

Tracing the evolving actor network: A social network analysis of the 2018 Mayotte crisis actors' mention in the press coverage of a seismo-volcanic activity in the French overseas

Louise Le Vagueresse¹, Marion Le Texier², Maud H. Devès^{1,3}

¹ Université Paris Cité, Institut de physique du globe de Paris, CNRS, F-75005 Paris, France

² Université Paris Cité, Centre de Recherche Psychanalyse Médecine et Société, CNRS, F-75006 Paris, France

³ LAGAM, Laboratory for Geography and Territorial Planning in Montpellier, University [Montpellier](#) Paul Valéry, [Montpellier 3](#), [France](#)

Correspondence to: Louise Le Vagueresse (levagueresse@ipgp.fr)

Abstract

~~The media~~Media, especially the press, play a crucial role in shaping public understanding ~~and representations~~ during risk and crisis management, acting as intermediaries between various actors and the public. However, their framing of sources can introduce biases into ~~these~~ representations. Limited analysis exists regarding how press coverage portrays relationships between crisis and risk management actors. Using Social Network Analysis, ~~this study maps~~we map quotation networks in press coverage of a seismo-volcanic crisis in Mayotte, a French overseas department. ~~This approach allows for allowing us to: i) have~~ an overview of the relationships between actors, ~~highlights; ii) highlight~~ unique aspects related to the context and media portrayal, ~~reveals; iii) display~~ underlying representations and levels of trust among interviewed actors and ~~iv) visualises~~ the network's ~~networks~~ dynamics over time. Analysis revealed variations in narrative approaches among newspapers, with some focusing on specific aspects. ~~The~~General results show that national authorities received more attention than local elected representatives, and ~~that~~ scientific figures dominated reported ~~speeches~~speeches, while the population's perspective remained relatively passive despite ~~its~~their centrality to the quotation network. ~~Prominent~~Identified individuals held significant positions, emphasising the importance of personal ~~connection~~connection in communication and revealing a potential distrust ~~of~~toward political and scientific institutions. This ~~finding~~underscores the need for ~~greater~~proximity between ~~information~~sources and the ~~affected~~community.

1. Introduction

Risk communication is a key component of disaster risk reduction (UNISDR, 2015). Implementing an ~~effective~~efficient risk communication strategy is, however, not a trivial matter ~~and presents a complex undertaking~~ (e.g. Drabek, 1986; Mileti and Sorensen, 1990; Tierney, Lindell and Perry, 2001; Graham et al., 2022). There are many pitfalls ~~at multiple stages~~: in the communication process between actors ~~responsible for in-charge of~~ risk monitoring and management, as well as in the process of public information ~~dissemination~~sharing. It is particularly difficult when uncertainties are ~~high~~large, which is ~~often~~ the case in crises related to volcanic hazards for instance (e.g. Barclay et al., 2008; Solana et al., 2017; Andreastuti et al., 2019). Mass media (newspapers, television, radio) play an important role ~~in shaping~~with regards to public information (see Perry and Lindell 1989, ~~pp.~~p. 47-62 or Scanlon, 2007 for an overview). In crisis situations,

they are identified as the main source of information for the public ~~actively seeking~~while searching for hazard-related information (Nazari et al., 2011; Poudel et al., 2015-; Van Belle, 2015). ~~This~~It is especially ~~true~~the ease for local and national media (~~Burkhart, 1991; Allan et al., 2000-; Scanlon, 2007; Jin et al., 2025),~~) and their participation is thus crucial for effective warning ~~dissemination~~(Lindell et al., 2006). News reports are also closely followed by crisis management teams, ~~which in turn influences~~influencing official communication strategies (e.g., Lagadec, 1991; Lindell et al., 2006). ~~In the long term, they~~They affect risk perception~~in the long term~~, notably by contributing to the circulation of “erroneous representations” ~~about~~how individuals, groups or organisations behave during disasters (Coleman, 1993; Quarantelli, 2002; Wachinger et al., 2013; Van Belle, 2015).

Compared

~~As compared~~ to other sources, newspapers, especially the daily press, are commonly seen as a more credible source of information because of their ability to provide in-depth analytic coverage (Quarantelli 2002, cited ~~in~~by Steelman et al. 2015). They are also widely relayed in other media or on social networks. The local press occupies a specific position ~~into~~ this respect, as local journalists are both interested parties and commentators ~~on~~of ongoing crises. The resulting coverage tends to be more regular and more detailed, and it often provides the raw material for press agencies and, through them, for ~~the~~other media (e.g. Nielsen, 2015; ~~on how local newspapers act as a “keystone media” despite having few readers and~~ Cagé, Hervé and Viard, 2017). Studies have also demonstrated the pivotal role played by local journalists as intermediaries between risk management authorities and populations ~~when~~while disseminating warning messages, conveying the community’s concerns, and providing updates on the situation at the grassroots level (Scanlon, 2007). Newspapers’ coverage constitutes, therefore, an important issue for disaster research (see Harris et al. 2012; Camilleri et al., 2020; Calabrò et al., 2020; -Le Texier et al., 2016; ~~and~~ Devès et al., 2019; ~~for application to seismic crises and~~ Devès et al., 2022b). ~~for applications to volcanic crises).~~

However, the daily press, and the media in general, cannot be considered as simple vehicles for providing information. As recalled by Aylesworth-Spink (2017), they act as **“a complex mediator with specific interests and motivations”**. The way the media depict an event is neither exhaustive nor neutral. There are many factors influencing the final coverage: selection of topics (Pavelka, 2014), layout and design choices (e.g. Moirand, 2006; Schindler and Krämer, 2017; Billard and Moran, 2023), political ideology and editorial policy of the newspaper (e.g. Wang et al., 1992; Shoemaker and Reese, 1996; Kaiser & Kleinen-von Königslöw, 2019), access to sources and their respective social status (Ploughman, 1997), ~~and~~ choices of contextualization (Llasat et al., 2009; Cavaca et al., 2016; Carter et al., ~~-(2018),~~ ~~in the context of Christchurch 2010 and 2011 and Kaikōura 2016 earthquakes).~~ Day-to-day journalistic practices also play a role (e.g. Boykoff and Boykoff, ~~-(2004),~~ ~~about quoting sources on an equal footing on the example of global warming).~~ The way journalists tend to ~~juxtapose~~cross the ~~accounts~~speeches of heterogeneous sources, ~~while~~whether important for depicting ~~at~~the variety of viewpoints, has been shown to “blur” messages (e.g. Lejeune, 2005, Léglise and Garric, 2012, and Devès et al., 2022a), ~~thereby reducing their clarity).~~ These various factors can lead to conveying representations to the public that are sometimes very different from how authorities and scientists see the situation (Ploughman, 1995). They may also implicitly replicate common misconceptions (see Quarantelli, 1996) or reproduce asymmetrical power relationships between actors without ~~really~~questioning them (~~local vs national authorities, experts vs lay public, etc., see~~ Valencio and Valencio, ~~-(2018),~~ ~~on the under-representation of at-risk communities’ vision about recovery solutions for their lives or~~

Devès et al., (2023). ~~on reproduction of asymmetrical power relationships in the media discourses in the context of a French-oversea seismo-volcanic crisis).~~

Examining press coverage provides insights into the pivotal moments and key actors perceived by journalists covering the event, who often serve as primary observers on the scene. The use of content and thematic analyses allows for the reconstruction of the sequence of events, ~~the~~ mapping of actors' networks (Hijmans, 1996), and ~~the~~ identification of representations conveyed by the press toward at-risk communities. This is exemplified by studies like those conducted by Thistlethwaite & Henstra (2019) or Calabro et al. (2020). However, ~~there is~~ a limited number of studies ~~analyse~~ ~~analysing~~ how relationships between actors are portrayed in the press. Do these networks of interrelations, commonly connecting crisis management actors, experts, and populations, align with the envisaged distribution of roles during crisis management planning? If disparities exist, what insights do they provide?

Examining such interrelations can be accomplished by creating maps of quotation networks, representing how ~~the~~ actors ~~themselves~~ cite or reference each other in the press text (McLaren and Bruner, 2022). This method falls within Social Network Analysis (SNA), a widely employed approach in ~~the~~ social and information sciences (Otte and Rousseau, 2002; Sapountzi et al., 2018). SNA utilises tools from network analysis and graph theory to investigate social ~~structures~~ ~~structure~~ and information circulation within networks of actors. Past studies utilising SNA or its derivatives in the realm of disaster risk research have ~~focused on~~ ~~shown interest in~~ examining misinformation and the structuring of information networks ~~on~~ ~~in~~ social media (e.g., Pourebrahim et al., 2015; Kim et al., 2018), or conducting a functional analysis of crisis management organisations (e.g., ~~refer to~~ Trias et al., 2019; ~~for governance, and~~ Flecha et al., 2023, ~~for humanitarian aid~~). To our knowledge, there is a lack of studies utilising SNA on press data within the context of risk or crisis management. Yet, this is an important area of research, as ~~the~~ ~~this~~ approach ~~allows for~~ ~~enables~~: i) gaining insights into the actual organisation of actors by providing a comprehensive view of all cited actors and their interactions, allowing the detection of communities (e.g. Park et al., 2015 and Williams et al., 2015); ii) identifying actors who are prominently featured, whether due to their perceived reliability, relevance, ~~specific social role, or accessibility to journalists, relevance~~ in transmitting information on a subject, specific social role or accessibility to journalists; iii) examining the involvement of various actors and the evolution of this network over time; ~~(including the appearance and disappearance of actors and its effect on the structure of the network)~~ and, iv) accessing a particular representation of actors, whether active or passive in media coverage. Here, ~~we apply~~ this method ~~is applied to~~ ~~on a~~ press coverage of a seismo-volcanic crisis ~~which began in May 2018 in the~~ ~~a~~ French ~~overseas~~ ~~oversea~~ department ~~of~~; Mayotte.-

Before presenting ~~the selection of articles~~ ~~our corpus~~ (Section 3.1) and methods (Section 3.2), ~~Mayotte's~~ ~~we~~ ~~briefly describe Mayotte~~ geological and sociological contexts ~~are briefly outlined, along with an explanation of~~ ~~and explain~~ why it ~~constitutes~~ ~~is~~ an interesting case study (Section 2). ~~The results are~~ ~~We then~~ ~~presented~~ ~~expose our findings~~ (Section 4). Section 4.1 concentrates on the actors' mention frequency and form in varying newspapers. ~~(depending on publication rate)~~. Section 4.2 ~~focuses~~ ~~foeusses~~ on whether actors' statements are displayed directly or through a third party.

117 | **2. The 2018 Mayotte seismo-volcanic crisis**119 | ~~2. Case study description~~

Devès et al. (2022a) provide a detailed description of Mayotte’s geological context and the so-called “seismo-volcanic crisis” that began in Mayotte in May 2018. [This section summarises](#)~~We settle here for reminding~~ the main events and [reviews](#)~~reviewing~~ the latest scientific updates, since knowledge [in this area](#) evolves quite rapidly ~~in the area~~ due to ongoing, significant research efforts. A detailed chronology is provided in Figure 1.

FIGURE 1 : Major phases and markers of the response by local and national authorities in charge of risk and crisis management and by scientific experts in charge of monitoring the seismo-volcanic activity in Mayotte. Our period of study extends from the

10th of May 2018 to the 1st of April 2021. SISMAYOTTE, REFMAORE, MAY-MT, and SISMAORE are acronyms of scientific campaigns. SISMAYOTTE was funded by “Tellus Mayotte” and the others by REVOSIMA’s institutional partners. The lockdown periods that are shown are those of metropolitan France during the Covid-19 pandemic (note that most of the scientific institutions involved in monitoring are located in metropolitan France). Mayotte endured longer lockdowns in spring 2020 and 2021, but there was no proper lockdown in autumn 2020 (figure from Devès et al., 2022).

The seismo-volcanic crisis began on the 10th of May 2018 with an unusual seismic activity (tens of felt earthquakes in the first month alone, with a magnitude up to Mw 5.9; see BCSFBSCF 2018). This seismic crisis ~~wasturned out to be~~ linked to ~~the formation of a new submarine eruption sitea volcanic eruptive activity at sea and a newly born volcanic edifice~~, named Fani Maore, which was discovered one year later, in May 2019 (Feuillet et al., 2021), at about 50 km off the eastern coast of the Mayotte islands. From a scientific perspective, uncertainties were ~~exceptionallyreally~~ high, especially in the first months of the seismic crisis, due to scarce knowledge of the geodynamical context in the area and a poor ~~monitoringinstrumental~~ network (Saurel et al., 2021; Bertil et al., 2021; Feuillet et al., 2021). ~~The recorded signals were poorly constrained in terms of location and magnitude and remained difficult to explain in this region. The volcanic hypothesis to explain the origin of the seismic activity did not emerge until several months later, in October 2018, and was not confirmed until May 2019.~~ This made public communication particularly difficult and led to the development of a “technicalist bias” with frequent, but ~~technicalist and~~ minimalist communication from institutions that did little to help the population ~~gain situational awarenesssto appraise the situation~~ (Devès et al., 2022a). Indeed, there was an overall feeling of a “lack of information” (Fallou et al., 2020), which led to the spread of numerous rumours to explain this phenomenon and to regular complaints from inhabitants and their representatives (see for instance the questions addressed to the government by a Member of Parliament for Mayotte, Ali, in 2018, as well as the ~~openopened~~ letter sent to the authorities and scientists by a group of citizens in February 2019; Picard, 2019). At the time of writing, the eruption of the new submarine volcano Fani Maore has ceased, and seismic activity is divided ~~intoin~~ two main clusters, active since the end of June 2018 (according to Lemoine et al., 2020), at respectively 5 to 15 km and 30 to 40 km from the coast (Feuillet et al., 2021; Saurel et al., 2021; Lavayssière et al., 2021). Most of them are volcano-tectonic ~~earthquakes-seisms~~. Another sign of this still ongoing activity is the detection at 10 to 15 km ~~offfrom~~ the coast of acoustic plumes associated with geochemical anomalies (22 sites observed in July 2022, MAYOBS 23). ~~These acoustic plumes are)and~~ possibly linked to ~~the~~ gas emissions monitored ~~prior to 2018onland~~ on Petite Terre island, ~~Mayotte's second-largest is-land, east of the largest island and closer to the Fani Maore volcano. since prior to 2018.~~ Hence, magmatic processes related to these observables are still ~~locatedpretty~~ close to the island. As their uncertain evolution presents a significant hazard, this activity is currently being monitored by REVOSIMA (Mayotte Volcanological and Seismological Monitoring Network).

In addition to scientific uncertainties and the ~~already mentioned~~ ensuing difficulties in public information, other factors could also have undermined the relationship between actors. For instance, there is both a geographical and a cultural gap between ~~the~~ scientists involved and the local populations, since most of the former ~~ones~~ are based either in mainland France or in La Réunion island and do not have ~~many lots of~~ occasions to exchange with ~~Mayotte's~~ Mayotte inhabitants. As detailed in Devès et al. (2022a), Mayotte is a multicultural archipelago with a dominant oral culture where about 37% of the population ~~does~~ do not speak French (INSEE, 2017), which complicates risk ~~prevention~~ communication from scientific institutions and ~~the~~ authorities in charge. It is also a particularly vulnerable territory marked by poverty and important social ~~inequalities~~ inequality (Roinsard, 2014; INSEE, 2021). Since its recent departmentalization in 2011, it has been regularly shaken by social ~~crises~~ crisis, one ending just as the seismic swarm began (Roinsard, 2019; Mori, 2021). Finally, there seemed to be no living memory of seismic and volcanic phenomena in Mayotte ~~within~~ implanted in the population. The last important earthquake was a magnitude ML 5.3 ~~event~~ in 1993 (Bertil et al., 2021). This, added to the underwater nature of this activity, ~~caused brought people to~~ confusion ~~among inhabitants. Some, some~~ of them ~~went going~~ so far as to doubt the scientific explanations and the very existence of a volcano, even today (see testimonials in Devès et al., 2023). In this context, ~~marked by considerable~~ which brings together strong scientific uncertainties, social tensions, and ~~the involvement of~~ a multitude of actors, particular attention is given ~~players, we are seeking~~ to ~~identifying~~ identify in greater detail the obstacles and mechanisms that have hampered ~~the~~ information flow at each link of the communication chain.

~~To sum up,~~ Mayotte's seismo-volcanic activity is ~~a useful~~ an interesting case ~~for this~~ study because: i) although the seismic-volcanic phenomenon itself has been associated with moderate impacts, in the first years of activity, it triggered a social crisis that the ~~risk~~ risks managers themselves qualified as a "communication crisis" (see questions to the government, Ali (2018) where the deputy Ramlati Ali ~~expressed~~ expresses in national assembly a need for information ~~in the national assembly,~~ and an open letter sent by a citizens' group (Picard, 2019) ~~in and I~~ which state services, elected officials, and scientists were taken to task on this subject. More details are ~~presented~~ exposed in Devès et al. 2022a and b, Fallou et al. 2020, ~~and~~ Mori 2021 and 2022); ii) despite a large quantity of public information documents issued by scientists and the authorities (Devès et al., 2022a), the significant feeling of ~~a~~ "lack of information" within the exposed population documented by Fallou et al. ~~(, 2020)~~ raises questions about the transmission chain of this information to the public; iii) risks are perceived mostly indirectly by at-risk populations, which poses specific challenges for public information (Skotnes, Hansen and Krovel, 2021); iv) there are large uncertainties, some of them still ongoing as we write; and ~~finally~~ eventually v) the activity is long-lasting, allowing ~~us~~ to study the evolution of a large coverage over time.

