

The Fukushima disaster involved an exceptionally dramatic, disruptive, and traumatic series of events. In addition to the human costs, they focused on nuclear power—a particularly loaded energy-policy domain where difficult questions related to science, expertise, economic interests, and political power intersect. Hence, the events of March 2011 caused complex systemic disruptions, ranging from lost lives and contaminated environments to the major policy decisions of nations and energy futures. This potential of meanings and consequences makes the interpretation of the event an exceptionally interesting object of study for understanding how the memory of such a traumatic event is communicated in the networked media landscape.

In this article, we take the microblogging service Twitter as an entry point to the transnational communication networks activated when such commemoration work takes place. In the 2010s, Twitter has emerged as one of the key platforms through which the new conditions of the contemporary media environment are played out. Indeed, in Japan, the aftermath of the 2011 Fukushima Daiichi disaster represented a particular breakthrough moment for Twitter, and the platform has been a focal point for discussion both globally and in Japan since the events began to unfold (Cho & Park, 2013; Friedman, 2011; Li, Vishwanath, & Rao, 2014). In this paper, we focus on the transnational flows of information relating to the Fukushima Daiichi nuclear disaster on English-speaking Twitter during the fifth anniversary of the event, and specifically on two of Twitter's key functions: hashtags (#) and sharing or "retweeting." We treated hashtags such as #fukushima as "hybrid forums" (Burgess, Galloway, & Sauter, 2015) that create a context for discussion and enable different kinds of subforums to form under a particular topic. Our data consists of 17,619 English-language tweets containing the hashtag #fukushima.

This article has two main aims. Methodologically, we wish to develop and test a research design that helps us better understand the use of Twitter as one key locus of the current global media landscape. As an effective tool for both quick commentary and the filtering and redistribution of content, Twitter user data has been used to study various phenomena, from fan cultures to political participation. Much of Twitter research has understandably been quantitative, relying on massive amounts of tweets. However, in addition to revealing the networks of issues and actors, there is an evident need to flesh out a more synthetic approach that lies between the quantitative analysis of network relations and the qualitative analysis of the discourses that articulate these relationships (Marwick, 2014; Sumiala, Tikka, Huhtamäki, & Valaskivi, 2016). More substantially, our aim is to reflect upon the role of Twitter networks in the

context of a traumatic event such as the Fukushima disaster. In particular, we want to explore questions related to the interplay between a moment of commemoration and the political potential opened up by collective, emotionally loaded, attention.

By applying two complementary perspectives—social network analysis (hereafter SNA) and critical discourse analysis (hereafter CDA)—we hope to uncover deeper insights into what remains in discourses relating to a complex disruptive event such as the Fukushima Daiichi disaster five years on, and how these discourses are produced, reproduced, and circulated in the contemporary, global, and transnational hybrid media environment that encompasses various cultures and national media systems from Japan to the EU and the Americas.² To elaborate our research object, we identify three analytically distinct “logics” that intersect in commemorating the Fukushima disaster. First, the logic of *hybridity* refers to the interplay of new and emerging institutions and modes of communication in traditional mass media and on social media platforms. Second, the logic of *ritualizing trauma* refers to how collective traumatic experiences are negotiated towards a shared, cultural interpretation of the disaster. Third, the logic of *politicizing memory* refers to the space of opportunity, and the attempts of various social actors to take advantage of it.

Dynamics of the Global Hybrid Media Environment

In recent years, the notion of “hybrid media system” has often been used to capture the blurring institutional boundaries, shifting actor roles, and multimodal representational opportunities of the digitalized media environment. In his influential book in which he coins the term, Andrew Chadwick (2013) uses the concept to zoom in on the changing interface between politics, journalism, and social media. He empirically and convincingly shows one form of hybridity: how old institutions (political parties, mainstream journalism) have been able to incorporate and exploit the new logic(s) of social media (van Dijck & Poell, 2013), partly allowing social media logics to shape these legacy institutions in return.

While our study constructs its *object* somewhat differently, we have drawn inspiration from the theoretical sensibility developed by Chadwick (2013). In crafting the “ontology of hybridity,” he recognizes multiple boundaries where the notion of hybridity has been made use of. This inventory stretches from analyses of democratic vs. authoritarian political systems to analyzing new modes of governance through public-private partnerships, and from the reflective and innovative remix of media genres to the blurring of human and nonhuman actors in Actor-Network-Theory (Chadwick, 2013, pp. 9–15). We take seriously this general definition of “hybridity,” and note that its ontological anchoring in the existing institutionalized practices of social subsystems—through their sometimes nonlinear and often “contrapuntal” interaction—keeps the systems in a constant state of becoming. However, instead of focusing on specific institutionalized, interacting logics as such, we link the notion of hybridity to a question concerning a social process. We use the networked commemoration work on the Fukushima anniversary as an opportunity to consider how the process of collectively handling the trauma of a dramatically disruptive event plays out in

² The article is part of a wider international research initiative on the mediation of the Fukushima nuclear power plant disaster that followed up on five anniversaries of the disaster.

the contemporary networked space. Here, the social theory of trauma outlined by Jeffrey Alexander (2012) offers a useful background.

