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Portents of Power: Natural Disasters throughout Indonesian History

Wayan Jarrah Sastrawan

Abstract

The Indonesian archipelago plays a major role in the global history of natural disaster. Traditional sources can provide crucial insights into this history, but their full potential has yet to be realized. This paper investigates a diverse range of sources from Java and Bali, spanning the eighth to the twentieth centuries, to ascertain cultural attitudes to disasters, the impacts of disasters on society, and practices of recording disaster events. These sources include royal charters, historical chronicles, temple ruins, traditional paintings, and divination manuals. The paper finds that natural disasters were considered to be signs of power, broadly conceived to include political, spiritual, and natural power. Disasters were therefore closely associated with political change and divine activity. The impacts of disaster, while sometimes severe, were normalized in Indonesian society through practices of augury and tactics of resilience. The paper's culture-focused approach allows for more reliable interpretations of traditional records of specific disaster events, such as a major eruption of Bali's Agung volcano in 1710–11. It can therefore offer valuable insights into how natural disasters have shaped global history in the long term.

Keywords: disaster, Indonesia, power, volcano, earthquake, history

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Introduction

Natural disasters loom large in the history of Indonesia. The greatest global disasters of historical times originated in the archipelago: the 1257 Samalas eruption, the 1815 Tambora eruption, and the 2004 Indian Ocean tsunami. Recent advances in the scientific study of the region's tectonic past have raised new questions about how disasters interact with human history.¹ In addition to a scientific understanding of disasters, we want to know how people experienced them at different times and places in history.² This growing interest has led to renewed attention to the historical record for disaster in Indonesia. The long-term effects of natural disaster are reflected in a wide variety of textual and material sources from Java and Bali, from the eighth to the twentieth century. Of particular interest are the sources written in indigenous languages of the archipelago, which promise to shed light on disaster events that are not recorded European-language sources.³

Indonesian experiences of natural disaster were shaped by a pattern of cultural attitudes. Central among them was the belief that natural disasters were signs of the presence of power in the world. The physical force of natural disaster was intimately connected to other kinds of power, such as those of divine agency and of human politics. Since this power was a natural part of how the world operated, disaster events were considered a normal part of life, and they could be rendered intelligible through practices of augury and chronicle-writing. While the power of natural disasters could be destructive, they also provided opportunities for rebuilding and renewal. The available sources consistently reflect ambivalent attitudes toward the positive and negative social effects of disaster. These attitudes were expressed in a variety of ways in different eras of Indonesian history; for example, the adoption of Islam in early modern Java led to new understandings of the role of divine power in natural disasters. Nevertheless, there were significant continuities of thought and practice that informed Indonesian experiences of disaster over the long term.

This article examines an exceptionally broad range of historical sources that have rarely been tapped for information about natural disasters.⁴ These sources from Java and Bali, dating from the eighth century onward, include dynastic chronicles, copperplate inscriptions, divination manuals, classical paintings, and archaeological finds. Drawing on this diverse material, I extend and add nuance to existing analyses of traditional Indonesian ideas about power, such as those of Benedict Anderson and Soemarsaid Moertono.⁵ I follow

¹ Gillen D'Arcy Wood, *Tambora: The Eruption That Changed the World* (Princeton: Princeton University Press, 2014), 5.

² Such concerns are prominent in two important edited volumes on natural disaster history: Greg Bankoff and Joseph Christensen, eds., *Natural Hazards and Peoples in the Indian Ocean World* (New York: Palgrave Macmillan, 2016); Gerrit Jasper Schenk, ed., *Historical Disaster Experiences: Towards a Comparative and Transcultural History of Disasters Across Asia and Europe* (Cham: Springer, 2017).

³ Anthony Reid, "Historical Evidence for Major Tsunamis in the Java Subduction Zone" (Asia Research Institute Working Paper Series 178, Singapore, Asia Research Institute, 2012); Anthony Reid, "Two Hitherto Unknown Indonesian Tsunamis of the Seventeenth Century: Probabilities and Context," *Journal of Southeast Asian Studies* 47, no. 1 (2016): 88–108; Anthony Reid, "Recognising Global Interdependence Through Disasters," in *Crossing Borders*, edited by M. Miller, M. Douglass, and M. Garschagen (Singapore: Springer, 2018), 23–40.