3. Method

3.1 Selection of articles

This study builds 3.1 Corpus

We build on from two previous studies. The first, by (Devès et al. (, 2022a), focused which focuses on public information processes and identified shortcomings showed caveats in both scientific and state institutional institutions communication. The second study, by and Devès et al. (, 2023), illustrated which illustrate how newspapers implicitly reproduce asymmetrical power relationships between actors (e.g., without really questioning them (local versus national authorities, experts versus lay public). Building on these findings, this study aims, etc)) to identify and compare the presence occurrence of actors according to their role in the risk reduction network, the geographical scope of newspapers (local versus regional versus national,) and whether there are significant differences between newspapers. We use

To do so, the same selection of articles corpus as Devès et al. (2022b) and Devès et al. (2023) is used. This selection contains that contain articles from six French-language written daily newspapers published between the 10th of May 2018 and the 10th of May 2021. The methodology for creating this selection corpus is inspired by Le Texier et al. (2016) and Devès et al. (2019). Newspapers were We selected newspapers based on four criteria/erterias: 1) number of articles published regarding this on our case study, 2) breadth/broadness of readership, 3) spatial distribution of the readership along with the structural and cultural links existing between the region this zone and the study ease-area, and 4) a specific targeted language (French in this study). Six French language daily newspapers were selected among 56 sources mentioning these events, addressing national (Le Monde, Le Figaro), regional (L'Express de Madagascar, Le Journal de l'île de La Réunion,) and local readerships (Le Journal de Mayotte and Mayotte la lère); see Figure 2 and Part 1 in Supplementary Information. Articles were then collected from with two types of sources: 1) Factiva and Europresse, two full-text press databases offering a selection of general and specialised, of both paywalled or freely accessible newspapers with regional, national, and international readerships, and 2) web archives, especially for local press articles which cannot can not be found in those two databases. Factiva and Europresse databases are often used by scholars to study media coverage (Severo et al., 2015, Reboul-Touré 2021, Bernier et al. 2013).-

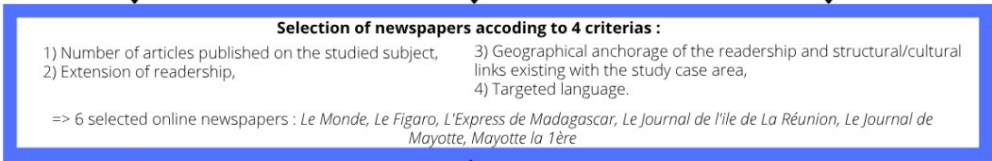
The resulting database is composed of 358 articles published between the May 10th of May 2018 and the 10th of May 2021, 10st 202 thus covering the first three years of Mayotte's seismic-volcanic crisis. This selection of articles was limited We chose to limit this database to May 2021, after which the pictures taken underwater and graphical representations of the phenomenon began to be regularly broadcast/broadeasted by these media. This date thus involving possible changes in the pereception of the phenomenon by the readership. It is also corresponds to when articles in the local press became become less frequent. Within this database, 15 articles were excluded from (see Supplementary Information) in this particular study to ensure the selection contained as we wanted to work only on news items whose main subject was is the seismo-volcanic activity. Therefore, the final database includes 343 articles and covers the first three years of the recent seismo-volcanic unrest near the archipelago of Mayotte.-

Sources



Selection

1. Newspapers selection



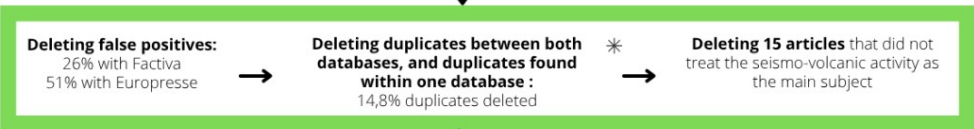
2. Filters and keywords selection



3. Storage

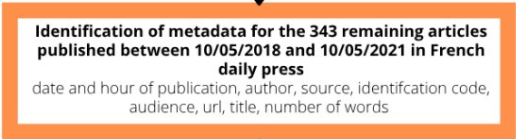


Cleaning

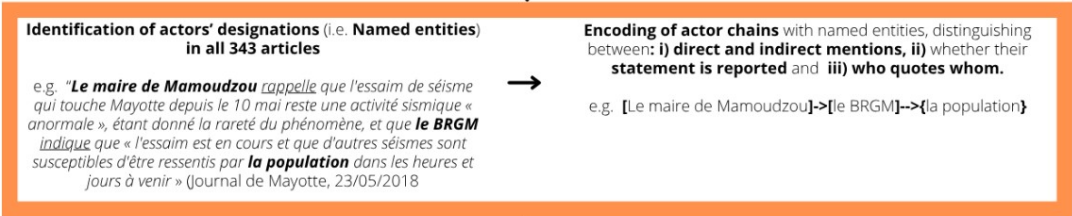


Treatment by 2 agents

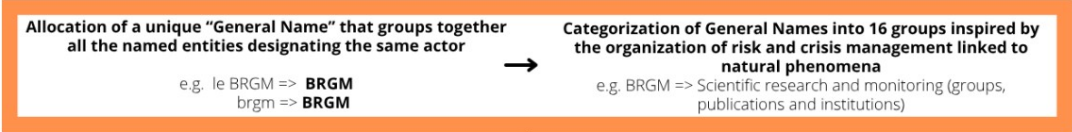
1. Metadata collection



2. Identification and encoding of actors' occurrences

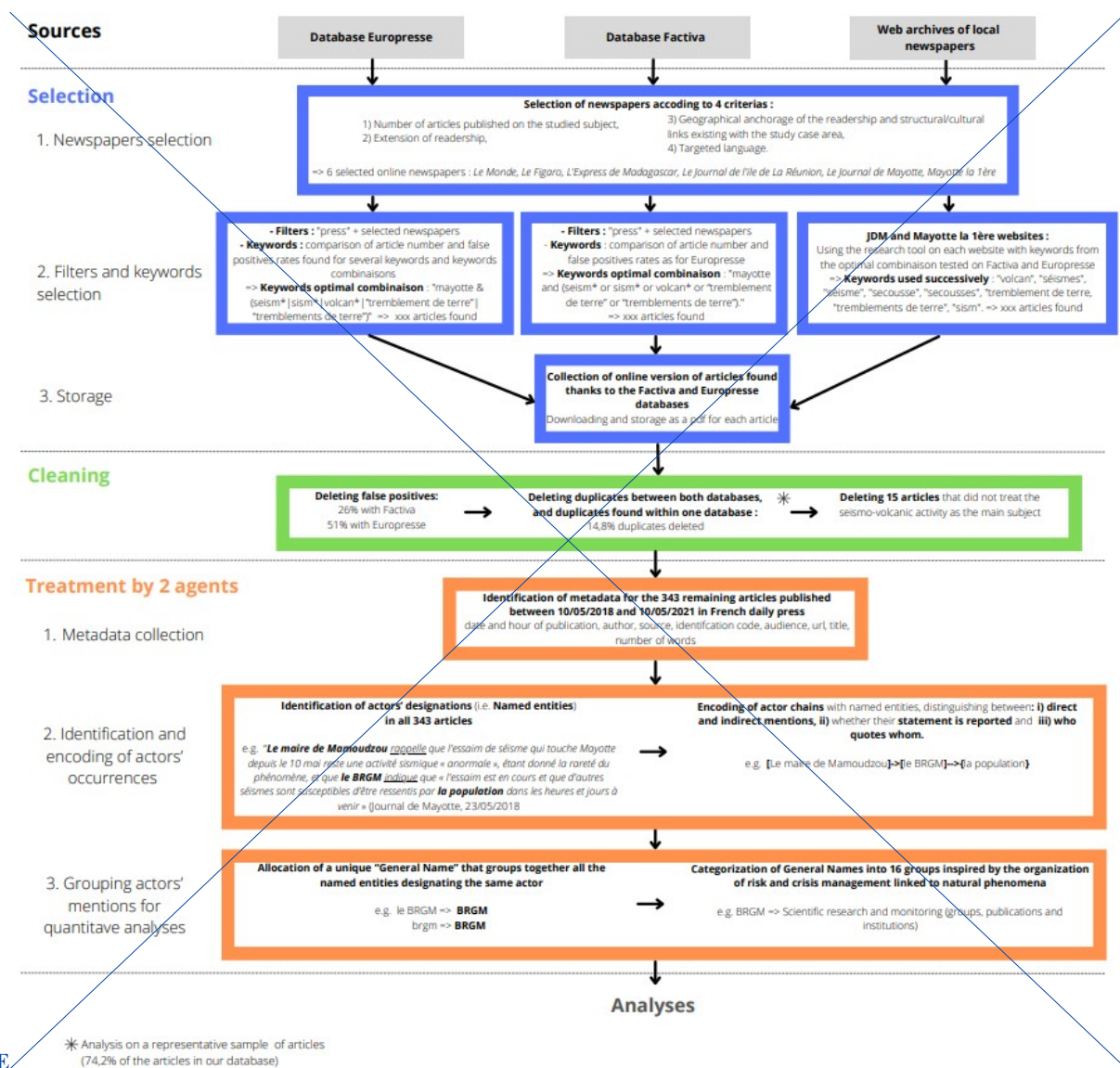


3. Grouping actors' mentions for quantitative analyses



Analyses

* Analysis on a representative sample of articles (74,2% of the articles in our database)



FIGURE

Figure 2: Schematic workflow for articleview of the process of newspapers' articles collection and processing in treatment before analyses. The articles are selected from 3 main sources using a combination of keywords (see Supplementary Information for more details on the keyword analysis). Articles are all initially read a first time in order to identify and remove/delete false positives and duplicates. False positive and negative rates are determined on representative samples (see Supplementary Information). Each article is theneventually read independently by 2 to 3 researchers who complete a data table with metadata and coded/treatment variables. Disagreements were discussed and resolved/solved collectively.

3.2 Indicators

3.2.1 Actors and categories of actors

The term “actor” is used with——~~We use~~ a broad definition ~~of the term “actor”~~ which encompasses both individual and legal entities, groups of individuals sharing a common character or purpose such as a scientific mission or being impacted in the same way by the crisis, but also media agencies ~~thatwho~~ play an active role in communicating about the event (Agence France Presse, ~~X formerly known as~~ Twitter, scientific journals, etc.). Places or buildings (mobile like a boat or immobile like a school) may be described in the media as actors when they are named as ~~a proxysynonymous~~ for the individuals they host and ~~were thereforeare then~~ also ~~included~~. Devès et al. (2022a) ~~provides a detailed account of actors and actors categories and outlines their expected roles, responsibilities, and capacities during the crisisselected.~~

To study the press coverage of different categories of “actors”,~~in our corpus, we first followed~~ a double-reading ~~process was employed. Two researchers independently reviewed the articles tomethod by human operators enabling us to select~~ ~~and~~ identify each actor or group of actors mentioned ~~in articles~~, even when they were identified by professional status, by nicknames, etc. This qualitative analysis of the texts ~~disambiguatedin the corpus made it possible to disambiguate~~ the majority of references to actors in the texts. For example, the terminology "experts" can be used to refer to scientists specialising in the hazard as well as to technicians from the Bureau Veritas in charge of assessing the damage, and some actors have different affiliations depending ~~onthe~~ articles due to errors or evolutions in ~~theirhis/her~~ career (e.g. Nathalie Feuillet, a researcher, ~~washas been~~ wrongly affiliated ~~withto~~ IFREMER in some articles, ~~such as in an article published in the Journal de Mayotte on the 7th of May 2019~~ ~~like for instance 20190507_JDM_001~~). A careful reading of the articles ~~wasis~~ thus ~~necessaryneeded~~ and generally ~~enabledallows~~ the actors to be categorised. Remaining actors are labelled as “unidentified” in the ~~category~~ Divers/Unidentified ~~category~~ (see Part 2 in the Supplementary Information). When an actor is identified in ~~anthe press~~ article, ~~theirwe note its~~ exact denomination(s) ~~is noted~~ (i.e., named entities) and ~~we~~ build two correspondence tables ~~that allow usallowing~~ to: i) identify the different ways of naming the same actor and ~~groupgrouping~~ them under a chosen “general name” (TABLE NamedEntitiesToGeneralName in TABLE SA) and ii) group these actors ~~intoin~~ categories (see TABLE GeneralNamesToCategories in TABLE SB for a correspondence table between “general names” and “categories”) in order to build a structural analysis.

TABLE 1: Denominations and definitions of categories used to group actors identified by two ~~researchershuman operators~~ in a database of 343 daily press articles published between ~~the 10th of May 10/05/2018~~ and ~~the 10th of May 10/05/2021~~ covering the first three years of the recent seismo-volcanic unrest in ~~the~~ Mayotte archipelago. Categories are determined according to the organisation of ~~riskrisks~~ and crisis management in France (see ~~Fearnley et al. (2018)~~ and Section 2 in Part 2 of the Supplementary Information).

Level 1 of categorization:	Usual categories considered in risks and crisis management studies
Name of categories	Definition of categories

Scientific research and monitoring (groups, publications and institutions)	Scientific groups, publications, institutions and all groups of people involved in monitoring and research on the seismosismo -volcanic activity in Mayotte.
Scientific research and monitoring (named individuals)	Namely identified scientists involved in monitoring and research on the seismosismo -volcanic activity in Mayotte.
Risks and crisis management actors	Administrative authorities involved in risk and crisis management activities
French political institutions	French political institutions involving members of the government, the French Parliament and the Senate
Public and para-public services to the population (institutions and members)	French public or parapublic services to the population
Elected local officials	Locally elected executive representatives
Mass media and associated journalists	Includes TV, radio, magazines, newspapers and associated journalists
Social media/Internet	Social media or websites
Civil society, private sector and NGOs	Civil society, private sector and NGOs
Local identified personalities	Influential figures in Mayotte
At-risk populations in Mayotte	Populations living in Mayotte and exposed to natural hazards
Educational staff and institutions	Educational staff and institutions in Mayotte and mainland France
Students and schoolers in Mayotte	Children living in Mayotte when mentioned in school contexts
Other populations	Populations living outside of Mayotte
Foreign states, communities and personalities	Foreign state actors, personalities or communities that are not involved in scientific or risk and crisis management activities
Divers/Unidentified	All actors that could not be categorised in the previous categories because unidentified, or belonging to more than one category

271 | 3.2.2 Direct ~~and~~vs indirect mentions; ~~and~~ reported speech ~~and~~vs simple mention-

272 A direct mention occursis when an actor is cited in the text body-by the author of the article without being
273 introduced by another actor. An indirectIndirect mention occurscorresponds to the case when an actor is mentioned
274 through a third party in the article. For example, in the sentence, “The prefecture reports that an-“An earthquake
275 with a magnitude of 4.0 was recorded by the Bureau of Geological and Mining Research (BRGM)”-), informs the
276 mentionprefecture”, the citation of the prefecture, which is the body representing and implementing government policy
277 at the local level, is considered declared as direct, while the mention of ~~and that from the~~ BRGM is considered as

indirect. This distinction allows us to analyse the interactions between actor categories of actors in the press. Specifically, it helps identify, and in particular the most frequent citation links, the direction of these relationships (and therefore their potential asymmetry), and, finally, the more or less central position of actors and actor categories within the citation network.

Reported We also draw a distinction between reported speech and simple mentions of actors are also distinguished (see Table 2). Reported speech can be direct or indirect. Reported What we identify as reported speech is defined as any text includes everything that the journalist presents as being the word or opinion of an actor, whether it appears to be reported directly (e.g., with the use of quotation marks), for example or indirectly, or even in a distorted manner. For example, e.g. in the sentence: “In May 2018, when the swarm of earthquakes began to shake Mayotte, the first scientists rushing to the island did not believe in volcanic activity”, “did not believe in volcanic activity” we consider that a voice is considered given to be reported speech the scientists since the news item is intended supposed to convey their beliefs. In contrast On the contrary, in the sentence, “End of mission: French prefect Dominique Sorain leaves Mayotte”, we consider that Dominique Sorain is “simply mentioned”.

TABLE 2: Examples illustrating the distinctions between direct and indirect mentions, and between reported speech and simple mentions using the actor “prefecture”, which is the body representing and implementing government policy at the local level, as an example.

	Direct mention	Indirect mention
Reported speech	An actor is cited in the text by the author of the article without being introduced by another actor and its opinion is reported. “The prefecture confirms that no fewer than 13 tremors were recorded.” Journal de Mayotte, 05/12/2018	An actor is mentioned through a third party in the article and its opinion is reported. “On Tuesday evening, they [prefecture] had to deny on Twitter a rumor indicating that a strong magnitude earthquake could occur soon ‘This rumor is totally unfounded’.” Le Figaro, 05/16/2018
Simple mention	An actor is cited in the text by the author of the article without being introduced by another actor and its opinion is not	An actor is mentioned through a third party in the article and opinion is not reported.

	Direct mention	Indirect mention
	<u>reported.</u> “The Mayotte <u>prefecture</u> activated its crisis unit this morning.” Le Figaro, 05/16/2018	“They [<u>S.T.T.M. Facebook group</u>STTM members] criticized the <u>prefecture</u>’s poor communication.” Mayotte la 1ère, 08/08/2019

3.2.3 Actor network analysis

~~The We describe the system of actors in the Mayotte seismo-volcanic activity reported in the press using two global network analysis indicators and further detect the presence of small communities using the Louvain clustering method. We study the system of actors depicted by the network of citations is studied in order to better understand the relationships between individual actors, actor people and categories of actors and their evolutions. This is accomplished using node-level network centrality indices, including in-degree, out-degree, and betweenness centrality, computed with the igraph package in R. Network and network diagrams plot plotting citation links with arrows, and weighting the size of the nodes, as well as and of the font size fonts of the generic names, are weighted according to by their degree, representing the number of direct connections each node has within the citation network. (degree). Unidentified actors are removed from the graphs graph plot to avoid generating false co-citation relationship structures.~~

~~To In order to study the position of the actors in the citation networks (source and destination of a citation) derived from the selection of articles, corpus, we use two node-level indicators from network analysis are used at the node level: degree centrality and betweenness centrality. Degree centrality measures the number of links held by a node. It captures the extent amplitude of an actor's connections the network with which an actor is connected in the media, through the citation process. There is a distinction between We distinguish in-degree (the number of times an actor is mentioned by others) and out-degree centrality. Actors, i.e. the number of actors by which an actor has been mentioned and the number of actors that he/she has mentioned. The actors with the highest out-degree index values are those most active with the strongest activity in transmitting and communicating the experiences, opinions, speeches, and actions of other stakeholders (including Mayotte’s population). Conversely On the contrary, a high in-degree index indicates demonstrates a central position in the network resulting from linked to strong interest from third parties. The study of the ratio between in-degree and out-degree centrality reveals makes it possible to study the level of reciprocity in of these interactions.~~

~~two states. Betweenness centrality measures the number of times a node lies on the shortest path between two other nodes. The values are normalised by the number of node pairs in the graph (the direction of citations is are not accounted for). A high betweenness index indicates that an actor plays an important bridging role, in connecting different parts of the network. This is particularly true for of actors depicted in the media, and in particular the subgroups revealed by that the citation patterns relationships update, either because they position themselves he/she positions himself/herself at the centre of the network, or because they are he/she is positioned on the periphery of several clusters. Actors with high betweenness are key bridges between different parts of a network.~~

Here, ~~eight~~we provide 8 different graphs, corresponding to matching the ~~eight~~8 major periods subdivision of the seismo-volcanic activity press coverage proposed by Devès et al. (2022b), are presented. This allows us to examine the evolution of the network at different periods, each characterised by the occurrence of a new triggering event (e.g., the external disturbance (first earthquakes, first discussions regarding the hypothesis of a volcanic origin, the discovery of the volcano, or a public conference, etc).