Starting from a culturalist-functionalist perspective, Alexander (2012) models an institutionally differentiated social process where a society slowly crafts a master narrative of a traumatic event. This involves identifying the loss or pain related to the traumatic events, identifying victims or “carrier groups” (people affected by the loss), and situating the wider audience. Such narrative reconstructions of traumatic events, then, are handled and filtered through a specialized, differentiated institutional order, where legal, aesthetic, religious, scientific, media, and state bureaucratic actors all process parts of the narrative, finally helping “the society” to come (more or less) culturally “to terms” with the event. Finally, in this model, as events become ritualized and normalized, the process allows “members of wider publics to participate in the pain of others” and thus “broaden the realm of social understanding and sympathy” (Alexander, 2012, pp. 15–30).

Such a neo-functionalist approach to social systems has been criticized for theoretical reasons (see Joas & Knöbl, 2010, p. 336). In terms our research object, however, it helps in identifying an intersection between the intensified *hybrid condition of the new media environment* on the one hand and the more generalized, differentiated *elements of the process of cultural trauma* on the other. Reading Alexander’s model, we can see that it lies on a theoretical foundation that sees modern society as a set of differentiating social subsystems (or institutions) that usually play a role (through their own logics) in rationalizing and ritualizing disruptive events. Reading Chadwick’s build-up of the notion of hybridity, we can begin to see how such a process is situated in a radically new communication context. Analyzing the commemoration of the Fukushima disaster anniversary on Twitter provides an opportunity to reflect on how the old, institutionalized pattern processing of social trauma takes place in the new hybrid media environment. Social media serves as a communication resource for a wide variety of actors and institutions—from science to religion to NGOs and legacy media outlets—and makes their mutual relationships more complex. At the same time, however, these complex mutual relationships can still be seen as a part of an ideal shared collective process.

As elements of a hybrid media environment, Twitter and other social media provide new channels to challenge and negotiate discourses produced by the mass media (Eriksson, 2016). During major media events, such as presidential election debates, interaction between Twitter users appears to be based on retweeting rather than the expression of personal opinions (Lin, Keegan, Margolin, & Lazer, 2014). However, widely retweeted content often seems to be produced by “elite users,” such as established media organizations, high-profile individual journalists, political parties or individual politicians, widely known organizations, and celebrities whose Twitter accounts have large numbers of followers (Freelon & Karpf, 2015; Lin et al., 2014). Previous studies also indicate that while Twitter is preoccupied with mainstream media, the relationship is rarely reciprocated (Rogstad, 2016). While the overall production of content by all users of Twitter increases during a media event, the dynamics of attention in the networked media environment clearly reward the aforementioned elite users who have pre-existing large audiences (Lin et al., 2014). Such an uneven distribution of attention is not unique to Twitter; online audiences of mainstream media websites and political blogs are strongly concentrated and follow a “winner-takes-all,” power-law distribution (Benkler, 2006; Hindman, 2009). The user’s number of followers and followees,

and the length of time they have owned their account, also increases the "retweetability" of their content, as does the presence of URLs and hashtags in a tweet (whereas the user's number of previous tweets does not) (Suh, Hong, Pirolli, & Chi, 2010). Similar dynamics also appear to apply during crises (Bruns, Burgess, Crawford, & Frances, 2012).

Despite the dominance of elite users, all users play a significant role in deciding what is shared, particularly as we look into the differentiated clusters of actors-relations in a Twitter network. Unlike in mass-media contexts, the users' individual decisions (however predictable) ultimately constitute the network. Singer (2014) calls this "a two-step gatekeeping process" in which users have the power to enhance the visibility of content produced by media and other elite users by sharing it with secondary audiences. Indeed, in terms of the most retweeted messages, it is largely the nonelite users that usually upgrade the visibility of content produced by the elite (Lin et al., 2014; Singer, 2014).

Data and Methods

We collected data using Twitter's Streaming API and the Digital Methods Initiative Twitter Capture and Analysis Toolset program (DMI-TCAT; Borra & Rieder, 2014). The former offers almost real-time access to Twitter's global stream, with tweets retrieved using keywords or by focusing on specific users. While the partial matching of keywords is not possible, hashtag versions of keywords are matched (i.e. "fukushima" matches "#fukushima" but not "#fukushimadisaster"). We collected 17,619 English-language tweets that included the hashtag #fukushima between March 10 at 10:00:00 and March 12 at 11:59:59 UTC, 2016.^{3,4} Of these, 5,012 were original tweets and 12,607 were retweets.⁵ In total, 10,788 users participated or were retweeted in the discussion; 2,377 users produced their own tweets, while the rest only retweeted.

As we are interested in the dynamics of power in the social process of commemorations, this material can be approached from two perspectives and using two complementary methods. While SNA constructs the Twitter feeds as networks, and thus articulates the actor-relationships that are a key aspect of social and political power, CDA looks at another aspect of political power, namely representations of the event and its affective dimension, victims, and political implications.

Social network analysis is a strategy for researching various social structures based on graph theory, a branch of mathematics. In this approach, the research subject is conceptualized as consisting of actors (or nodes) and the connections (or ties) between them. This form of analysis has been used in the

³ The period in Coordinated Universal Time (UTC) when it was March 11 in at least one time zone on Earth.

⁴ To test the reliability of Twitter's automatic language detection, we had two humans code a sample of 1000 tweets as either primarily English or non-English. The human coders then identified tweets where they disagreed on language. We compared the results against Twitter's automatic classification and found a high agreement rate (Cohen's $\kappa = 0.95$). Disagreement mostly concerned extremely short tweets or those containing multiple languages.

⁵ Not including "manual retweets" performed using expressions such as "RT @," "MT @," or "via @."

social sciences to provide a deeper understanding of diverse phenomena, including belief systems, alliance and treaty systems, and international and transnational organizations (Cioffi-Revilla, 2010). Data obtained from social networking services such as Twitter can be conceptualized as a network, making SNA a powerful method and a sound starting point for analyzing these services.

We constructed networks from our tweet sample and then examined them visually. Network visualizations are both representations of network structures and a means of communicating them to others⁶ (Freeman, 2000). Our approach resembled previously presented models of visual network analysis that focused on iteratively filtering, visualizing, and computing metrics in making sense of network data (Hansen, Rotman, Bonsignore, Milic-Frayling, Mendes Rodrigues, Smith, & Shneiderman, 2009; Huhtamäki, Russell, Rubens, & Still, 2015). An open source network analysis and visualization software Gephi (Bastian, Heymann, & Jacomy, 2009), and its Force Atlas 2 layout algorithm, were applied to visualize the data.⁷ As a result, actors that share a large number of connections are situated close to each other in the visualization. Finally, we used modularity to locate communities within the network, and nodes were colored according to the community to which they belonged.⁸

In addition to visualizations, we used degree centrality within a retweet network to identify key users. The weighted degree of node *V* is the number of times a user's tweets were retweeted by others (for simplicity, we refer to this simply as "degree"). We also differentiated between in-degree (the number of times *V*'s tweets were retweeted) and out-degree (the number of times *V* retweeted other users' tweets). We then identified the top users from each category. To determine dominant users, we looked at the number of retweets received, the number of retweets made, the number of original tweets posted, or the total number of tweets, and produced Lorenz curves and computed Gini coefficients for these distributions. A Lorenz curve shows the cumulative share of all retweets made or received, or tweets posted, at % *y* by the bottom % *x* of users. Thus, if this share is distributed evenly among all users, the Lorenz curve becomes linear, whereas a convex shape indicates that a small number of top users account for a large share of activity. The Gini coefficient can be defined as the ratio of the area that lies between a 45-degree line (representing a perfectly equal distribution) and the Lorenz curve, to the area beneath the 45-degree line. A high Gini coefficient indicates an unequal distribution of attention or activity.

We also examined whether the users whose tweets had been retweeted were the same as those who had retweeted other users' tweets or who tweeted more actively overall. For this, we used the Kendall rank correlation coefficient to measure whether a user's ranking in one category (e.g., retweets received) correlated with their ranking in another category (e.g., retweets made). Therefore, it does not

⁶ We understand that visualizations are themselves discursive, and therefore are not objective representations of the data.

⁷ Force Atlas 2 is a force-directed layout algorithm, meaning that nodes in the visualization repulse each other while ties draw them together in an attempt to turn structural proximities into visual ones (Jacomy, Venturini, Heymann, & Bastian, 2014).

⁸ Modularity (Newman, 2006) is a property of networks that can be used to divide a network into clusters; members of a cluster have a large number of ties between them compared to actors outside the cluster.

depend on the absolute values of these variables. Finally, lists were created of the most popular tweets, news articles, and various other attributes.

CDA extends from linguistically focused microanalysis to broader formations and constellations that shape larger universes of meaning, always focusing on how the use of language is tied to politics and power in society (e.g., Gee, 2014; Gee & Handford, 2014; Maesele, 2015). The focus of CDA is on the specific meanings that utterances construct and the power relations these meanings shape and reinforce (Blommaert & Bulcaen, 2000; Fairclough, 1995; Wodak, 2013). Through an analysis of how actors and realities are constructed, it provides an opportunity to capture the ritual and political aspects of the meanings that played out in the #fukushima stream. A commemorative moment for a major traumatic disaster offers a strategic moment to study such discursive strategies that naturalize and legitimate social order (van Dijk, 1993; see also Alexander, 2012).

Building on the results of SNA, we focused on tweets that were retweeted at least 10 times ($n = 208$), and paid attention to the accounts from which they were sent and the affiliations thereof. We looked particularly at the utterances and expressions used in depicting the initial event, and at whether or not the tweet included references to other events or actors. We also focused only on the content of the tweet itself, bracketing out URLs from the analysis. By combining these findings with the results yielded by the SNA, we were able to shed light on the combinations of actors and discourses that came to dominate the #fukushima feed on March 11, 2016.

In the analysis below, we first describe the network structure of the #fukushima stream, with an emphasis on the connections between users and other hashtags used in the discussion. To define the relationships between mainstream mass media organizations and other actors, we also look at the identities of the most influential actors in the network. After depicting this “structure of commemoration,” we move on to consider the discursive action in this networked space by taking a more detailed look at the tweets retweeted at least 10 times. Focusing on the most retweeted content allows us to pinpoint the type of discourses that dominated the circulation of meanings, and enables us to explore the relationship between the most circulated discourses and the most influential users highlighted by the SNA. As Sumiala, Tikka, Huhtamäki, and Valaskivi (2016) argue, this kind of multimethod approach is essential in understanding how media events unfold in the contemporary hybrid media environment.

The Network: Structure of Commemoration

We formed networks from our data by interpreting Twitter users and hashtags as actors, and interpreting retweets and mentions of both users and hashtags as connections. In the analysis, connections were treated as directed, meaning that they did not apply the other way around. An adjacency list of connections in the form of {actor, actor} pairs was generated using Python scripts.