4. Results

4.1 Actors' mentions in the selection of articles corpus

Table 3 presents a set of descriptive statistics on the frequency and form of actors' mentions in this selection of articles. The publication newspapers under study have not all published with the same frequency varies among the newspapers studied events: the national daily Le Monde devoted 10 articles to the subject, while 190 articles were published by the local daily Journal de Mayotte. These varying Differing publication rates result in different actor mention differing actors' mentions rates depending on newspapers: Le Monde names 310 actors (often repeatedly), while this number peaks at 2,541 for the Journal de Mayotte. Beyond this rate effect, we also find differences also emerge in the diversity of the actors that are mentioned: Le Monde, the national daily Le Figaro, and the regional daily Le Journal de l'Île de la Réunion respectively mentioned an average of 31, 20, and 20 actors per news item, while this mean value was only reached 13 for Le Journal de Mayotte, 12 for the local daily Mayotte la 1ère, and dropped fell to 10 for the regional daily L'Express de Madagascar. An inverse relationship emerges between publication rates and the average number of actors' mentions per article. Ultimately, the position of actors in the citation network is largely will be driven by the most prolific media. This effect is controlled for in this analysis through the use of, which we control by building our analyses on relative indicators.

Another source of variability in the media coverage of the actors lies in the balance space left by each newspaper strikes between the direct and indirect mentions mention of actors, and between the reported speech and of these actors versus their simple mentions. While mention. If the trend is +/- 80% for most newspapers, direct mentions constitute approximately 80% of the total per article (compared to +/- 20% for indirect mentions), this proportion drops to 66.7% for the national daily Le Figaro. However, this newspaper also distinguishes itself is distinguished by the highest frequency of reported speech (68.6%), both for direct as opposed to simple mentions (, whether they appear directly (70.2%) and for indirect ones (% of reported speech) or indirectly (65.3%). % of reported speech). The regional daily L'Express de Madagascar also features a has high proportion proportions of reported speech (66.8%), as compared to simple mention), but this is driven primarily by mainly the ease for the actors mentioned directly (74%) and applies to a % of reported speech) and does not concern as much lesser extent to those mentioned indirectly (40%). % of reported speech). The local daily Mayotte la 1ère has the lowest rates of reported speech (at, with 33.6%), on average, followed by the regional daily Journal de l'Île de la Réunion (42.7%) and the national daily Le Monde (45.5%). Consistently Again, the proportion of reported

speech is invariably lower for among actors indirectly mentioned actors by a third party than for those mentioned actors appearing directly.

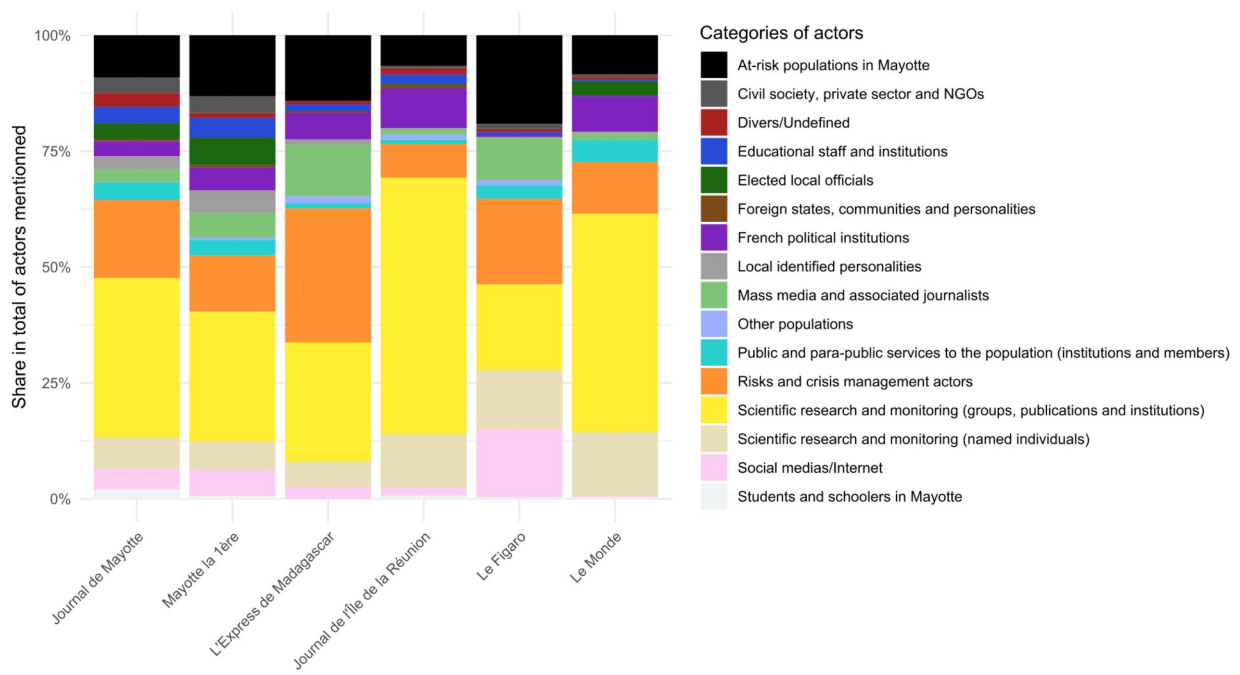
TABLE 3: Proportions of reported speech and vs simple mentions across mention in each of the six selected newspapers. This table presents data from selected. In a database of 343 press articles, published between the 10th of May from 10/05/2018 and the 10th of May to 10/05/2021, on we identified actors that played a part in the information chain regarding the seismo-volcanic activity off the coast of Mayotte. An indirectIndirect mention refers to when an actor is introduced in the press discourse by a third party, as opposed to a direct mention. A distinction is drawn between actors whose speech or opinion is reported (,when anything presented as their word or opinion is reported, even if distorted), and actors that are simply mentioned.-

	Number of news items	Number of actors mentioned	Average number of actors mentioned per news item	Direct mention			Indirect mention			Share of direct mentions in total	Share of reported speeches in total
				Reported speech	Simple mention	Total	Reported speech	Simple mention	Total		
Journal de Mayotte	190	2541	13	1112 (57.4%)	825 (42.6%)	1937	185 (30.6%)	419 (69.4%)	604	76.2%	51.0%
Mayotte la lère	82	999	12	292 (36.4%)	511 (63.6%)	803	44 (22.4%)	152 (77.6%)	196	80.4%	33.6%
L'Express de Madagascar	25	259	10	151 (74.0%)	53 26.0%)	204	22 (40.0%)	33 (60.0%)	55	78.8%	66.8%
Journal de l'Île de la Réunion	21	422	20	160 (44.9%)	196 (55.1%)	356	20 (30.3%)	46 (69.7%)	66	84.4%	42.7%
Le Figaro	15	296	20	139 (70.2%)	59 (29.8%)	198	64 (65.3%)	34 (34.7%)	98	66.9%	68.6%
Le Monde	10	310	31	132 (51.8%)	123 (48.2%)	255	9 (16.4%)	46 (83.6%)	55	82.3%	45.5%

Beyond these structural characteristics, the newspapers distinguish themselvesmedia are distinguished by the prominenceplae given to different actor categories (Figureof actors (Fig. 3), revealing distinct narrative specializations. Although actors relatedspecialisations in the event narration. If the actors linked to scientific research and monitoring (groups, publications, and institutions) are the most prominent category present in all the newspapers, theirthis proportion varies significantly from one outletmedia to another: they are particularly prevalent inwithin the regional daily *Le Journal de l'Île de la Réunion*, and, to a lesser extent, inwithin *Le Monde*, while they

represent only represents less than a quarter of the actors mentioned by the national daily *Le Figaro*. This trend is reinforced when specifically named if we add up the scientific and monitoring actors are also considered.

whose names are explicitly mentioned. The second category of actors most prominent category of actors is represented in the different media is that of risk and crisis management actors. Here too Again, this proportion varies from one outlet media to another, with (the highest rates are observed in the regional daily *L'Express de Madagascar* and in the national daily *Le Figaro*). Interestingly, at-risk the populations at risk in Mayotte do not exceed at the quarter of (or even the total share of actors mentioned tenth in the media. In some certain newspapers, such as the local daily *Journal de Mayotte*, the regional daily *Journal de l'Île de la Réunion* or *Le Monde*) of the shares of actors mentioned in the media. The relative presence of other groups of actors is more variable from one outlet media to another: for example, citations of social networks are more common in *Le Figaro* than in other newspapers, and we observe a lower smaller frequency of actors from the French political institutions is observed category in local newspapers than in national and regional newspapers (with the clear exception of *Le Figaro*).



FIGURE

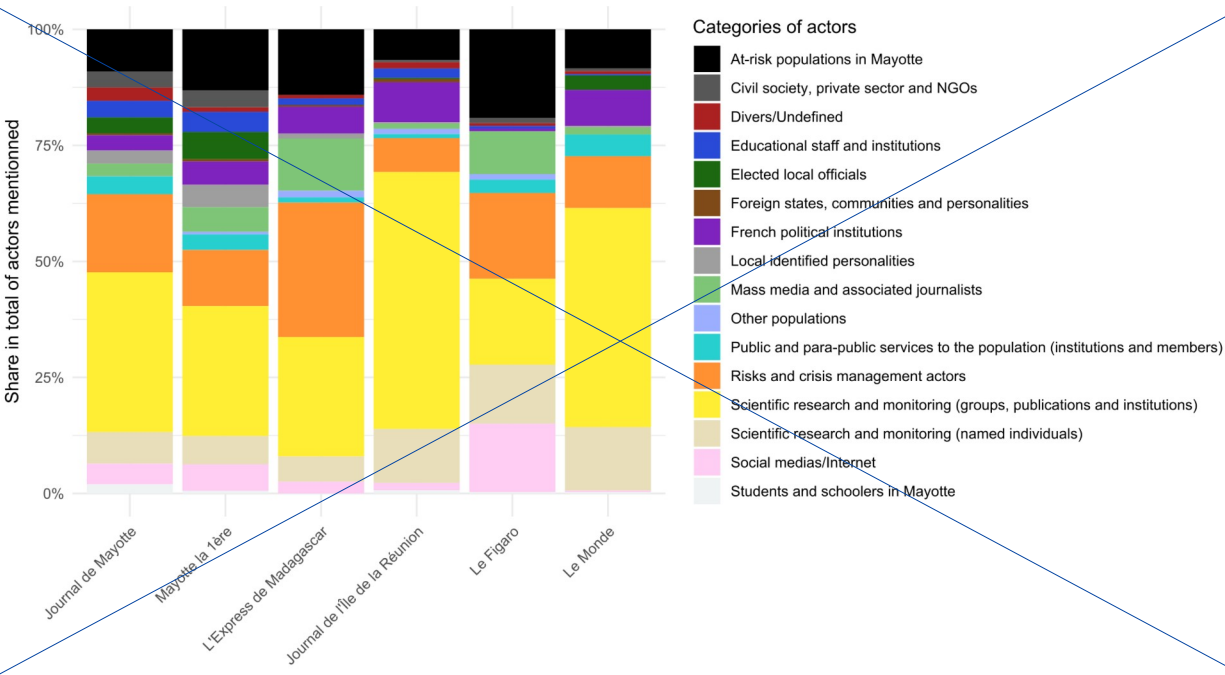


Figure 3: Relative Variations in relative share of crisis actor categories across different in all publications by media outlets. The actor categories. Categories were developed based on inspired from the organizational structure organisation of risks and crisis management in France (see Fearnley et al., 2018 and Section 2). in Part 2).

4.2. Direct and Indirect Speech by Actor Category speech opportunity vs framing of speech / reported speech Table

TABLE 4 reports the number volume and share of direct and indirect mentions, and of reported speech and simple mentions, by actor category of actors in the entire selection of articles. While most actor categories are primarily mentioned directly (i.e., corpus. Each category stands out as being mainly named in the news without an intermediary), (i.e. through a direct mention), but for certain groups, indirect their mentions in an article consecutive to a third party (i.e. indirect mention) are more common, than for others. This is particularly true the ease for at-risk Mayotte's populations in Mayotte, which, in more than 40% of 4 cases out of 10, are indirectly mentioned indirectly in the articles. The share of direct mentions is also relatively low lower (to a lesser extent) for public and para-public services and for the population (institutions and members) and for the students and schoolers in Mayotte (over 30% indirect mentions). Conversely, specifically named more than 3 cases out of 10) than for other groups. Named scientific and monitoring actors and local-identified local personalities groups are the group ones that are the most frequently directly mentioned directly in the corpus.

Significant There are large variations exist between actor categories regarding the proportion of actors in terms of relative importance of reported speech compared to simple mentions. The analysis shows that scientific, media, and institutional actors are granted benefit from more frequent reported speech than actors from civil society lay people. For instance, the total proportion of reported speech for students and schoolers in Mayotte is only 10.8%,% and 32.4% for the at-risk populations in Mayotte. In stark contrast, while it reaches 62.9% for local personalities, 77.2% for specifically scientific research and monitoring named individuals in science and monitoring, 78.8-% for mass media and associated journalists, and 83.3% for the social media/Internet sources. Among the categories identified, only specifically named scientific actors and foreign states, communities, and personalities have a higher share of reported speech when mentioned indirectly than when mentioned directly. by a third party than by a direct mention in the article, which seems to illustrate the importance of these external points of view on the perception of the crisis by the various local actors.

TABLE 4: Key statistics figures on actor category the mentions across of categories of actors in all articles. Data were compiled from the news items of the corpus. In a database of 343 press articles, published between the 10th of May from 10/05/2018 and the 10th of May to 10/05/2021, on the we identified categories of actors that could play a part in the information chain regarding the seismo-volcanic activity off the coast of Mayotte. An indirect Indirect mention refers to when an actor is introduced in the press discourse by a third party, as opposed to a direct mention. A distinction is drawn between actors whose speech or opinion is reported (anything presented as their word or opinion, even if distorted) and actors that are simply mentioned.

	Number of mentions	Direct mention			Indirect mention			Share of direct mention s in total	Share of reported speeches in total
		Reported speech	Simple mention	Total	Reported speech	Simple mention	Total		
Scientific research and monitoring (groups, publications and institutions)	1762	633 (43.7%)	815 (56.3%)	1448	100 (31.8%)	214 (68.2%)	314	82.2%	41.6%
Risks and crisis	683	334	189	523	58	102	160	76.6%	57.4%

	Number of mentions	Direct mention			Indirect mention			Share of direct mentions in total	Share of reported speeches in total
		Reported speech	Simple mention	Total	Reported speech	Simple mention	Total		
Management actors		(63.9%)	(36.1%)		(36.3%)	(63.7%)			
At-risk populations in Mayotte	549	122 (37.7%)	202 (62.3%)	324	56 (24.9%)	169 (75.1%)	225	59.0%	32.4%
Scientific research and monitoring (named individuals)	355	237 (76.0%)	75 (24%)	312	37 (86.0%)	6 (14.0%)	43	87.9%	77.2%
French political institutions	208	85 (53.1%)	75 (46.9%)	160	11 (22.9%)	37 (77.1%)	48	76.9%	46.2%
Social media/Internet	186	134 (90.5%)	14 (9.5%)	148	21 (55.3%)	17 (44.7%)	38	79.6%	83.3%
Mass media and associated journalists	179	120 (81.6%)	27 (18.4%)	147	21 (65.6%)	11 (34.4%)	32	82.1%	78.8%
Public and para-public services to the population (institutions and members)	148	31 (34.1%)	60 (65.9%)	91	7 (12.3%)	50 (87.7%)	57	61.5%	25.7%
Educational staff and institutions	135	29 (31.5%)	63 (68.5%)	92	11 (25.6%)	32 (74.4%)	43	68.1%	29.6%
Civil society, private sector and NGOs	129	39 (39.8%)	59 (60.2%)	98	4 (12.9%)	27 (87.1%)	31	76.0%	33.3%
Local identified personalities	116	66 (66.0%)	34 (34.0%)	100	7 (43.7%)	9 (56.3%)	16	86.2%	62.9%
Elected local officials	111	47 (55.3%)	38 (44.7%)	85	5 (19.2%)	21 (80.8%)	26	76.6%	46.8%
Students and schoolers in Mayotte	65	6 (13.3%)	39 (86.7%)	45	1 (5.0%)	19 (95.0%)	20	69.2%	10.8%
Divers/Unidentified	64	56 (98.2%)	1 (1.8%)	57	1 (14.3%)	6 (85.7%)	7	89.1%	89.1%
Other populations	20	7 (63.6%)	4 (36.4%)	11	1 (11.1%)	8 (88.9%)	9	55.0%	40.0%

	Number of mentions	Direct mention			Indirect mention			Share of direct mentions in total	Share of reported speeches in total
		Reported speech	Simple mention	Total	Reported speech	Simple mention	Total		
Foreign states, communities and personalities	20	5 (33.3%)	10 (66.7%)	15	3 (60.0%)	2 (40.0%)	5	75.0%	40.0%

4.3 Position of actors in the citation network

The cross-analysis of the frequency with which identification frequencies of actors are identified as a source or recipient of a quotation in the selection of articles corpus (Figure 4) indicates that the Prefecture role played by the prefecture of Mayotte and its main representatives play a central role in communicating about the event, as is central, since their media appearances in the media largely lead to the mention of other actors. Many mentions of actors in the event also originate from the X (formerly Twitter) network, which appears to be an essential primary source in the media narrative story. A few local personalities also emerge as central nodes in the network, relaying and make it possible to relay information concerning a large number of actors. These include: This is the case of: i) Saïd Saïd-Hachim, a Mahorese geographer from Mayotte (Mahoran) who works working at the Departmental Council of Mayotte and is also achieving a PhD candidate in geography at Paul Valéry Montpellier 3 University in mainland France; ii) Lieutenant-Colonel Philippe Blanc, a member of the Directorate-General for Civil Protection and Crisis Management... who operates (part of the Bureau for Exercise Planning, Feedback and Coordination of the Beauvau Crisis Centre in the Directorate-General for Civil Protection and Crisis Management.) who exercises at a national level and was sent to in Mayotte in June 2018 as a member of an interministerial delegation for civil protection...; in the context of the seismic crisis; iii) Eric Humler, scientific director of REVOSIMA... (volcanological and seismological monitoring network in Mayotte) from 2019 to 2022 and in charge of the coordination of the TelluS-Mayotte mission; and iv) Frédéric Tronel, the regional director of BRGM (French geological survey BRGM) in Mayotte from 2017 to 2020. The UDAF (Departmental Union of Family Associations) interestingly emerges as a key player in the actors chains of citation chains of the actors within the selection of articles. In contrast, the Mahorane corpus. This can be explained by the meeting they organised on the 5th of June 2018 to relay people's experiences and promote dialogue between local actors (among them, state institutions, public and para-public services to the population, local elected representatives, ect) regarding the measures to be taken at the start of the seismic crisis (*Le Monde*, 14/06/2018 and *Journal de Mayotte*, 01/06/2018) and which was relayed by both local and national press. On the contrary, the Mahorese population and, to a lesser extent, the schoolchildren, are highly cited but rarely initiate citations of other actors indicating not often at the origin of the citation of a third actor, indicate a relatively passive position within the citation network extracted from the selection of articles corpus. This is also the case for the French geological survey (BRGM), the REVOSIMA, (Volcanological and seismological monitoring network in Mayotte) and the scientific community (in general), which are regularly used as a source of information by third-party actors whose words are reported (directly or indirectly) in the articles.