We visualized and inspected three networks: 1) a user-hashtag mention network, formed from direct and indirect mentions of hashtags by users; 2) a user-user retweet network; and 3) a network that

showed all direct and indirect connections between users and hashtags.⁹ A visualization of this third network (Figure 1) shows some key user and hashtag actors, colored based on their modularity in order to make different communities (or subforums) stand out.

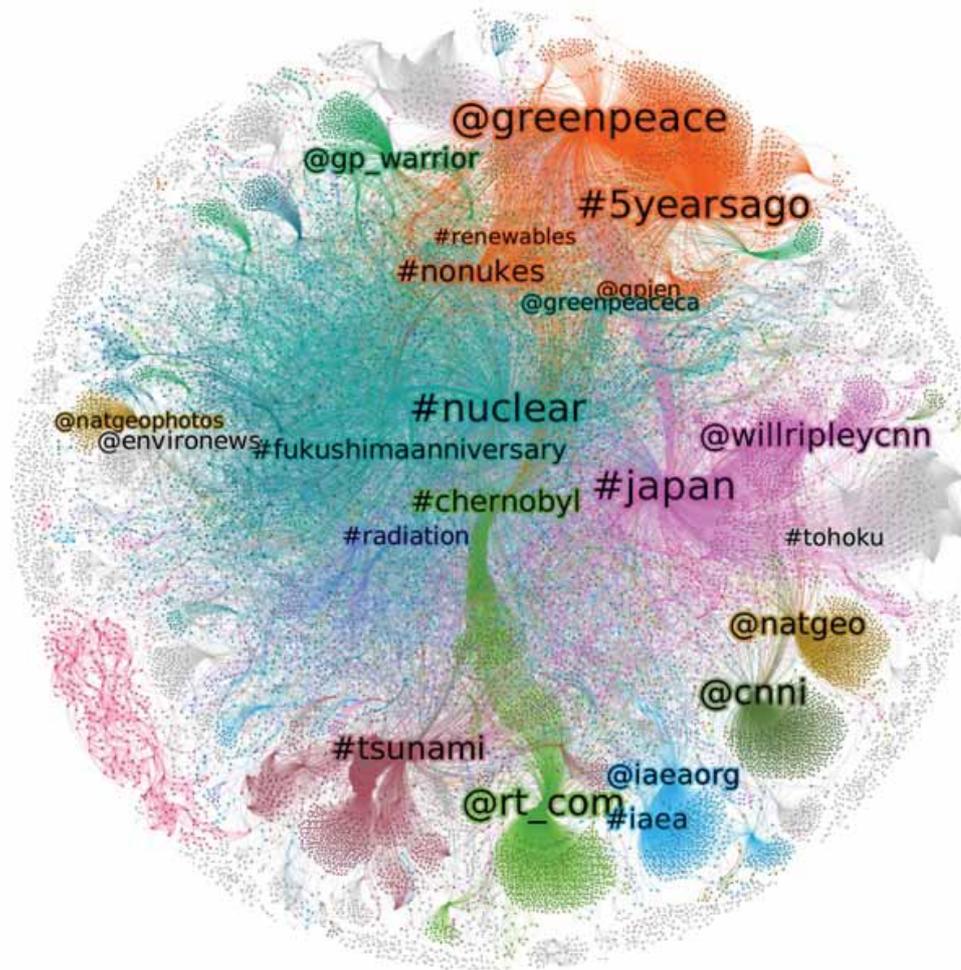


Figure 1. Visualization of user-user and user-hashtag connections.
(Several prolific private users within the #nuclear subforum are not shown.)¹⁰

⁹ In this case, if user A posted a tweet that included mentions of user B and hashtag H, the connections shown would be A -> B and A -> H. If user C were to retweet this tweet, the resulting connections would be C -> A, C -> B, and C -> H.

¹⁰ The large concentration of grey nodes at the edges are mostly users who tweeted using only the #fukushima hashtag either directly or by retweeting, and who did not explicitly connect to any of the

Many of the most popular hashtags and key users appeared as the central actors of clusters, which we interpreted as subforums of the larger, hybrid #fukushima forum in the network visualization. As the visualization shows, many of these subforums relate to powerful organizations that either have a stake in the nuclear energy debate or can be characterized as established media institutions.

A Greenpeace subforum, shown in the top-right section of Figure 1, formed around Greenpeace International's user account @Greenpeace and several other Greenpeace-affiliated accounts—such as that of the crew of the Greenpeace ship *Rainbow Warrior III* (@gp_warrior)—and around the hashtags #5yearsago, #nonukes, and #renewables. The activity within this subforum consisted mainly of a large number of retweets of several popular tweets created by Greenpeace and, to some extent, of replies to those tweets. Most tweets that included #5yearsago were authored by Greenpeace or were retweets of such tweets. A smaller subforum appeared on the opposite side of the visualization, centered on the International Atomic Energy Agency (IAEA) (@iaeaorg) and its hashtag #iaea.

Another notable subforum appeared around the hashtag #japan, in which CNN International correspondent Will Ripley (@willripleyCNN) featured prominently. Other media-centric forums could be observed around the Russian state-funded RT¹¹ (@RT_com, previously Russia Today), Ripley's affiliate channel CNN International (@cnni), and National Geographic (@NatGeo). What these forums had in common is that they included a large number of retweets from users who did not otherwise engage in discussion relating to #fukushima. This is indicated in the visualization by the large number of separate smaller clusters around these accounts. In addition, users who retweeted these influential accounts most likely did not do so for other accounts. For instance, few users retweeted both @RT_com and @Greenpeace.