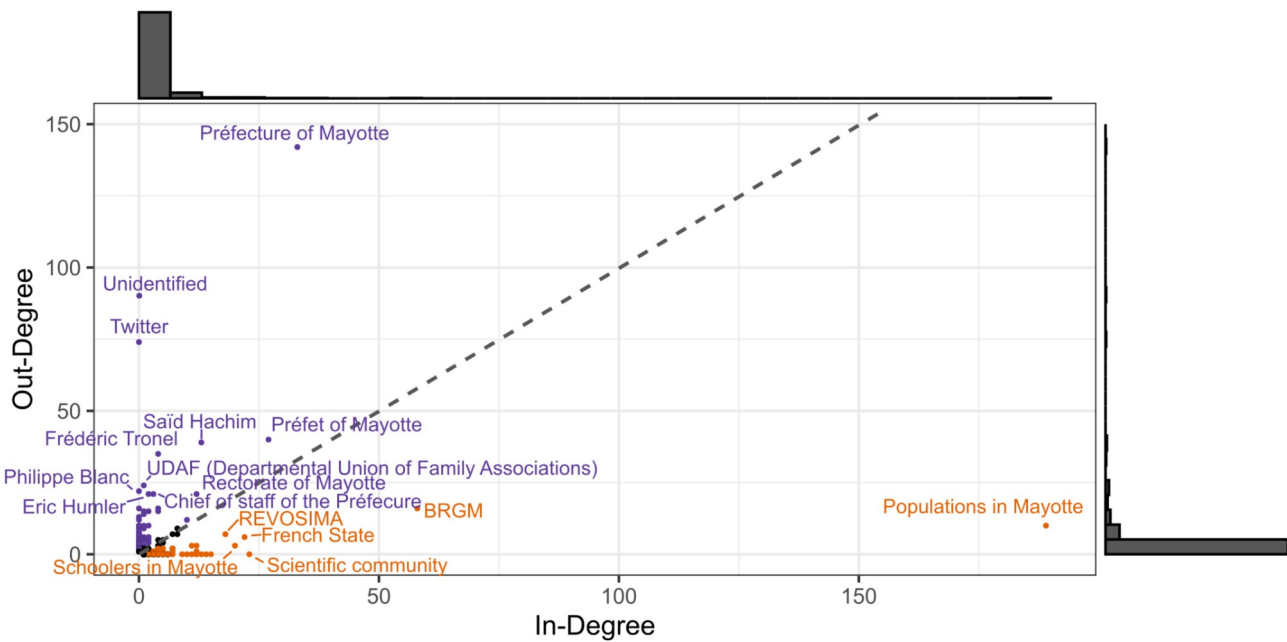
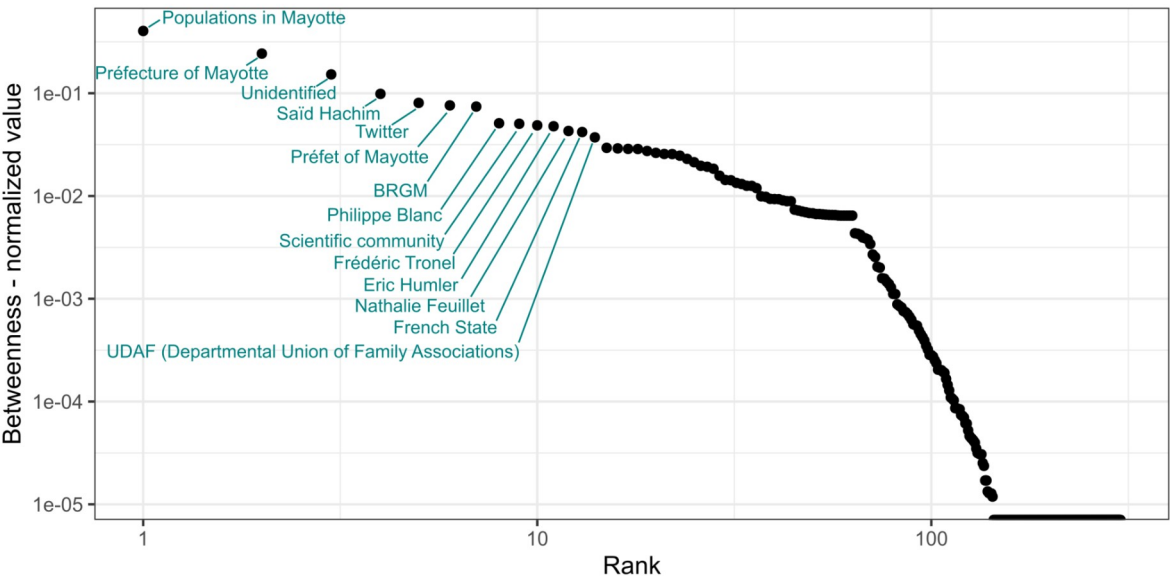


FIGURE 4: In-degree and out-degree distributions by actor category across all articles. This scatterplot shows the number of times an actor initiates a citation chain (out-degree) versus the number of times they are mentioned as a recipient of a citation (in-degree). Actors who are most often the source of the citation (and who are more often a source than a recipient) are annotated with purple labels. Conversely, actors who are most often the subject of the citation (and who are more often a recipient than a source) are annotated with orange labels.

Figure 5 shows an exponential relationship between the normalised values of the betweenness indices and the ranks, indicating a hierarchical structure of the network through the concentration of –citation interactions by a small proportion of actors. The MahoranMahorese population emerges as atthe key connectingeconnection element of the network of actors constructed from citation links in the media, a role also prominently filledhighly played by the local expert Saïd Saïd-Hachim. The central role of the Prefectprefet and the Prefectureprefecture, representing the French State in the department, is also evidentdepicted. The scientific community as a whole, the French geological survey (BRGM), and the-REVOSIMA also appear to be essential elements in the structuring of the network, asso is the online-social media platform X (formerly Twitter), which allows-allowing media visibility for individuals and institutions, and promotespromoting citation chains via re-tweets and mentions. Individualsidentifications. Expectedly, individuals with many connections also have high degrees of betweenness: Philippe Blanc, Eric Humler, and Frédéric Tronel (mentioned above), as well as Nathalie Feuillet, an observatory physicist at the IPGP (Institut de Physiquephysique du Globe deglobe in Paris (IPGP) and mission leader of the first oceanographic campaigns (MayObs 1 and 2; see Feuillet, 2019 and Jorry, 2019), who, despite having lower in-degree and out-degree values, connectsecontributes to concentrating a relatively large number of shortest paths in the network.-



FIGURE

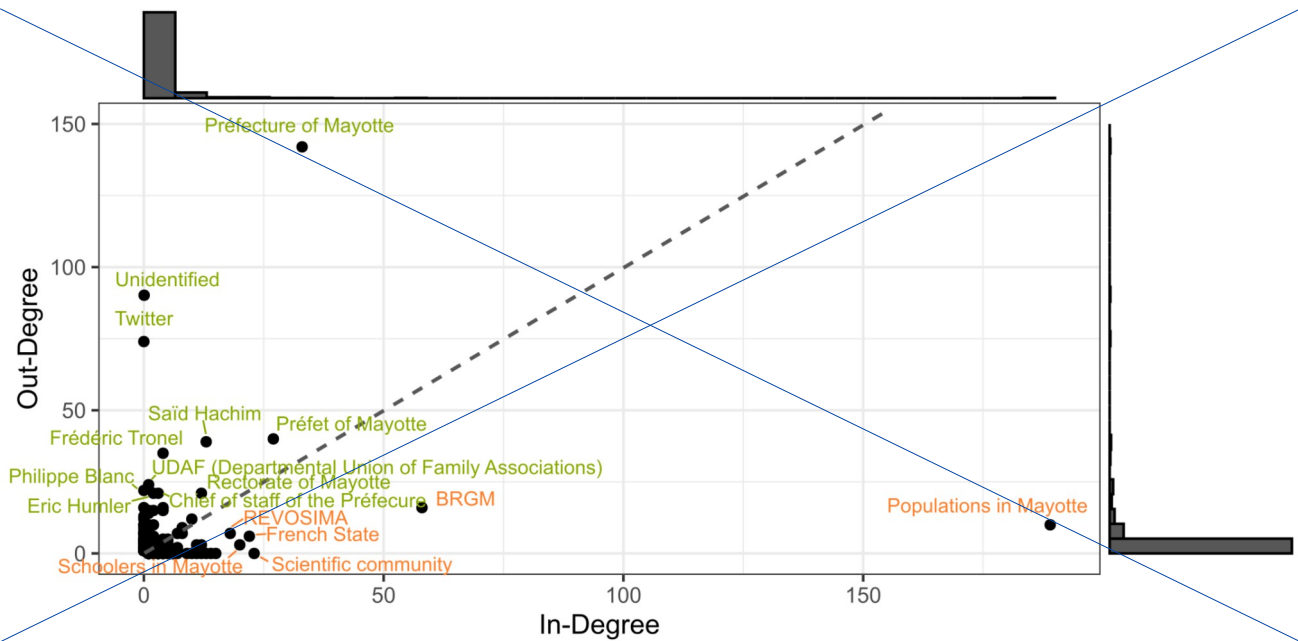


Figure 3: In- and out-degree distributions per category of actors in all the news items of the corpus. Scatterplot of the number of times an actor is mentioned at the start of a quoting chain (out-degree) over the number of times he or she is mentioned as a recipient of a quoting chain (in-degree). The actors who are most often the source of the quote (and who are more often the source than the one cited) are presented in green, while the actors who are most often the subject of the quote (and who are more often the one cited than the source of a quote) are presented in orange.

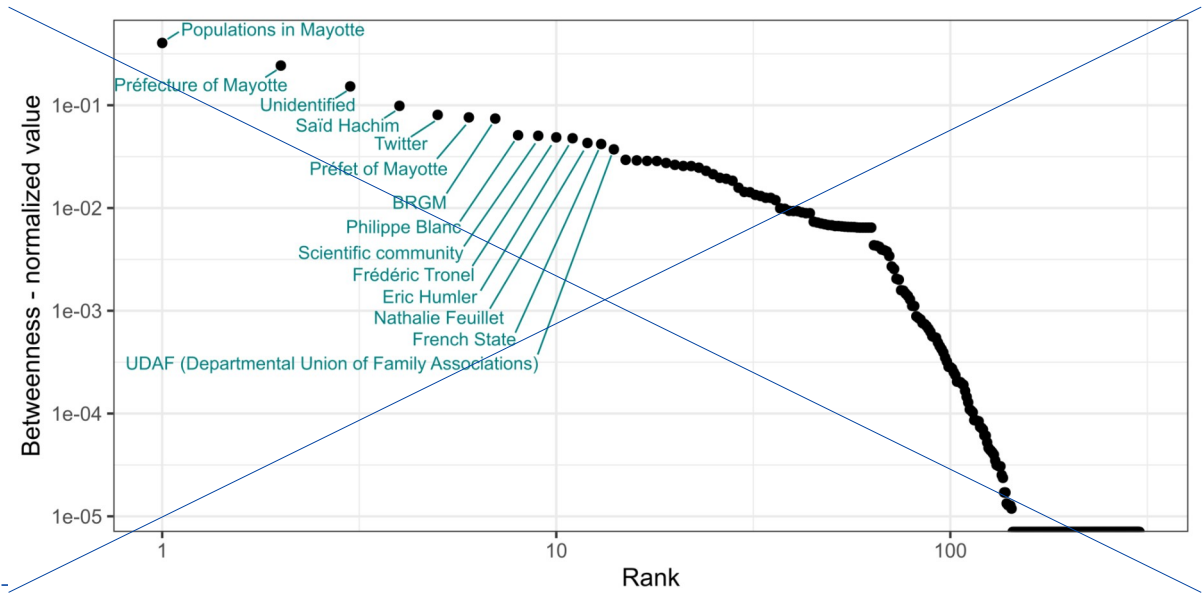


Figure 5: Rank-size distribution of betweenness centrality values. The plot shows the relationship between the normalized betweenness values of actors and their corresponding ranks, presented on a logarithmic scale.

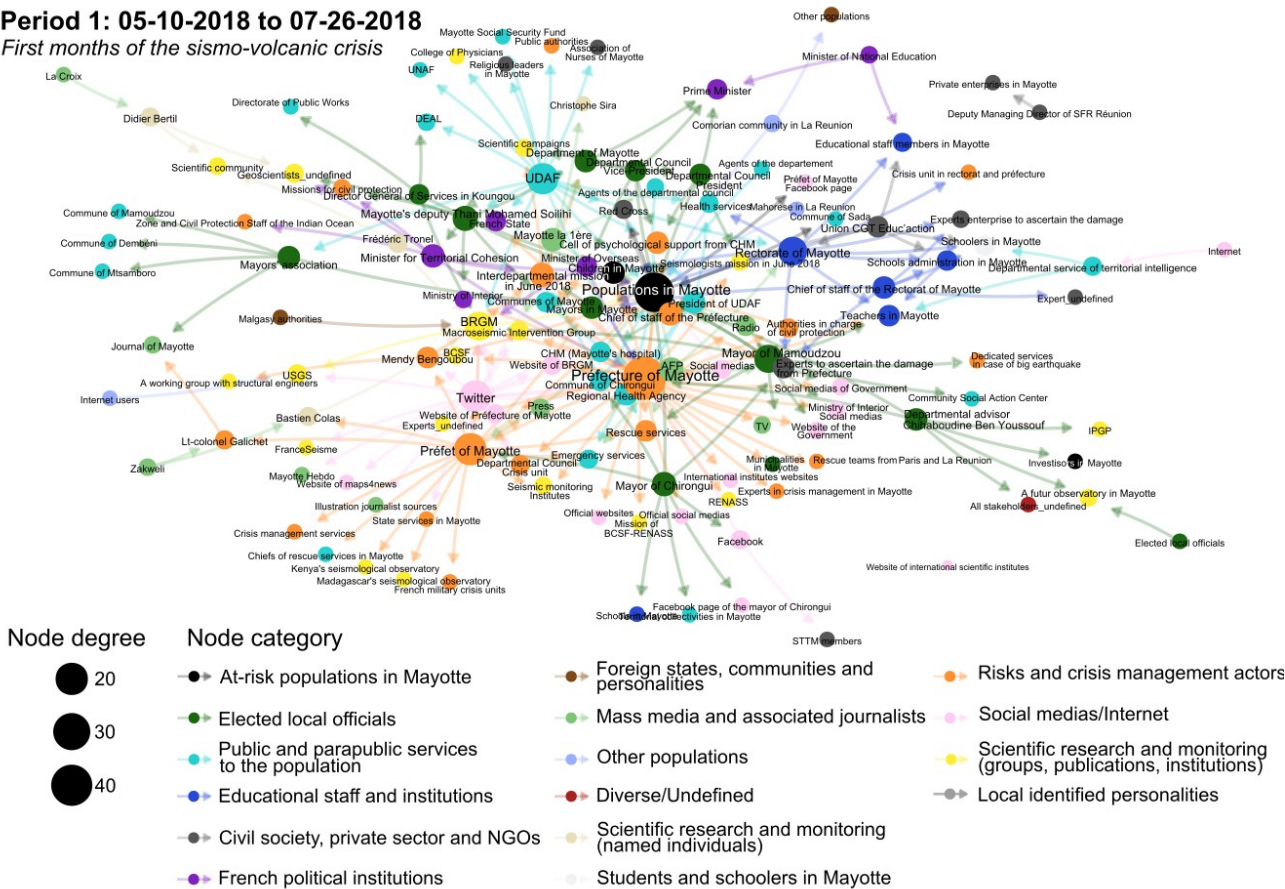
4.4 Actor network structure

The 126 articles published during the first months of the crisis (period 1, from the 10th of May 2018 to the 26th of July 2018) reflect a network of highly interconnected actors structured around key figures attracting a certain number of citations (Figure 6). These include: the Mayotte population as a whole, the Prefecture of Mayotte and the Prefect, the Departmental Union of Family Affairs, actors of the educational system (including the rectorate, the decentralized government department for education, and teachers), but also mayors (the association of mayors, the mayor of Mamoudzou (the capital city), the mayor of Chirongui, and other municipalities) and the social network X (formerly Twitter).