The center of the network visualization is dominated by a large and sparse forum around the hashtags #nuclear, #radiation, #chernobyl, and #fukushimaanniversary, and by several highly active users that we could not identify as belonging to any established organization. Whereas the aforementioned, more tightly knit, forums formed due to the large number of users retweeting or mentioning content posted by a small number of users, the #nuclear-#radiation forum featured many connections between many users, although it is marked by an absence of users who dominate the forum as a whole. In a formal network analysis, this "forum" looks like a level field of discussion or interaction between diffuse groups of readers. Actors within this forum are also interconnected to the less central parts of the network.

Table 1 lists users who received the most retweets (see Appendix) and who were therefore the most successful in spreading their message during the anniversary discussion. These users notably include international media outlets Agence France-Presse (@afp) and the German channel Deutsche Welle (@dwnews) (cf. Bruns et al., 2012; Lin et al., 2014).

subforums (at least not by using the appropriate hashtags). In some 8,230 tweets, the only hashtag used was #fukushima.

¹¹ See, for example: <https://www.rt.com/usa/rt-government-broadcasting-radio/> (Accessed October 4, 2016 at 11:52 GMT+2).

The volume of a user's contributions does not provide a simple, reliable approximation of the impact of their tweets (Bruns & Burgess, 2012). Some interesting observations can be made regarding the out-degree values and the number of tweets posted by users in the #fukushima network as a whole. While most users have low out-degree values and tweet counts, a few appear to have been particularly prolific. However, a closer look at the profiles and contributions of these users reveals that some of them engaged in bot-like behavior, tweeting the same tweet multiple times while tagging different users. This type of use of Twitter usually takes place to promote oneself, and may also serve political purposes or even resemble propaganda (Starbird, 2017). In our case, this behavior seems mostly promotional, and indicates that any timely hashtag that is likely to receive attention will also attract bot-like behavior that might or might not be connected with the event or the hashtag itself.

Figure 2 shows the Lorenz curves for the distributions of retweet in-degree, retweet out-degree, number of original tweets posted, and the number of total tweets posted (see Table 2 in the Appendix for a more comprehensive list of Gini coefficients). In general, the distribution of retweets received is highly skewed, meaning that a small number of users received the highest number of retweets. However, the coefficients for retweet out-degrees are lower, indicating that highly active user accounts did not play a major role in retweeting content. Among the users who posted original tweets, prolific individuals accounted for a somewhat larger share of tweets produced. Retweet in-degree and out-degree are weakly correlated, as are retweet in-degree and the number of tweets produced (see Table 2). This reinforces the finding that the users who received attention and the users who tweeted actively were not the same. Examining the profiles of the most active users also supports this notion. These results are in line with previous research on the role of elite users in Twitter discussions (Lin et al., 2014), and on online audiences (Hindman, 2009).

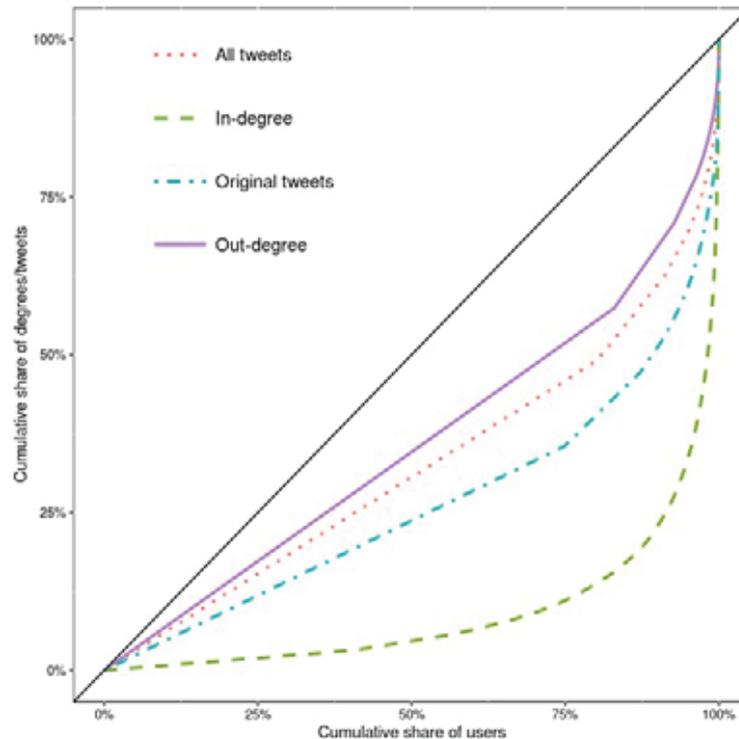


Figure 2. Lorenz curves. The curves shown only include users with a corresponding value higher than zero (e.g., users who have posted tweets, users who have posted original tweets, and so on).

In the introductory chapter, we identified three analytically distinct, intersecting “logics” as the targets of our attention. Of these three (hybrid, ritual, and political), the logics of hybridity in the media environment can best be seen in the SNA data and analysis. Three types of boundary blurring are evident. First, the intertwining practices of older media institutions and social media are evident given that the most prominent (and retweeted) actors are media corporations (CNN, RT) making use of Twitter to circulate their content. This in fact points to how “old” media logic and institutions shape and saturate the content of a new media space, a feature well established in media history (see Chadwick, 2013, pp. 23–41). Second, the hybridization of actor roles is illustrated by Greenpeace, an NGO with strong political aims reaching out directly to audiences through social media. As network actors, then, CNN and Greenpeace carry out relatively similar roles, as both provide content for individual users to retweet. Third, the reach of the network is clearly transnational, crossing the borders of national media “systems.” This relates both to international NGOs like Greenpeace and to media actors and international organizations of nuclear policy governance (although these are weaker in the network).

Entangled Discourses: Ritual and political

The Fukushima disaster is a prime example of an unexpected, disruptive media event (Katz & Liebes, 2007). After such an event passes and society re-establishes its routines, the remembrance of the event often takes the form of prescheduled and anticipated events in the mainstream media news flow (Eyre, 2007; Lagerkvist, 2014). These can be seen as media rituals with the power to represent, redefine, and reinterpret the past event, shedding light on the role of mainstream news media in constructing the perceived importance of events (Sumiala, 2013). With the help of media and other social arenas (Alexander, 2012), such public commemorations mark the passage of social and chronological time and place a route marker on the journey toward rehabilitation and recovery following a tragedy (Eyre, 2007). Importantly, mediated and anticipated rituals of commemoration are not only moments of heightened mainstream media power over discourse on tragedies, but are also moments when this power becomes visible, opening the potentially volatile relationship between the power of ritualizing and the (counter) power of politicizing the ritualized moment. This tension was also present in the most circulated tweets in the #fukushima network.

The ritual discourse often combined two elements typical of the commemoration of any major disruptive event: expressions of collective grief and compassion, and inviting the audience to join in on the remembrance. Many of the most retweeted tweets urged a formal commemoration to define the Fukushima Daiichi disaster as a global event that must be remembered and mediated on its anniversary because of its exceptional and unsettling nature. Thus, the anniversary was viewed by some key actors in the network as a moment when the world needs a reminder of what happened. The following tweet by CNN International was the most retweeted tweet in our data, and illustrates this proposal well.

*@cnni: 5 years ago today, world watched in horror as earthquake and tsunami struck Japan #Fukushima [573]*¹²

In this discourse, powerful actors, such as CNN and other news organizations, defined the disaster as a global event that involved the “world” as a horrified spectator. This mode of memorializing invites the spectators to remember the disturbing event and the way in which it marked a moment in time. Such mediated commemoration can be approached both as a post-disaster ritual (Eyre, 2007) and as a preplanned, ritualistic media event (Sumiala, 2013). It is part of a process that Alexander (2012, pp. 26–28) refers to as the slow collective routinization of a traumatic event. Legacy mass media are often a crucial site for this, working together with other institutional actors. By urging the audience—for a moment, together, and from a distance—to remember the immediate shock of an event, such communication can become part of the process of detaching “affect” from the “meaning” of the case (Alexander, 2012, pp. 26–28).

Commemoration also includes an element of expressing compassion toward the immediate survivors and honoring those who passed away. The former can be seen as a moral obligation to address the suffering of others (Kyriakidou, 2014; Sznajder, 1998). Thereby, these tweets create a division

¹² The number after each quoted tweet in this section is the number of retweets it received.

between “us” and “them”—“we” are not directly affected by the disaster but are obligated to feel compassion toward “those” who are the victims. In our data, one object of such compassion was the people evacuated from the areas contaminated by the nuclear disaster. However, due to the threefold damage of the overall tragedy, there were other objects of compassion in the form of the people who were affected by the tsunami and the earthquake but who did not necessarily have any connection with the Fukushima Daiichi accident. Overall, the identification of victims is a core nodal point of the cultural process of handling a collective trauma. It points to the legitimate “carrier groups” and immediate sufferers of the initial injury, and while the considerate honoring of victims is part of the collective routinization of the trauma, such carrier groups are also actively working against the ritualization of their suffering (Alexander, 2012). In our international (English) Twitter networks, however, the victims’ own voices remain weak.

A political discourse in the tweets linked the Fukushima anniversary to contemporary disputes and tensions, such as the ongoing radiation problems at the damaged power plant, other disastrous nuclear accidents, or the risks of nuclear energy in general. In our sample, opponents of nuclear energy appeared to be more visible and vocal than its proponents. Moreover, tweets in this discourse emphasized a clear distinction between the time before the accident and the present situation in the affected area, thus indirectly at least speaking in the name of some “carrier groups” traumatic experiences. For example, a tweet from the National Geographic photography account compared Fukushima’s past as an agricultural area to the situation in March 2016.

@NatGeoPhotos: Five years after nuclear meltdown, see what remains of once fertile landscape of #Fukushima [158]

Although we could analytically separate the ritual and political discourse, they also often overlapped, as the discourse of compassion and commemoration became entangled with the politics of nuclear power. Even though the tsunami caused the highest number of casualties, its victims were sometimes associated or confused with those affected by the nuclear disaster in our data (Morris-Suzuki, 2015; WHO, 2014). In addition, in some tweets the loss of life and evacuations resulting from the tsunami became associated with the nuclear disaster. This intertwining is illustrated below in a tweet from the Greenpeace *Rainbow Warrior III* account.