The municipality of Chirongui stands out here, probably because its hosting of the Groupe d'Intervention Macrosismique served as an entry point for the presentation of the group in the local press, what's more, the mayor at the time remained in office from 2008 to 2020 and her team seems to have been particularly active and well integrated into the local community. The citation network is extensive, and all categories of actors are present with the exception of local personalities (although many groups made up of members from civil society, associations, and businesses appear in the network). Interestingly, while the citation chains from the entire selection of articles show paths between actors belonging to the same category, the network itself presents a certain heterogeneity. The Prefecture of Mayotte relayed information from local and other national risks and crisis management actors, but also from scientific research and monitoring institutions, groups, and publications, and was cited by and communicated through a variety of mass media and social media. The articles in this selection also make it possible to link the Prefecture of Mayotte to

the Mahoran population, as well as to various public and parapublic services such as hospitals. Thus, the Prefecture emerges as the central actor in the management of this first period of the seismic-volcanic activity, which is in accordance with its official mandate for public safety and State representation. Notably, the Prefect's missions of security of people and property and representation of the State which are conferred. It is interesting to note that the prefect's interventions and mentions in the press do not link him to the same actors as the institution he represents. His communications were aimed at the civilian population and representatives of civil society and associations, stakeholders in the educational world, and mayors. Actors from the delegation of specialists in civil security and natural risks, such as like Mendy Bengoubou, appear as intermediate nodes between the Prefecture and the Prefect, with whom they share a large number of co-cited actors. Conversely, in these first months of the crisis, the citation networks between scientific actors appear fragmented, and local elected officials relatively peripheral.

Period 1: 05-10-2018 to 07-26-2018
First months of the sismo-volcanic crisis



Period 1: 05-10-2018 to 07-26-2018
First months of the sismo-volcanic crisis



50

577 -In contrast, Nathalie Feuillet (as-an observatory physicist), the University of La Rochelle in mainland France,
578 and the Tellus Mayotte oceanographic mission from IPGP are isolated. Christophe Sira, a macroseismic surveyor
579 and member of the Groupe d'Intervention MacrosismiqueMacroseismic Intervention Group, and Laurent Michon, a
580 research professor at the University of La Réunion island, are also separated from other scientific actors.
581 Likewise, Bastien Colas and Mendy Bengoubou, two-out of the three3 members of the delegation of specialists in
582 civil security and natural risks dispatched by two ministries (Ministry of Ecology and Ministry of the Interior) to
583 assess the seismo-volcanic activity on site in June 2018, are cited separately (and-are-separated-from each other and
584 from mentions of the interdepartmental mission itself, they belonged to), while the third expert, Lieutenant-Colonel
585 Olivier Galichet, is not mentioned in the selected articles. Once again, the actors in the medico-social world, who
586 initiate at the origin of citations of various actors, have intermediate positions in the network, while the actors in
587 the educational world are find themselves more isolated than during the previous period. Another important
588 distinctiondistinctive element is the introduction of a first identified local personality, Saïd Saïd-Hachim, in the
589 network. In this subset of articles, he, which only cites the Prefecture,prefecture in this sub-corpus of the article as he
590 relayed and detailed a note from the institutionprefecture mentioning the volcanic origin hypothesis derived from
591 the latest GPS data. Local fishermen also appear in the network of actors via citations from IFREMER and the
592 Prefect's chief of staff of the prefecture, following the discovery of deep-sea dead fishfishes about 50 km east of
593 the eastward from coast.

Volcanic hypothesis and subsidence data

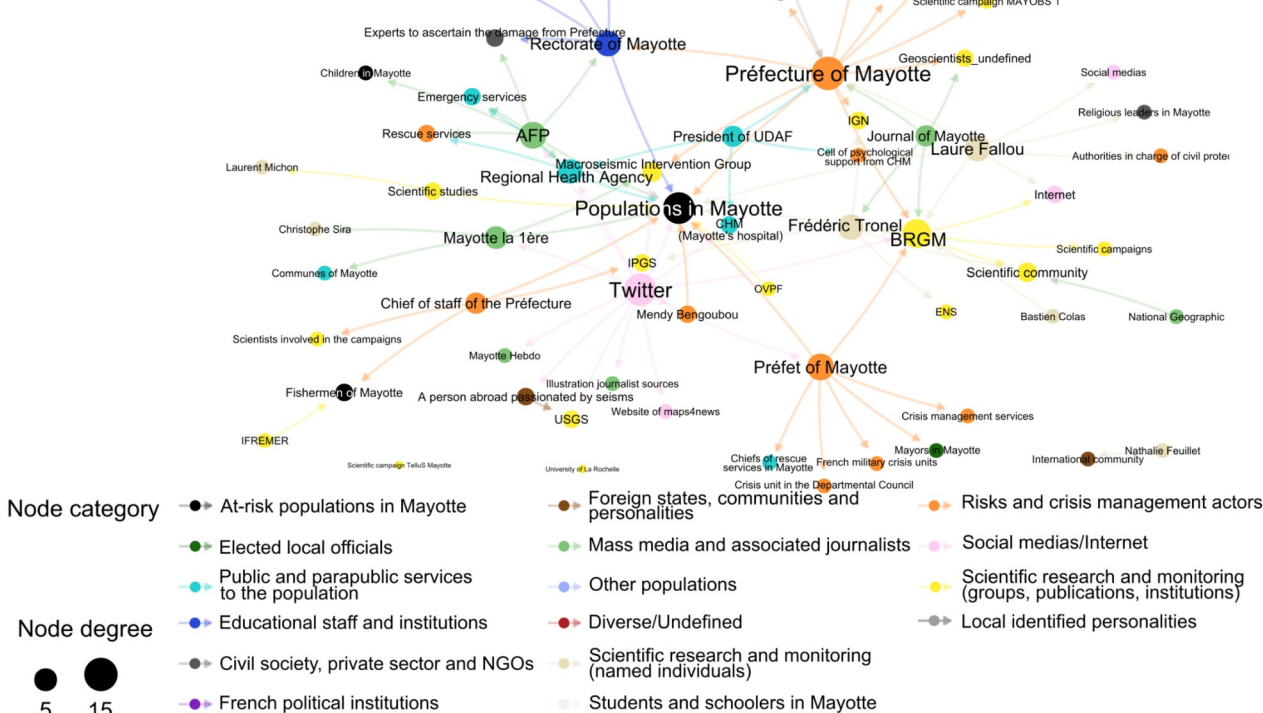


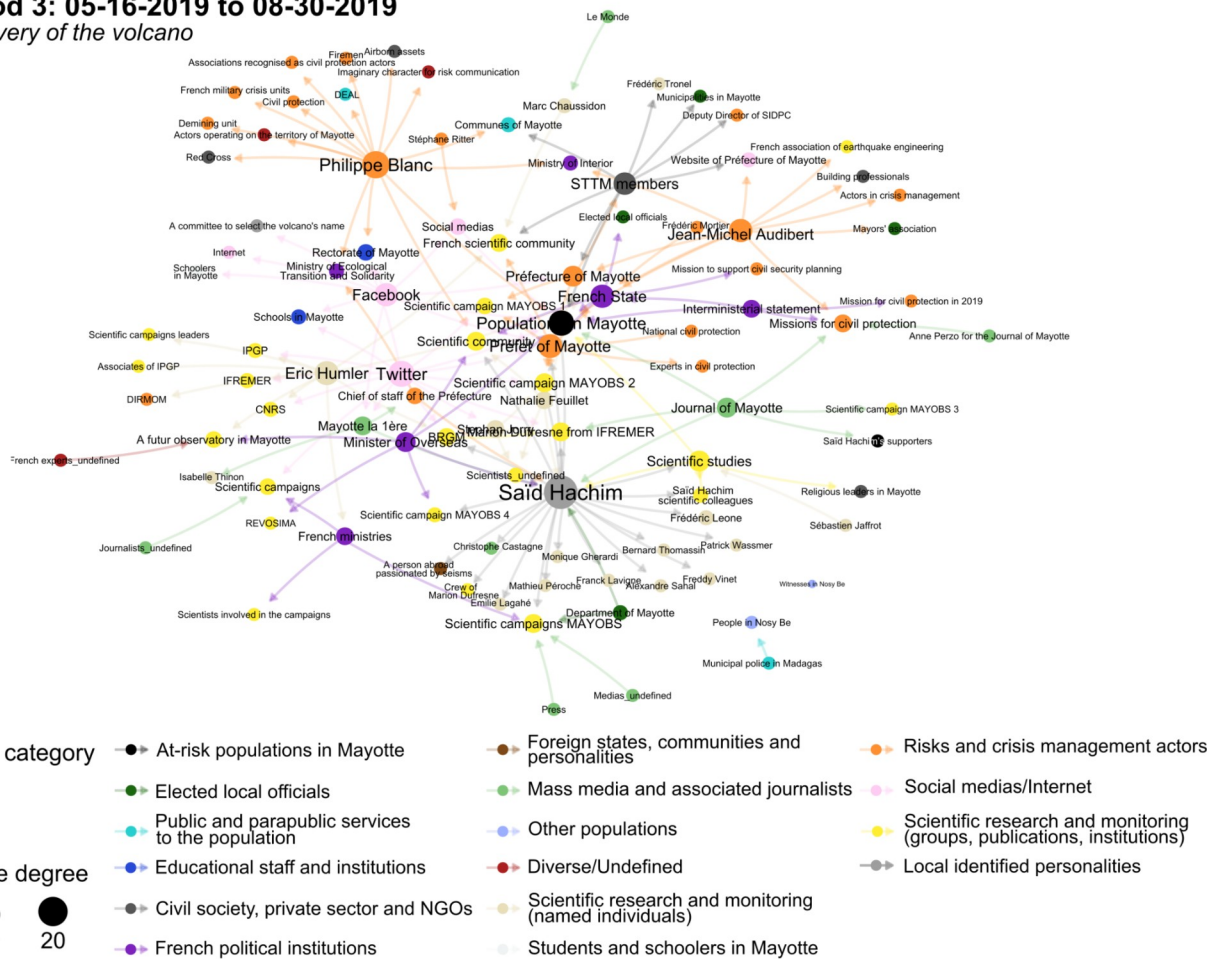
Figure 7: Actor citation network following the emergence of the volcanic origin hypothesis and the first subsidence data.

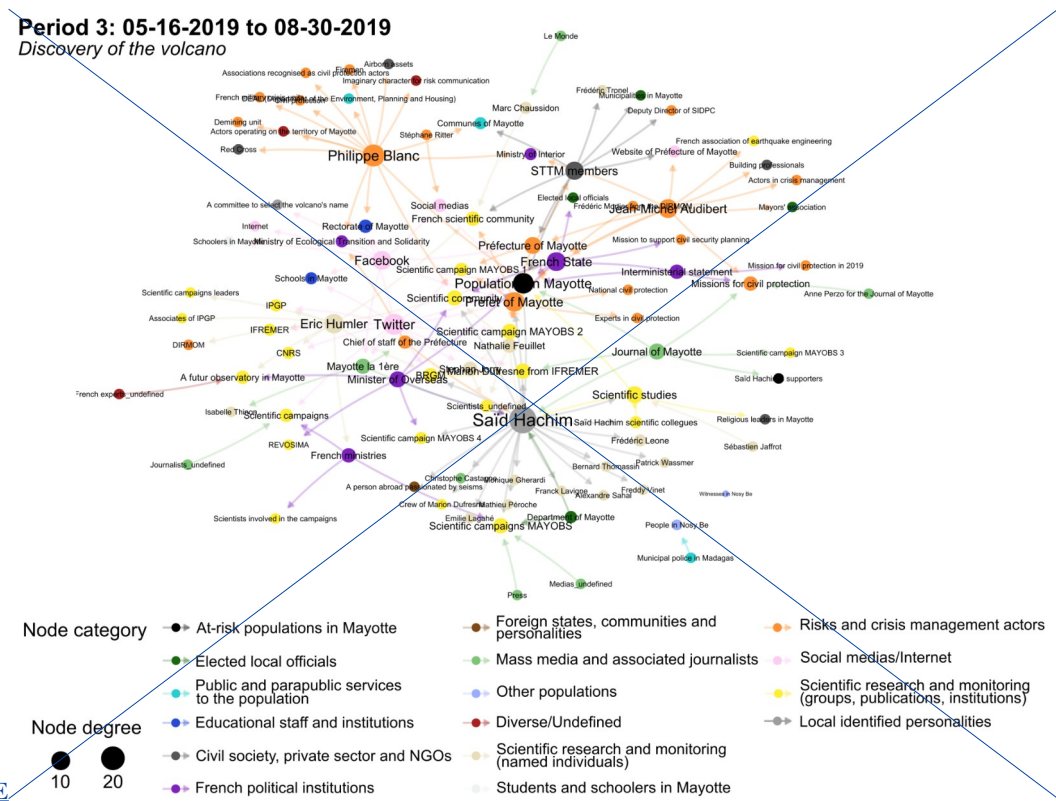
The third period studied corresponds to the discovery of the underwater volcano and coverage concerns 36 articles published from the May 16th of May, 2019 to the August, 30th of August 2019. Figure 8 depicts its actor co-citation network. ComparedAs compared to the previous periods, the central connectinganalytic role of the population is diminishing, while the position of local actors acting either as relays for residents' voices (such as the Facebook group Signalement Tremblement de Terre Mayotte, or -(S.T.T.M.), for “earthquake reports in Mayotte” which was created after the first earthquakes of 2018) or as relays for scientific voices (such as Saïd Saïd-Hachim) is strengthened. Philippe Blanc, as a member of a Civil Security mission on volcano-related risks, also appears as an important source of citations in the network, mainly for other riskrisks and crisis management actors, without receivingbenefiting from any citationsquote from a third party in return. The sameThis is true foralso the case of Jean-Michel Audibert, who was part of the same mission for civil security; without the two actors are only connected by their sharedsharing any other common citation than that of the MahoranMahorese population.

The various ministries involved in crisis management and the French state are only indirectly connected to each other, reflecting segmented cooperation networks, even within the framework of inter-ministerial actions. The Ministry of Overseas Territories introduces numerous actors into the citation network, including REVOSIMA (Mayotte's volcanological and seismological monitoring network)₂ which was just-created on the 18th of June 2019₂ and a hypothetical future observatory in Mayotte, which is still in the planning stage at the time of writing. The network of scientific actors is more structured and includes more numerous, diverse, and international actors than in the previous periods. Indeed, the recording of the waves of a very-long-periodVLP earthquake all over the world on the 11th of November 11/11/2018 has attracted the attention of international institutions and media in

addition to that of scientific and political authorities at the national level (Hossein and Sadaomi, 2021). Notably, it is however interesting to note that the scientific actors named by Eric Humler or via the X (formerly Twitter) network differ from those named by Saïd Saïd-Hachim, who which mainly relays the names of scientists with whom he had published an atlas of natural risks and vulnerabilities of Mayotte in 2014 and discusses the MayObsMayObs' campaigns. Several social networks, the Facebook group S.T.T.M., and two local newspapers appear as important nodes of the citation network, mainly citing other media, the MahoranMahorese population, scientists (with despite for the exception of the S.T.T.M.STTM Facebook group), public institutions, and the actors of the MayObs oceanographic campaigns carried out from the Ifremer ship *Marion Dufresne*. Interestingly, the membersmember of the MayObs oceanographic campaigns are not cited by the same actors, reflecting a sequencing of the actors mentioned in the media as the oceanographic campaigns progress (the Prefecture, the Prefect,Préfet and X (formerly Twitter) for the 1st campaign; the Ministry of Overseas and Saïd Saïd Hachim for the 4th, while interministerial communiqués do not distinguish between the different missions).

Period 3: 05-16-2019 to 08-30-2019
Discovery of the volcano





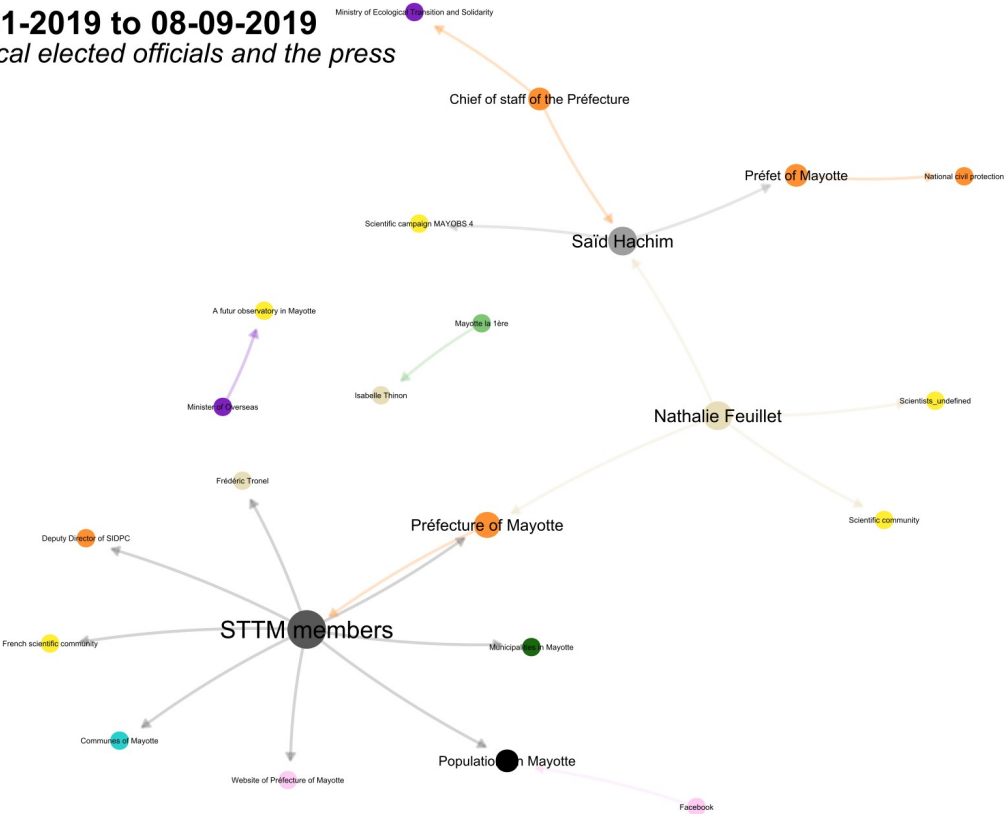
FIGURE

Figure 8: Actor citation ÷ Citations network from of actors in the press coverage following after the discovery of the volcano.

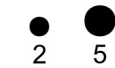
Period 4 focuses on a specific event within Period 3: particular moment intersecting period 3: the organisation of a conference for local elected officials and the press, organized-organised by the Prefectureprefecture and led by scientists involvedwho-partieipated in the volcano's discovery. This period covers-of-the-voleano. It includes 6 articles published between the 31st of July 31, 2019 and the 9th of August 9, 2019.

-As shown in the network of actors represented in Figure 9, Nathalie Feuillet acts as an plays the role of intermediary, connecting-between, on the one hand, the part of the network structured around Saïd Saïd-Hachim withand that structured-around the S.T.T.M.STTM Facebook group. She creates this link via her citation of the Prefecture -with which quotes, andshe is quoted, by the S.T.T.M Facebook group.indirectly linked via his quote of the prefecture. Without this connection, the actor network of actors appears fragmented, even among keybetween actors; at the heart of the event: the scientists, state representatives (the Prefecture, the Prefect,the representation of the French State via the prefecture, the prefect and his chief of staff), but also via the Interministerial Defense and Civil Protection Service (SIDPC), as well asjust like the Ministry of Overseas Territories and the Ministry of Ecological and Inclusive Transition. Frédéric Tronel and Isabelle Thinon are the only scientists citednamed by other actors: Tronel is cited bya-third-party, the S.T.T.M.STTM Facebook group, while Thinon is cited by-for the first-and the local news broadcast Mayotte la 1ère. This -for the second. Added to this low presence of named scientific actors is compounded by the absence of a mention-of-specific scientific institutions, which are instead referred to abstractly as 'the scientific community'in favour of abstract mentions of the community.

Period 4: 07-31-2019 to 08-09-2019
Conference for local elected officials and the press

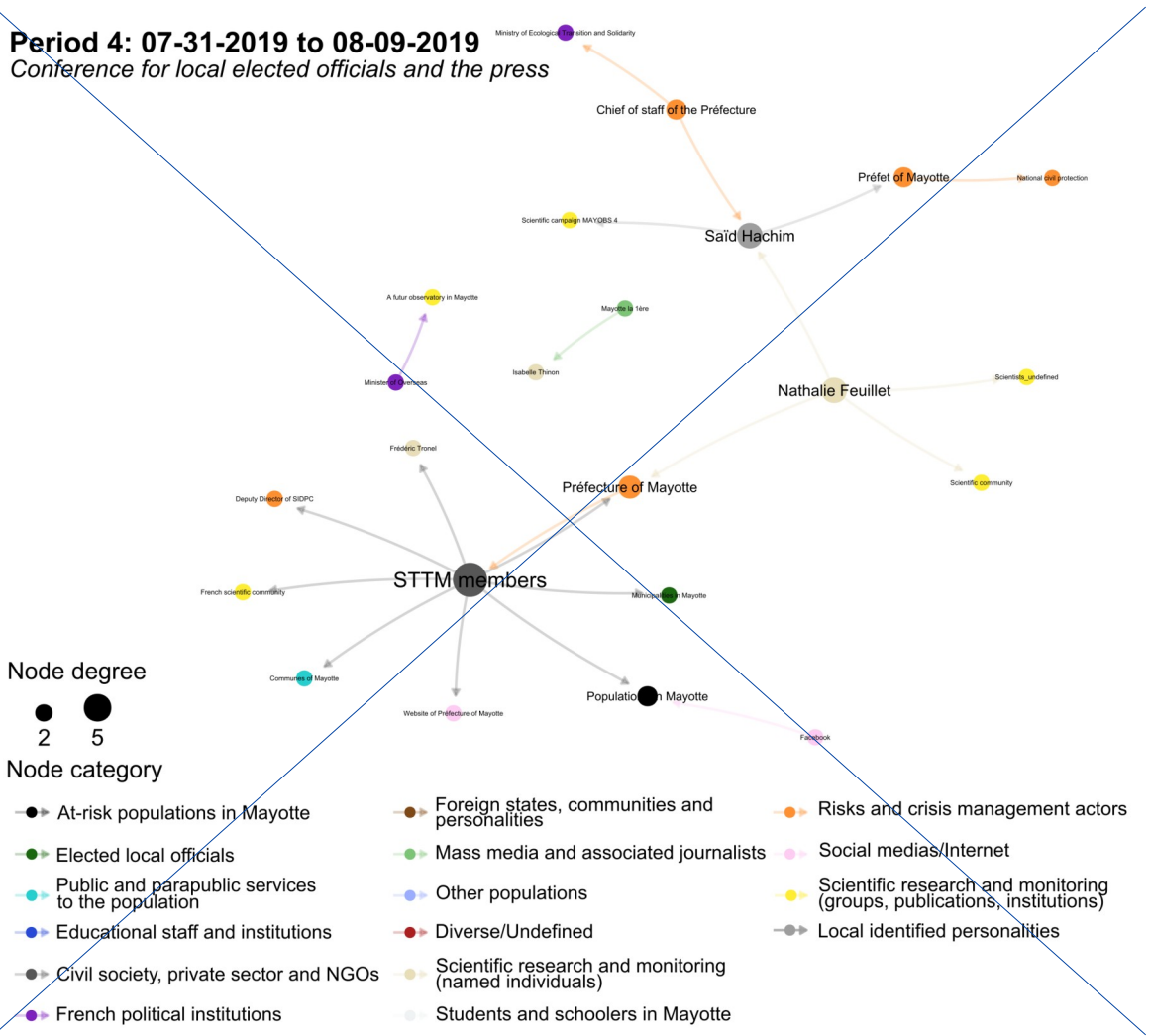


Node degree



Node category

- | | | |
|---|---|--|
| ●→ At-risk populations in Mayotte | ●→ Foreign states, communities and personalities | ●→ Risks and crisis management actors |
| ●→ Elected local officials | ●→ Mass media and associated journalists | ●→ Social medias/Internet |
| ●→ Public and parapublic services to the population | ●→ Other populations | ●→ Scientific research and monitoring (groups, publications, institutions) |
| ●→ Educational staff and institutions | ●→ Diverse/Undefined | ●→ Local identified personalities |
| ●→ Civil society, private sector and NGOs | ●→ Scientific research and monitoring (named individuals) | |
| ●→ French political institutions | ●→ Students and schoolers in Mayotte | |

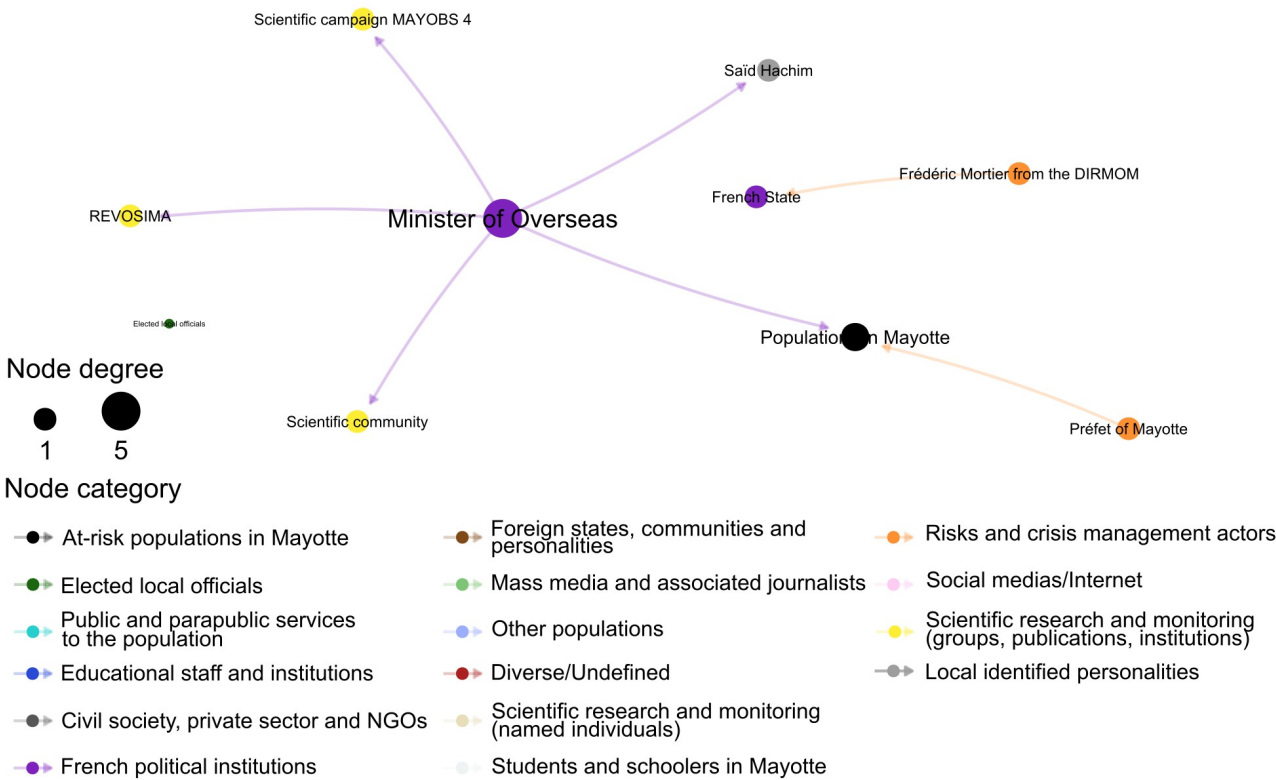


FIGURE

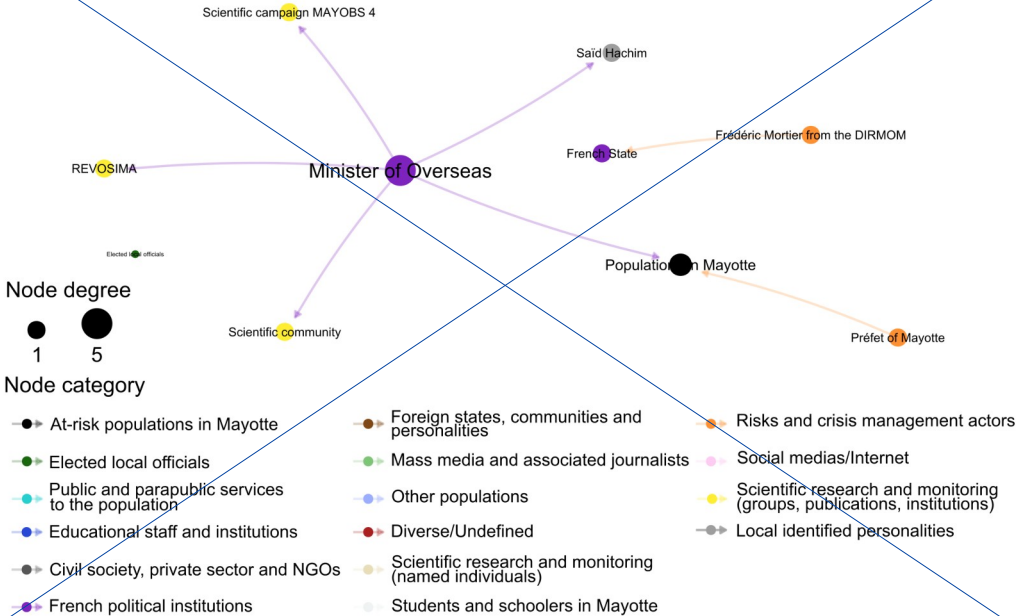
Figure 9: Actor citation Citations network from press coverage of actors in the press following the conference for local elected officials and the press organised by the prefecture.

Period 5 (Figure 10) focuses on a second specific event within Period particular moment intersecting period-3: the visit of the Minister for Overseas France to minister in Mayotte. This period covers It includes 3 articles published between the 27th of August 27, 2019 and the 30th of August 30, 2019. As depicted in Figure 10, the number of cited actors is low. The Minister for Overseas France occupies a central place in the network, as they mention five since it mentions 5 other actors: the scientific actors responsible for in-charge of studying the phenomenon (REVOSIMA and the underwater observation campaign underwater-MayObs 4), and the scientific community more generally, as well as the local expert Saïd Saïd-Hachim, and the MahoranMahorese population (, also cited by the Prefect). Theprefect. We also note the isolated mention of the French State by Frédéric Mortier (from the interministerial delegation for major overseas risks, DIRMOM) and a separatethe unrelated mention of local elected officials can also be noted.

Period 5: 08-27-2019 to 08-30-2019
Visit of the Overseas Minister



Period 5: 08-27-2019 to 08-30-2019
Visit of the Overseas Minister



FIGURE

Figure 10: Actor citation network from actors in the press coverage following the visit of the Minister for Overseas France's visit to Minister in Mayotte.

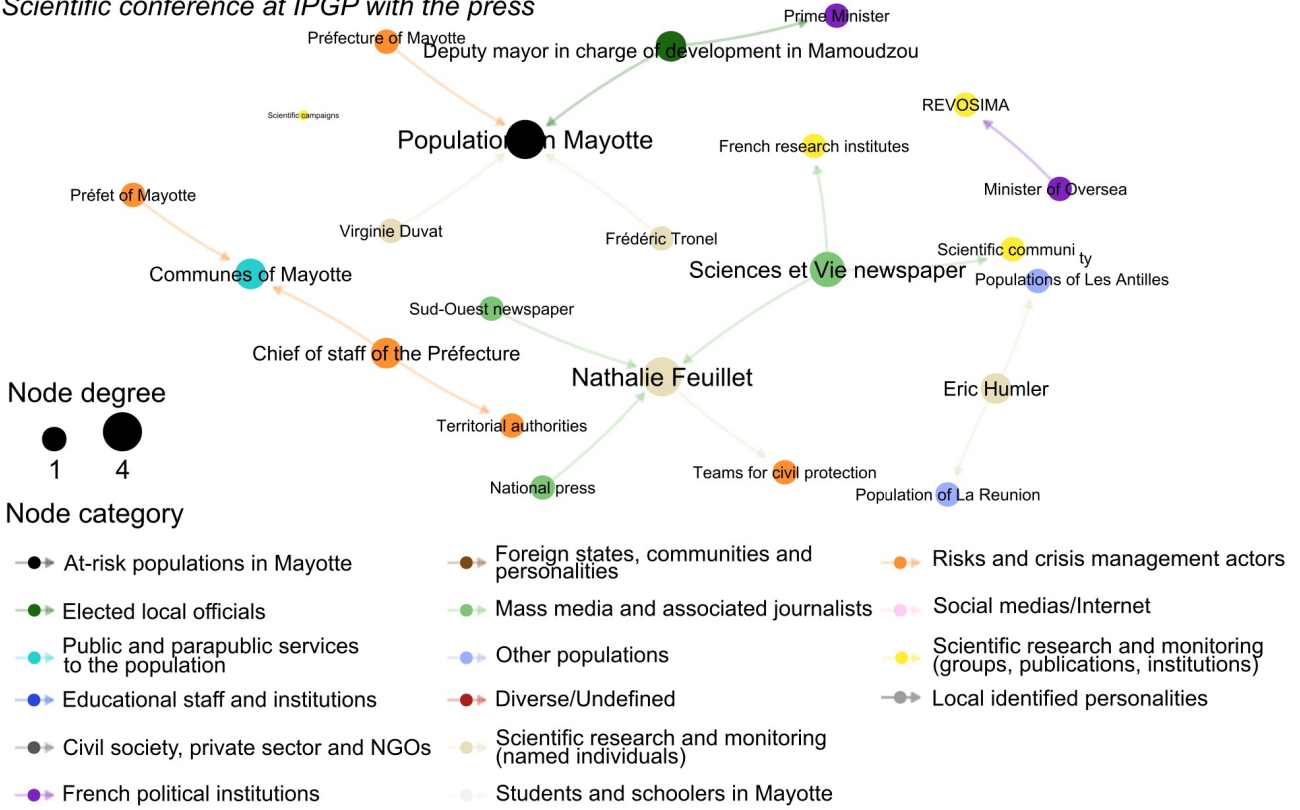
Eight articles in the selection of articles corpus cover the period from the 4th of September 4, 2019 to the 26th of October 26, 2019 (Period 6, Figure 11). This period encompasses, during which a scientific conference is held at IPGP

headquarters in Paris, and immediately followed by a public conference hosted operated by scientists and ministerial officials.

Interestingly, REVOSIMA (once again solely cited by the Ministry of Overseas Territories) is isolated from the rest of the citation network (Figure 11), even though it brings together the actors in charge of the volcanological and seismological monitoring of Mayotte. It is, nevertheless, the only scientific institute explicitly named, as the citation network gives giving a more central place to individual scientists than to institutions. The actor network of actors—is more fragmented than in previous periodspreviously, and its sub-networkssubparts are respectively organised around: Nathalie Feuillet (who received citations from various media);, Eric Humler (quoting populations from other French overseas departments);, the chief of staff of the PrefecturePréfecture (citing the communes of Mayotte and territorial authorities in general);, and the journal *Sciences et Vie* (citing Nathalie Feuillet and encompassing the scientific community and French research institutes). Several isolated citations point again point to the Mahoran populationMahorese populations (from scientists Virginie Duvat and Frédéric Tronel, but also from the PrefecturePréfecture of Mayotte and from a local elected official from the capital city, Mamoudzou). Once again, the Prefectureprefecture of Mayotte is separated from the Prefectprefect and his chief of staff within the citation network. For the first time, the Prime Minister is cited by an actor—specifically,—namely the deputy in charge of development in Mamoudzou—, regarding a letter—the latter sent to the Prime Minister to point out the effects of subsidence on urban development.