@gp_warrior: Rainbow Warrior crew offer 200 flowers to the sea in remembrance of the 20,000 lives lost 5yr ago today #Fukushima [214]

Here, the number of casualties caused by the tsunami is used in conjunction with #fukushima without explicitly mentioning the giant wave. Conscious of this loose association, several replies criticized the choice of hashtag because it combined the Fukushima disaster and the tsunami victims. Nevertheless, this was the fifth-most retweeted tweet in our data with 214 retweets, and most of which did not comment on the ideological connection made in the original tweet. This case can be seen as an indication of political dialogue taking place, with Greenpeace at least being called on its attempt to confuse the tsunami victims with the Fukushima nuclear accident. Although the event itself was already distant in time, there were those who reacted to factual dissonance and the political utilization of a tragedy.

The way in which the above tweet sparked debate about the perceived severity of the nuclear disaster in relation to the tsunami illustrates the still-rich political potential of the anniversary memory of Fukushima Daiichi in the network (Bird, Haynes, van den Honert, McAneney, & Poortinga, 2014; Hommerich, 2012; Siegrist & Visschers, 2013). Therefore, it is unsurprising that environmental organizations such as Greenpeace took advantage of the moment to highlight their own agendas. Several other actors also used the occasion to campaign for the phasing out of nuclear energy, capitalizing on the emotional charge of the anniversary. While these tweets received a more modest number of retweets compared to the tweet by @gp_warrior above, they accounted for a significant amount of the overall retweeted material. This appears to mirror the findings of previous studies about Chernobyl, specifically that events to commemorate nuclear disasters tend to become highly contested (Kalmbach, 2013; Kasperski, 2012). However, explicitly positive views about nuclear power were rare among the most retweeted #fukushima tweets. The disaster, or even the hashtag #fukushima, perhaps did not offer a context where supporters saw fit to argue for nuclear energy, as it would most likely be seen as offensive considering the strong ritual accents of the discourse in this network (see above).

One way to underline the damage of the disaster in the tweet network was to make use of the comparison with previous nuclear disasters. In the Western popular imagination, the Chernobyl disaster has become synonymous with the dangers of nuclear power, and the health and environmental effects of the catastrophe are still debated 30 years after the event (Kalmbach, 2013; Kasperski, 2012). Comparisons between the two disasters were first made in 2011 (Friedman, 2011), and in the #fukushima stream of 2016 were still visible. A tweet by RT provides an example that also raises questions:

@RT_com: Not as bad as #Chernobyl? 4 biggest lies about #Fukushima disaster. [138]

The above comparison can be seen either as an effort to downplay the severity of the Chernobyl accident or an attempt to further politicize the Fukushima Daiichi disaster. Moreover, while comparisons with Chernobyl were used to provide a historical perspective on events at Fukushima Daiichi, they also added a strong emotional dimension. In our data, two actors in particular—RT and Greenpeace—compared the two disasters. Despite their differences, what the most retweeted tweets from the Greenpeace, RT, and National Geographic accounts have in common is that they focus on the extent and irreversibility of the environmental, material, and psychological damage wrought by the earthquake, the tsunami, and the nuclear disaster, and sometimes combined them with each other. Overall, the implication of the political discourse was to see nuclear power as something dangerous and potentially beyond human control.

Conclusion

The commemoration work in the Twitter network for the fifth anniversary of the Fukushima nuclear disaster demonstrates the interplay of three intertwining analytically distinct logics (hybrid, ritual, and political) that were identified in different ways in our analysis. Elements of hybridity appear most prominently in the SNA mapping of the network and actors, but SNA also sheds light on power-as-actor relations, and thus to the political logics of the networking. Through the CDA we can see collective, ritual logic at the level of representations, but also concrete acts of politicizing the anniversary. This distinction

is, of course, ultimately always analytical. The ritual remembrance of the anniversary of the disaster cannot avoid articulating affects toward survivors and victims, but the political potential of memory is always present at the (unstable) level of representations (cf. Eyre 2007), especially so when intersecting with the logics of hybridity. What makes Twitter and other social media so crucial is that they can help to amplify, diversify, fragment, or bridge the meanings circulated in such a moment of commemoration. The anticipated attention on a tragic anniversary energizes the network with emotional stakes, and the participants share in this affective aspect of the circulation. However, instead of a neatly packaged, mass-mediated commemoration ritual, the social media landscape opens up to become a structured, but more diverse, space of interpretation. This interplay of affective energy and the specific ways in which it can be articulated politically is a crucial topic for further research into how the hybrid media environment operates. In this kind of work, looking simultaneously at both the structures of the networks and the articulation of meaning circulated in the emerging networks is a complicated task.

The prevalence of retweeting is relevant in terms of power relations, as it appears to reinforce the presence of legacy media institutions on the newer platform of Twitter. In addition, our analysis confirms that on Twitter, the mainstream media competes for attention both with actors that previously were more dependent on legacy outlets and with new media outlets that explicitly claim to offer an “alternative” to the mainstream agenda. Beyond technological affordances, this refers to social and political media hybridity, which creates an interesting dynamic in which the legacy media content plays a major role on a newer media platform (Li et al., 2014; Singer, 2014) but at the same time becomes increasingly exposed to unpredictable recontextualization and interpretation.