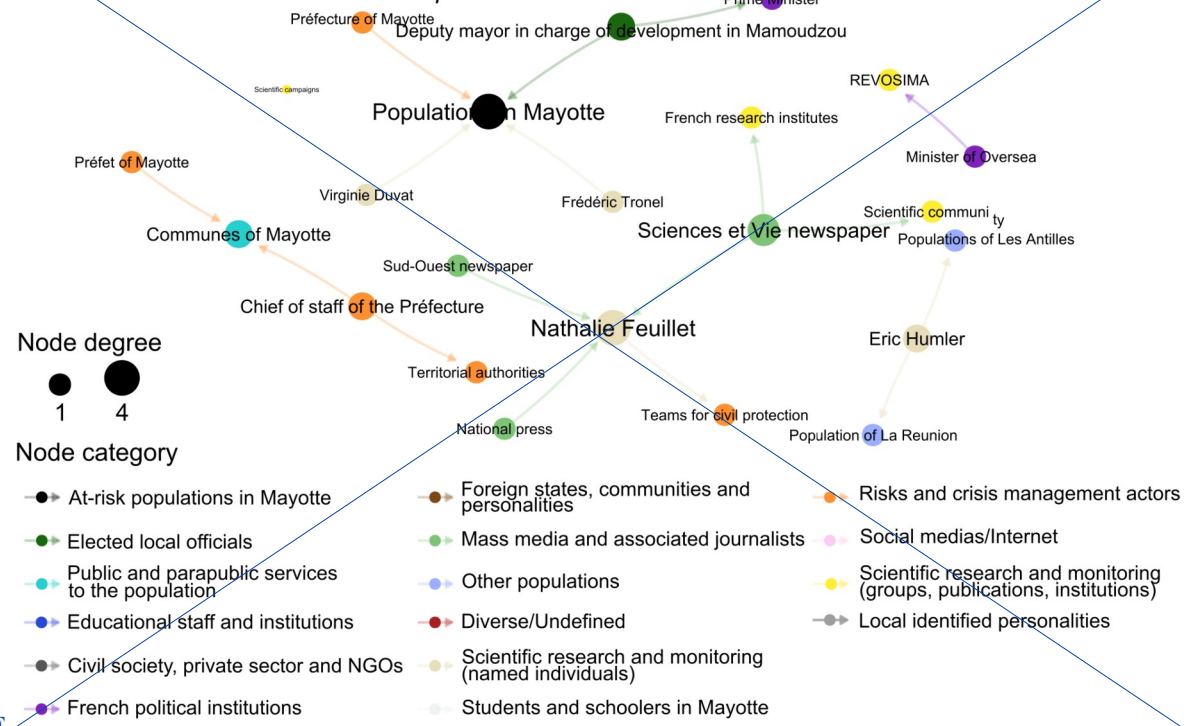
Period 6: 09-04-2019 to 10-26-2019

Scientific conference at IPGP with the press



Period 6: 09-04-2019 to 10-26-2019

Scientific conference at IPGP with the press



FIGURE

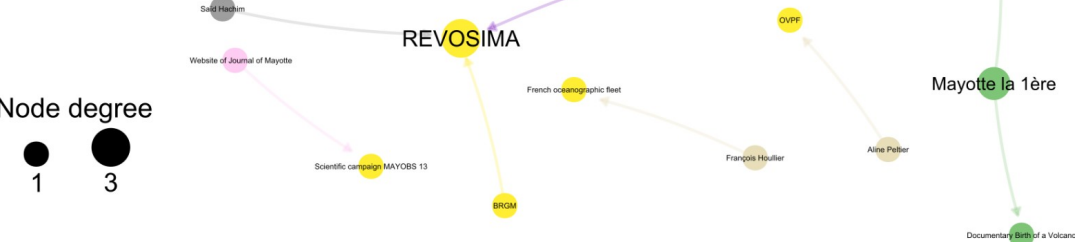
Figure 11: Actor citation network from actors in the press coverage of following the scientific and conference at IPGP followed by a public conference by scientists and ministerial officials and attended by journalists.

Period 7, which extends from the 4th of May 4, 2020 to the 28th of September 28, 2020 and covers the missions MayObs 13-1 and MayObs 13-2, is covered by includes 7 articles from the selection of articles corpus. Its citation network is shown in Figure 12. For the first time, REVOSIMA appears as a central node of the network, although the number of nodes and links is limited by the small number of articles. The REVOSIMA is cited by local expert Saïd Saïd-Hachim and by the Prime Minister, but also by the BRGM, one of its member institutions. The Prime Minister also cites the IPGP separately from REVOSIMA, even though IPGP the institute is one in charge of the institutions responsible for it. The network of scientific actors appears generally fragmented during these two missions. Notably, it should also be noted that the documentary "Birth of a volcano" produced by Crestar Productions and L'éolienne and broadcasted on Mayotte la 1ère is not relayed by any actor other than the channel.

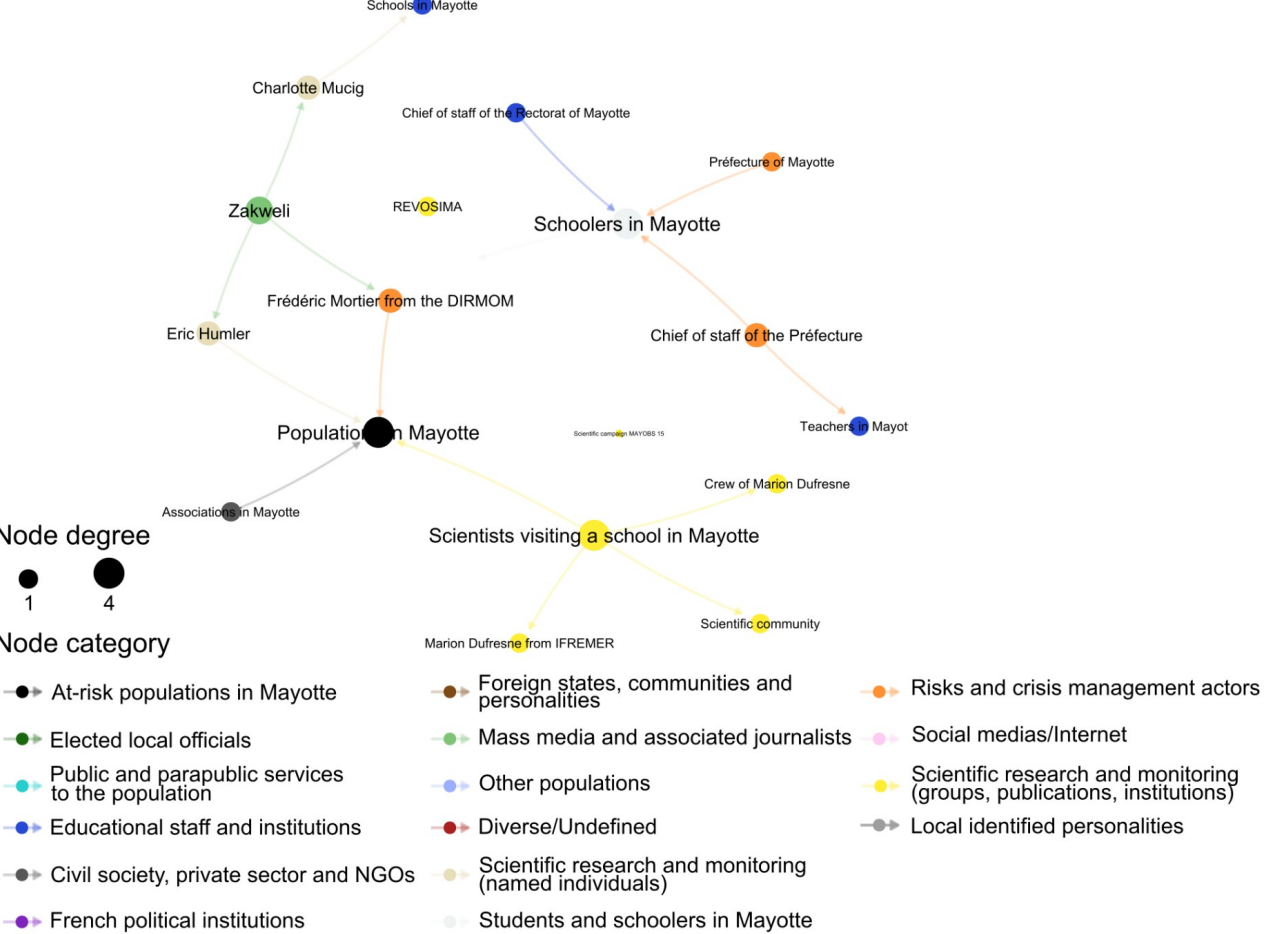
The last period extends from the 28th of October 28, 2020 to the 3rd of November 3, 2020 and covers deals with two events recounted in 6 articles: the "Volcano Week" and the first siren alerts in the municipality of Dombéni. The actor network of actors (Figure 12) is structured around two main components. The first is organised around Mahoran schoolchildren, and includes citations quotes from the chief of staff of the Rectorat of Mayotte Rectorate, from the chief of staff of the Préfecture, Préfecture and from the Préfecture Préfecture itself. Teachers The teachers in Mayotte are also part of this the citation chain, as they are cited also quoted by the chief of

staff of the PrefecturePréfecture. Interestingly, schools in Mayotte (mentioned as actors) belong to the second citation sub-networksubnetwork, of which they form the periphery throughthanks to a citation by Charlotte Mucig, who was in turnherself cited by the TV and radio show Zakweli broadcastbroadcasted by Mayotte la 1ère. The show Zakweli also linksmakes the link with Eric Humler and Frédéric Mortier, both of whom citeciting the MahoranMahorese population. The latter is also cited by unidentified MahoranMahorese associations not identified in the articles, as well as by scientists visiting Mahoran schools during the Volcano Weekvolcano week, who will also mention the MayObs missions on the ship Marion Dufresne eithermore or less explicitly or implicitly. Finally, REVOSIMA appears fully isolated from the other actors.

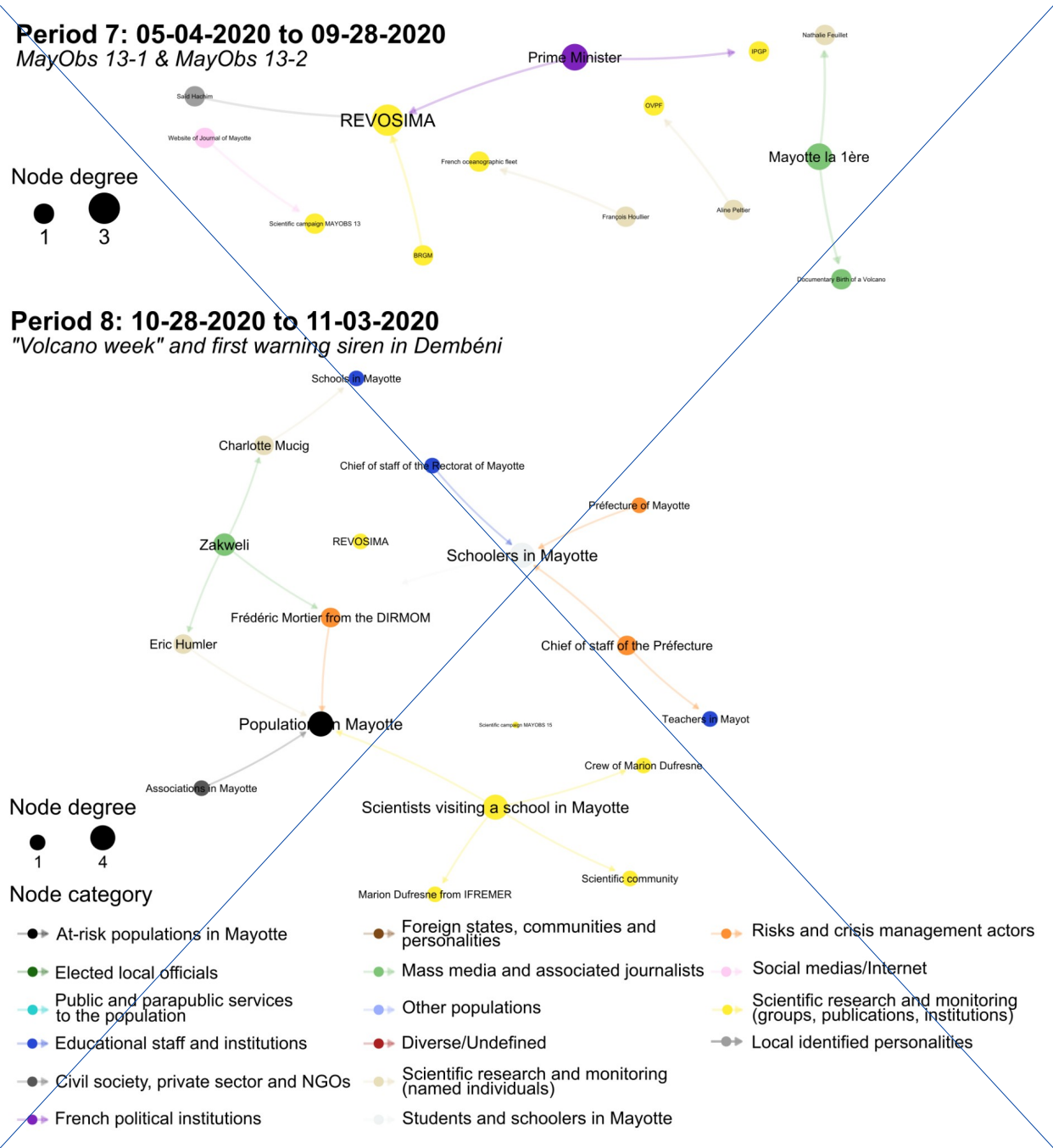
Period 7: 05-04-2020 to 09-28-2020
MayObs 13-1 & MayObs 13-2



Period 8: 10-28-2020 to 11-03-2020
"Volcano week" and first warning siren in Dembèni



FIGURE



2008; Aday, 2010). They influence people's perceptions of various actors involved in understanding, monitoring hazards, and managing their effects, as well as their performance during events (Harris et al., 2012). Despite ~~several limitations in our study, such as~~ the focus on newspaper representations rather than those among populations, and the use of articles from six non-specialist French-language newspapers, ~~this study~~ provides a comprehensive insight into media narratives during the seismic-volcanic "crisis" in Mayotte from ~~Mayspring~~ 2018 to ~~Mayspring~~ 2021. The inclusion of additional local, regional, and national daily papers in different languages and other media forms could ~~deepen~~ ~~enhance~~ the ~~analysis depth of the dataset~~. However, the chosen ~~selection of articles~~ ~~corpus~~, primarily ~~from the~~ non-specialist daily press, ~~(including Mayotte la lère, which displays a TV, radio, a written website, and produces content in both French and Shimaore thus widely followed by inhabitants in Mayotte)~~, remains a strong candidate for studying representations conveyed by the media as a whole (Cagé et al., 2017). ~~This is~~, especially ~~true given that this selection includes Mayotte la lère, an outlet that operates across multiple platforms (TV, radio, and a website) and produces content in both French and Shimaore, ensuring a wide local audience, and~~ considering the dynamics and complementarity ~~between~~ of quantitative and qualitative analyses facilitated by written press data.

When examining the results, it is crucial to acknowledge the influence of journalistic ~~practices~~ ~~writing~~. Newspapers, acting as mediators in the broadest sense, have their own practices and priorities in collecting and disseminating information. Daily newspaper journalists, ~~who are~~ often generalists with diverse profiles and working methods (Ruellan, 1992), are commonly bound by the ~~shared~~ constraint of tight deadlines. This limitation may affect their ability to access multiple sources or ~~to investigate~~ ~~delve deeply into~~ the context ~~in depth~~. Consequently, they tend to prioritise information that is deemed reliable, easily accessible, and of interest to their readership (van Belle, 2015). Geographic proximity to events influences coverage (e.g. Cavacas et al., 2016), with local journalists having easier access to the field and local actors. This is evident in the composition of the selected articles, with a predominant 78% (and 54% in *Journal de Mayotte* alone) being published in local newspapers. These local articles typically take the form of concise press releases offering updates on the latest developments. ~~In contrast~~ ~~Contrastingly~~, national newspapers, faced with the challenge of engaging a readership ~~approximately distant from about~~ 8,700 km ~~away~~ and not directly impacted by events, tend to favour less frequent but more extensive publications providing summaries or in-depth analyses (see section 4.1: an average of 20-31 actors are mentioned per article in national newspapers, compared to around ten in local newspapers). This also influences the selection of quoted sources, with local journalists relying more on local actors and national journalists adopting alternative strategies, ~~such as~~ ~~like~~ using social networks (e.g., ~~X~~ ~~here~~ ~~Twitter~~ and Facebook for ~~the~~ national dailies ~~like~~ *Le Figaro* and *Le Monde*) or relying on news agencies like AFP (~~Agence~~ France-~~Presse~~), ~~press~~ ~~Agency~~) or their local counterparts (Lecheler and Kruikemeier, 2016), ~~directly, or indirectly, via associated press (e.g. Reuters) who provide articles for international media based on local reporting.~~ This is illustrated here by *Le Figaro* and *Le Monde*, which ~~can~~ present a comprehensive view of the involved actors, albeit with less ease in reporting their statements. ~~Given their~~ ~~limited~~ time constraints, journalists typically favour sources they consider legitimate and relatively easy to access. ~~For instance, the municipality of Chirongui stands out, as the mayor at the time remained in office from 2008 to 2020, and her team appears to have been particularly active and well integrated into the local community. Also, it hosted the delegation of specialists in civil security and natural risks dispatched by two ministries (Ministry of Ecology and Ministry of the Interior) (Journal de Mayotte, the 6th of June 2018) and this event served as an entry point for the presentation of the group in the local press. Another example is the UDAF (Departmental Union of~~

Family Associations) which emerges as a key player in the actor citation chains within the selection of articles. This can be explained by the meeting they organised on the 5th of June 2018 to relay people's experiences and promote dialogue between local actors (among them, state institutions, public and para-public services, local elected representatives, etc.) regarding measures to be taken at the start of the seismic crisis (Le Monde, the 14th of June 2018; Journal de Mayotte, the 1st of June 2018), which was relayed by both local and national press. The choice of sources may vary based on editorial stance (Shoemaker and Reese, 1996; Kaiser & Kleinen-von Königslöw, 2019). -For example, in this context, local newspapers, which are seemingly inclined to emphasise the local context in comparison to national and regional newspapers, exhibit a lower rate of reported speech from French political institutions. As observed in ~~these our~~ findings and reinforced by Ploughman (1997), journalists tend to have more accessible and regular contact with certain types of sources, including public institutions, officials, or high-profile personalities, ~~whowhich~~ are ~~consequently~~ more ~~prominenteehood~~ in the news.

Having acknowledged the influence of journalistic ~~practices, this study shows~~~~writing, we show~~ that using this method to scrutinise press coverage also allows the identification of actor groups typically present in a crisis context related to a natural phenomenon (e.g. Fearnley et al., 2018; Trias et al., 2019; ~~Gonzalez, 2022~~), ~~using network analysis on disaster risk reduction ecosystem in the Asia Pacific region; Gonzalez, 2022, using assemblage theory and mapping relationships following the 1985 San Antonio Earthquake~~. First of all, the main trio in crisis management emerges as the most mentioned and quoted actors in this network: scientists overseeing monitoring, authorities responsible for civil protection, and at-risk populations (Fearnley et al., 2018; Devès et al., 2023). Other categories, such as mass media, social networks, civil society, public and para-public services, and even humanitarian aid associations (e.g. the Red Cross), are also well-represented. However, the latter are less prevalent than in other crises, likely due to ~~the limited physical impacts (e.g., minor buildingrelatively minimal material and human damage and few injuries)~~~~(only three lightly injured and cracked buildings in Mayotte)~~. Notably, international actors, including personalities, newspapers, communities, and states, are also present, which ~~suggests the importance of these external points of view as reported by other actors within the crisis narrative. This is alsois~~ highlighted in previous studies as indicative of a growing interconnection between actors in ~~the~~ disaster risk reduction context on an international scale (e.g. Trias et al., 2019). In the case of this very local, small-scale crisis, the mere presence of international reactions becomes an event worth reporting by others. The actors involved in crisis management, organised by the ~~Organisation de la Réponse de Sécurité Civile (ORSEC (Civil Security Response organisation))~~ in France, are also represented. ~~Under theAs a reminder, according to~~ ORSEC framework, mayors coordinate emergency services and public facility management (hospitals, schools, etc.) if the event is local. If ~~damage extendsdamages extend~~ department-wide and ~~surpassessurpass~~ the capacity of town halls, the ~~Prefectureprefecture~~ assumes control. Ultimately, the crisis is managed by the regional headquarters (EMZCOI for Mayotte), then by the French government if the lower levels are overwhelmed. However, here, despite the limited physical impact of this crisis, it ~~wasis~~ mainly the ~~Prefectureprefecture~~ and national civil protection services (under the responsibility of ministries) that ~~wereare~~ mentioned and whose speech ~~wasis~~ reported. Local elected representatives, including mayors, are surprisingly less present than other actors who theoretically play a lesser role (such as civil society, local personalities, and public and semi-public services, including education staff), while the regional headquarters is rarely mentioned. These asymmetries in representation partly reflect Mayotte's unique situation as a French overseas department, with part of its administration, including the regional headquarters, based more than 1,400 km away in Reunion Island. This region, while distant from

the mainland, poses specific challenges requiring a substantial response from the national authorities responsible for crisis management (Cottureau, 2021; Roinsard, 2022; Duchesne, 2023). Another specific feature also observed in several overseas departments is a lesser degree of cooperation between local elected representatives and national representatives located in these departments (Lemerrier et al., 2014; Gillet et al., 2023). ~~Additionally, our results highlight the emergence of different actors or groups of actors within the population, a facet not treated in the press as homogenous, as seen in official/legal texts. Particularly, several local personalities are identifiable, as observed in other cases (e.g. Devès et al., 2019).~~ Overall, we obtain an overview of the diverse actors involved in this crisis management and communication, aligning with findings from other studies using similar (e.g. Rajput et al., 2020) or different methodologies (e.g. Villodre and Criado, 2020; Calabro et al., 2020).

Additionally, the results underscore the emergence of various actors or groups of actors within the population, a facet that is not treated homogeneously in official or legal texts. In particular, several local figures can be identified, as has been noted in other case studies (e.g. Devès et al., 2019). The temporal evolution of the network yields several insights. The notably dense network observed during the first two weeks of the seismic crisis reflects both the unprecedented nature of the hazard and the initial difficulty faced by the media, and by many of the actors interviewed, in identifying reliable or authoritative sources. This is unsurprising, as the hazard had no precedent in living memory on the island (Cripps & Souffrin, 2020), and the only scientific institution present at the onset of the crisis was the BRGM. This highly disorganised yet progressively clarifying and structuring network appears to exemplify a form of crisis information-seeking behaviour, as observed in other contexts (e.g. Heverin & Zach, 2011; Krakowska, 2020), though here it occurs in a situation where authoritative sources were not yet clearly established. In the absence of recognised institutional referents, certain local personalities, such as Saïd Hachim, increasingly occupy central positions within the network. This is also consistent with a post-colonial context, in which there may be a degree of mistrust towards authorities, and where local actors are more readily cited by local media outlets. Even when the scientific community began organising in 2019 around the creation of REVOSIMA (Mayotte's Volcanological and Seismological Monitoring Network), scientific actors—although present—remained relatively marginal in terms of visibility, often appearing as isolated nodes within the communication network. REVOSIMA itself also remained largely peripheral in the network, even more than six months after its establishment. Time appears to have worked against the institution, with information sources and actor networks already well established, making it difficult for REVOSIMA to integrate effectively among them. Nevertheless, the local figure Saïd Hachim progressively introduced scientists from mainland France, as well as from REVOSIMA, into the media discourse while reporting their speeches and mentions maritime campaigns. However, he himself was rarely cited in return by these actors. His role thus aligns more closely with that of a mediator, facilitating the circulation of scientific information, rather than an alternative expert in direct opposition to institutional authorities, as it has been observed in other studies (e.g. Devès et al., 2021).

During the examination of who ~~is granted a voice in~~~~an express themselves through~~ media coverage, several key observations emerge. Firstly, primary sources of information (often introduced or relayed by other actors quoted in the article), do not necessarily align with journalists' sources. This discrepancy may arise due to limited access to a primary source, as elaborated earlier (~~either due to geographical distance, time constraints, etc.),~~~~et~~, or the preference for another source deemed ~~as~~ more legitimate, more accessible, or because of implicit or explicit issues of representation (see Carlson, 2009 and Grassau et al., ~~(2021), for an analysis of journalists' sources in an emergency situation~~). This opens a window into the ~~newspapers'~~~~newspaper's~~ networks, the hierarchy of ~~their~~~~its~~ trust, and the perceived legitimacy of

interviewed sources. As identified in a qualitative analysis (Devès, Moirand and Le Vagueresse, 2023), scientific actors notably dominate reported speeches, both from the article authors and third-party actors. Consequently, they are considered the most reliable or, at the very least, the most legitimate to express themselves, even surpassing the authorities responsible for crisis management and civil protection. While other studies have recognized scientists as "bridges" and "focal points" among various actors (Trias et al., 2019), the notable overrepresentation of scientific figures and institutions is noteworthy here. This could be attributed to journalists focusing on short-term issues like hazard descriptions, impacts, and emergency operations (Devès et al., 2019) or the complexities arising from scientific uncertainties requiring focused attention (Valencio and Valencio, 2018). Scientific actors, being perceived as those with the knowledge, are considered closest to understanding the phenomenon and thus are positioned to make recommendations (Oreskes, 2019). Apart from scientific personalities and institutions, the analysis indicates that media and institutional actors also benefit from greater media reach for their statements compared to actors from civil society. This proximity of journalists to institutions, as highlighted in other case studies (e.g. Ploughman, 1997; Wintterlin, 2020), and their reliance on the publications of their counterparts when direct sources are unavailable (Coddington –and Molyneux, 2023) are ~~common~~usual practices. On ~~the~~another other hand, social media sources have a higher share of exceed other mass media in reported speech than other mass media share, reflecting the increasing use of social media as information sources due to their detailed coverage of current events (e.g. Lindsay, 2011; Lecheler and Kruikeimer, 2016), potentially facilitating two-way communication between institutions and the public (Feldman et al., 2016; Kim and Hastak, 2018b). Two-way communication has the potential to facilitate cooperative decision-making (Renn, 2009), to draw upon local knowledge in order to improve understanding of field-level dynamics (Lindell et al., 2006), and, in turn, to strengthen public engagement and contribute to the development of trust (Leiss, 1996; Renn, 2009). However, Pourebrahim et al. (2019) argue that this potential is largely ~~underutilized~~underused, showing that X (formerly Twitter) is dominated by authorities primarily engaged in one-way communication rather than interacting with their audiences (see also Watters and Williams, 2011). A more focused analysis would be needed to explore this in the present case. Throughout the coverage, populations in Mayotte and, to a lesser extent, schoolchildren are frequently cited, but as discussed in ~~this~~our qualitative analysis, they are not often the origin of citations, indicating a relatively passive position within the citation network extracted from this dataset. Despite this, the population is central to the network and is cited by numerous actors. In the general imagination, its protection is the reason for the organisation of this network, but its opinion is seldom expressed, even in local media, which tend to apply pre-constructed news templates (Jemphrey and Berrington, 2000). This perpetuates an asymmetrical and hierarchical representation favouring those perceived to hold knowledge (scientists, institutions in charge of civil protection) at the expense of the inhabitants' perspective, who find themselves in the position of being subjected to the crisis~~undergoing~~ and being protected (Valencio and Valencio, 2018; Gonzalez et al., 2022). Journalists' common practices make it challenging for them to distance themselves from this representation (Cavaca et al., 2016). This result is explored and assessed for this case study by Devès et al. (2023), who also demonstrate that these representations are integrated by various actors in crisis management, particularly within at-risk populations.

That being said, it is worth underscoring that ~~named~~identified individuals hold a significant position in this network. Despite the context where crisis and risk management, as well as communication, are organised and framed by established institutions (ministries, prefectures, town halls, scientific institutions responsible for monitoring), individual

sources with clear identities tend to contribute more ~~to~~^{to} reported ~~speech~~^{speeches} compared to institutions. Specifically, named scientists take the lead over their institutions when ~~examining~~^{we examine} whose speeches these articles mostly report. Moreover, local personalities are mainly quoted when directly mentioned, while the reverse is true when they are indirectly mentioned. Even in the case of crisis managers, individuals such as the ~~Prefect, Cabinet Director, or ministerial~~^{prefect, cabinet director or ministries} envoys clearly stand out from their respective institutions within the network (see section 4.4.). Admittedly, these personalities are often associated with an institution. Oreskes (2019) highlights this aspect in her essay “Why trust science?”, using scientists as an example. She contends that trust in an individual is primarily conferred as a member of a professional community with a shared body of knowledge. Butts et al. (2007) also found that coordinating roles, which include information flow, are influenced by the formal institutional status or position within an organisation. ~~This~~^{Added to this} is ~~compounded by~~^{compounded by} the journalistic practice of conducting interviews, which involves collecting an institution’s stance through the discourse of one of its representatives. Individuals act as entry points to information for journalists, relaying the messages of their institutions, colleagues, or, in all cases, a community. Hence, they play the role of hubs, or "guardian nodes" as mentioned by Flecha et al. (2023). However, this interpretation needs qualification based on interviews with inhabitants, analysed in Devès et al. (2023). On one hand, these interviews highlight the importance, according to Mayotte's inhabitants, of embodying information or words with a name or a face. On the other hand, they reveal a significant distrust towards political and even scientific institutions. In this study, we observed that featuring the director of the local BRGM branch over the national director was prioritised, and even the ~~Prefect~~^{prefect} over representatives of the ministries, although the latter have visited the area. Also, the local geographer, Saïd Hachim, is given prominence over members of the scientific monitoring network, even in situations where they are present during campaigns at sea or interventions with schoolchildren. Similar observations were made in two other independent studies: ~~—~~[—](Cripps and Souffrin ~~(,2020),~~^{(,2020),} which emphasises a general distrust towards official discourse, and Bedessem et al. ~~(,2023),~~^{(,2023),} which found confidence in scientists without being able to determine if this extends to trust in their institutions.~~,~~[,] In such circumstances, one might question whether there exists a gap between the representation of journalists and that of local populations, accentuated by a journalistic bias towards institutions ~~that journalists identify~~^{identified} as reliable and easily accessible. ~~Regardless by journalists. In any case,~~^{Regardless by journalists. In any case,} there is a clear need for proximity ~~—~~[—]geographical, if not cultural ~~—~~[—]between sources, given the evident dominance of cited personalities when they are on-site. With regard to local personalities in particular, their emergence in press coverage occurs later than for others, perhaps attributable to a search for new sources to compensate for the perceived lack of information on the spot (Fallou et al., 2019). In any case, the over-representation of individuals compared to institutions raises questions and warrants further investigation.

This approach offers: i) an overview of the interrelationships between all actors involved in managing this crisis;[;] ii) highlights specificities linked to the context and media coverage; iii) reflects implicit representations and bonds of trust between actors;[;] and iv) visualises the network's dynamics over time and how it is disrupted and reorganised after the occurrence of new events. ~~It could be further refined to incorporate not only the quantitative frequency of actor citations, but also qualitative information indicating whether references in the press discourse are positive, negative, or neutral—thereby offering a more nuanced and precise understanding of their media representation. Furthermore, this approach also aligns with a—theoretical frameworks~~^{background} discussed in recent studies, ~~which have proven~~^{proving} relevant for studying risk and crisis management and governance, ~~such as :Post-ANT~~^{(Actor-Network Theory (ANT))} (e.g. Beck and

Kropp, 2011; Neisser et al., 2014; Bielenia-Grajewska, 2020) and Assemblage Theory (McGowran and Donovan, 2021). This study aligns with this theoretical background in several ways. First, it involves an empirical examination of interrelations and associations among actors operating in a simultaneously complex, uncertain, and ambiguous context. Our perspective on these actors is both relationalist and functionalist: it is the flow of discourse, itself structured by the roles these actors play in relation to one another, which creates and shapes this network. Moreover, these various actors are networks themselves, and they are considered~~we consider them~~ on an equal footing, including the media used to constitute the dataset. This analysis~~We also depictsmanage to depict~~ the dynamic nature of this network and how it can be affected by the emergence of new actors, relationships, arrangements, or any other disruptive element, including non-human factors (see section 4.4). Finally, this study illustrates and enhances our understanding of the patterns of ordering. Its originality lies in the fact that ~~we apply~~ this method is applied not only to study the network of actors in the context of crisis management or governance but also to explore the representation that certain actors (the media) have of information circulation in this crisis management context. The use of Actor-Network Theory (ANT) and Assemblage Theory is relevant in this approach, considering their application to discuss the role of mobilisation in communication (Bielenia-Grajewska, 2020) and the compatibility of ANT with media theory (Couldry, 2008, and Belliger and Krieger, 2015). Could be improved

6. Conclusion ~~and~~ perspectives

This study provides a~~proposes mapping of~~ citation and reference networks of actors identified in 6 daily newspapers as involved in the flow of information ~~circulation during a seismo-volcanic crisis management in~~ Mayotte island ~~from 2018 to 2021~~. In addition to providing an overview of the interrelationships between these actors, it offers a dynamic representation of how these networks evolve over time, including the emergence of key ~~referent sources around which the network gradually becomes structured, as well as~~ and how they can be disrupted and reorganised following ~~after the occurrence of new events~~. The method ~~It also reveals~~ allows us to identify the ~~standardecommon~~ organisation of crisis management as well as specific features~~some specificities~~ linked to the particular context of Mayotte or its portrayal~~treatment~~ in the media. This method also reveals implicit representations and trust bonds of trust among these actors and aligns with results from more detailed analyses. Key findings include an overrepresentation of scientific actors, both among actors cited in the articles and among actors introduced by a third party, which emphasises~~emphasise~~ the centrality of scientific discourse in a context where the manifestations of the hazard are mainly visible through their instruments. This finding~~It also~~ calls for further research to explain the feeling of an “information vacuum” highlighted by Fallou et al. (2019) among inhabitants, despite the abundant communication from scientists and authorities documented~~exposed~~ by Devès et al. (2022a) and their overrepresentation in the media~~mediate~~ discourse evidenced here. Another important result is the central representation of individuals over~~—beyond~~ institutions, which suggests varying trust placed in individual versus institutional discourse. The tension between national and local actors is evident, a pattern~~as~~ also observed in similar contexts in other overseas departments. From an operational point of view, these results provide key insights for identifying individuals~~keys to identify profiles that have proved decisive in~~ the flow of information. The fact that these networks are not always interconnected, especially around REVOSIMA (Mayotte volcanological and seismological monitoring network) which is sometimes completely isolated, also emphasises the need for diversified information channels to ensure~~make its circulation~~ more efficient information flow. -

Both

Here, we use this method to study both networks of actors in a crisis management context and media representations of the information flow are analysed in this study. However, this method can have numerous other applications, such as comparing representations between different groups of actors by applying it to several different text corpora (scientific or official press releases, media articles, experience reports, etc.) or studying the morphogenesis and the evolution of a specific actor, by focusing on a particular actor and/or a given period (for instance, to study the scientific collaboration as portrayed by operations from the point of view of the media). It is also a first step towards other explorations. For example, it could be refined to identify the actors cited in support of or in opposition to a given statement and study how these actors perceive each other. Ultimately, it could also generate datasets for artificial intelligence (AI) training to automate the mapping of actor networks' organisation and information flow according to a heterogeneous corpus of texts. Finally, this reproducible method can be used for other case studies around the world. It can also be analysed in other ways to study how scientific information flows from where it is produced to the media, to explore tensions between information and entertainment in media discourse, and to compare media coverage of the same events at different geographical scales (national, regional, local).

Author contributions

MHD and MLT conceptualized and were responsible for the conceptualization of the study and handled project administration. They also developed MHD and MLT provided a methodology for data collection. MHD conducted the keyword selection and analysis. LLV was responsible for data collection, storage and processing. MLT and LLV designed the method used for identifying and encoding actors' citation chains. MLT created identification and encoding. MLT was responsible for the figures and produced the scripts for the analysis. MLT, MHD and LLV conducted all analyses. LLV and MLT wrote the original draft of the manuscript, while MHD undertook the final revision and editing of the final paper. All authors discussed the results and contributed to the final manuscript.

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Data availability

Due to As we can not disseminate articles' content because of copyright restrictions, the full text of the articles used in this study cannot be publicly shared. However, an attribute table is made available online on the IPGP

~~Dataverse~~ **Dataverse platform** (<https://dataverse.ipgp.fr/privateurl.xhtml?token=7269cab5-784a-4e85-9653-64b2784f9f48>). This table provides links to the original articles' (<https://dataverse.ipgp.fr/privateurl.xhtml?token=7269cab5-784a-4e85-9653-64b2784f9f48>) with : 1) a link to articles' URLs on newspaper websites, and 2) key features such as newspaper name, publication date, authorship, readership, and title (see Supplementary Information available on the same IGP platform for further details). ~~Requests~~ **Feel free to contact the authors for further information or access to the complete whole database should be directed to the corresponding author. The analysis code used and all supplementary materials appendices are also accessible at the same Dataverse repository on the same dataverse platform and a valid DOI will be provided for the publication of this article.**

Competing interests

The authors declare that they have no conflict of interest.

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