Although elite users arguably have the power to define events for wide audiences, this power is a complex one. On the one hand, the network structures and subforums serve as “secondary gatekeeping” (Singer, 2014). This redistribution role of some key actors can be seen in light of the original two-step flow model of media influence (Katz & Lazarsfeld, 1955), where opinion leaders were crucial in mediating the effect of mass media. On the other hand, serving mostly as redistributing agents means that the power of noninstitutional users is largely limited to enhancing (or degrading) the visibility of content created by elite sources. This moderates their influence in two ways. First, retweeting is also an act of recognition, which normalizes and reinforces dominant discourses and sources as they are circulated. A high occurrence of retweeting a certain kind of content may work to dismiss other aspects of the past, such as discourses that challenge the mainstream discourses or core actors related to the event. The type of political discourse present in our data may reflect the above phenomenon, as the political discussion around #fukushima appears to have been dominated by Greenpeace and other actors associated with a loosely defined antinuclear political agenda. Second, in order to gain the kind of interpretative authority that characterized the classic opinion leaders, there probably needs to be a level of coherence that supports the communication inside the subforums we identified. Our initial findings suggest that sometimes this may be the case, but merely analyzing the network relations is not sufficient to confirm it.

There are some limitations to our study. First, our data was limited to English-language tweets and did not incorporate most of the discussion in Japan or elsewhere. At best, this is an analysis of a transnational space of hybrid commemoration work. Moreover, by focusing only on the hashtag #fukushima, and the English-language content relating to it, we have accessed only a fraction of the

possible variety of discussions that took place on Twitter during March 2016. Thus, we cannot make any claims about how dominant the tweets about Fukushima Daiichi were in the overall commemoration of the triple disaster, or about which actors and discourses dominated other Twitter networks outside the #fukushima one. Second, a major shortcoming is that the number of tweets retrieved using the Streaming API cannot exceed one percent of Twitter's global traffic (Morstatter, Pfeffer, Liu, & Carley, 2013). If the number of tweets matching the search terms used is larger than this, some of them are discarded. During our data collection period we hit this limit several times, meaning that some data was lost. However, the incompleteness of any data obtained from Twitter is a well-known problem (boyd & Crawford, 2012; Driscoll & Walker, 2014). Another significant limitation is that keyword-based matching collects only those tweets that include the keyword. In our case, since we were looking for tweets that included the hashtag #fukushima, replies to those tweets were included only if they, too, included the hashtag (Bruns & Burgess, 2012; Lorentzen & Nolin, 2015).

Studying a transnational media event in the hybrid environment demands that we simultaneously map the formation of networks and the circulation of meanings and discourses therein. This requires both a systematic multimethod approach and a healthy dose of humility regarding the conclusiveness of the evidence. Comparing different anniversaries over time would provide a deeper understanding of how discourses around remembrance are developed and shaped, and of the identity of those actors who gain the visibility and power required to reconstruct the event. Although Twitter is well suited to research focusing on dominant actors and discourses in large datasets, it will be important to study other media platforms to better understand the dimensions of the hybrid media environment and its workings during major events such as disaster anniversaries. One important step for future studies would be to examine how content circulates through multiple platforms in the hybrid environment.

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Appendix: Tables

Table 1. Users With Highest Degrees in the Retweet Network (Ranked by Their In-Degrees).

User	In-Degree	Out-Degree	Degree	Description
@Greenpeace	1472	4	1476	Greenpeace (environmental organization)
@RT_com	837	1	838	RT (TV/news network)
@cnni	587	5	592	CNN (TV/news network)
@willripleyCNN	585	2	587	Will Ripley (CNN International correspondent)
@NatGeo	407	0	407	National Geographic (magazine)
@iaeaorg	321	0	321	International Atomic Energy Agency
@gp_warrior	282	3	285	Rainbow Warrior (Greenpeace ship)
@newsbreakslive	278	0	278	BreakingNewsFeed.com (news aggregator)
@environews	216	4	220	Enviro News (alternative environmental news website)
@greenpeaceCA	194	3	197	Greenpeace Canada
@gpj_english	162	11	173	Greenpeace Japan
@NatGeoPhotos	158	0	158	Photographs by National Geographic
@TEDtalks	149	0	149	TED (nonprofit organization that hosts conferences with speakers from various disciplines)
@greenpeaceusa	144	0	144	Greenpeace USA
@naturenews	143	0	143	Nature (academic journal)
@efmania	133	0	133	Japanese account posting Formula 1-related content
@doomsdayscw	121	177	298	Noninstitutional user
@dwnews	112	3	115	Deutsche Welle (international public broadcaster)
@afp	103	0	103	Agence France-Press (news agency)
@frediteres	98	23	121	Noninstitutional user

Table 2. Gini Coefficients and Correlations.

Type	N / Gini / correlation
A: Users who tweeted at least once	10,788
Gini retweet in-degree	0.99
Gini retweet out-degree	0.42
Gini all tweets posted	0.36
Gini original tweets posted	0.89
Correlation rt in-degree and rt out-degree	-0.32
Correlation rt in-degree and all tweets posted	0.20
B: Users who tweeted and were retweeted	884
Gini retweet in-degree	0.82
Gini retweet out-degree	0.67
Correlation rt in-degree and rt out-degree	0.14
Correlation rt in-degree and all tweets posted	0.26
Correlation rt in-degree and original tweets posted	0.27
C: Users who posted original tweets	2377
Gini original tweets posted	0.48
Correlation rt in-degree and original tweets posted	0.22
D: Users who posted original tweets and were retweeted	873
Gini retweet in-degree	0.82
Gini normal tweets posted	0.61
Correlation rt in-degree and original tweets posted	0.27