⁴ I restrict my discussion to earthquakes and volcanic eruptions, since these are the types of disaster that appear most prominently in the indigenous historical record.

⁵ Soemarsaid Moertono, *State and Statecraft in Old Java: A Study of the Later Mataram Period, 16th to 19th Century*, Modern Indonesia Project Monograph Series (Ithaca: Cornell University Press, 1968); Benedict R.

several key conceptual threads that formed a coherent yet dynamic pattern of cultural attitudes towards natural disaster over the centuries. It is only by properly understanding these attitudes that we can accurately interpret traditional Indonesian sources. This article thus offers new ways of engaging with these challenging but rewarding Indonesian sources that can contribute significantly to a global history of natural disaster.

I consider three overarching themes: cultural attitudes toward natural disaster, the impact of disasters on premodern societies, and practices of recording specific disaster events. First, I examine the central assumption about natural disasters that can be traced in Javanese sources back to the fourteenth century: that disasters are signs of the presence of power and, therefore, that they have ambivalent effects on the world. This assumption is reflected in chronicles of political history as well as in traditions of disaster augury. Second, I argue that the Javanese and Balinese considered natural disasters and their impacts to be a normal part of life. The inscriptional and archaeological record of Central Java, when read in conjunction with stratigraphic data, shows a society that was able to manage the risks and harms of geophysical disaster. Finally, I discuss how to interpret the handful of Javanese and Balinese chronicles that give information about specific disaster events. The indigenous record can offer rich insights into the experience of natural disaster, as illustrated by a unique Balinese source on a little-known eruption of Mount Agung in 1710–11. But working with these indigenous sources can be challenging, because they often construe disaster in ways that are unfamiliar to the professional discipline of history. So before proceeding with an examination of these sources on natural disaster, I briefly consider the methodological issues that they pose.

The Challenges of Traditional Indonesian Sources

It can be difficult to work with traditional Javanese and Balinese sources on natural disasters. Most of the texts are written in literary Javanese and Balinese, languages that require specialist training for many present-day readers.⁶ The vast majority of them remain unpublished. Even among those Indonesian accounts of disaster that are readily available, it is extremely rare to find sources written before the twentieth century that are both rich in detail and were written soon after the events they describe. The extant primary sources of precolonial times rarely mention disaster events, and most of the surviving indigenous records of disaster were written decades or centuries after

O'G. Anderson, *Language and Power: Exploring Political Cultures in Indonesia* (Ithaca: Cornell University Press, 1990).

⁶ I draw on textual sources written in several literary languages: Old and Modern Javanese, Classical Malay, and Modern Balinese. I present these texts in transcription into Latin script, in line with the following conventions: for Old Javanese, the *DHARMA Transliteration Guide* (version 3); for Modern Javanese, the *Pedoman Umum Ejaan Bahasa Jawa Huruf Latin Yang Disempurnakan* (rev. ed.); for Classical Malay, the *Pedoman Umum Ejaan Bahasa Indonesia* (4th ed.); and for Modern Balinese, the *Pedoman Umum Ejaan Bahasa Bali*. In quotations of verse texts, single slashes indicate line breaks and double slashes indicate stanza breaks. I indicate the language of the quotation in square brackets, and all English translations of these quotations are my own. Dániel Balogh and Arlo Griffiths, "DHARMA Transliteration Guide," 2020, accessed April 7, 2021, <https://hal.archives-ouvertes.fr/halshs-02272407v3>; Tim Pengembang Pedoman Bahasa Indonesia, *Pedoman Umum Ejaan Bahasa Indonesia*, 4th ed. (Jakarta: Badan Pengembangan dan Pembinaan Bahasa, Kementerian Pendidikan dan Kebudayaan, 2016); Balai Bahasa Yogyakarta, *Pedoman Umum Ejaan Bahasa Jawa Huruf Latin Yang Disempurnakan* (Yogyakarta: Penerbit Kanisius, 2006); Ida Ayu Mirah Purwiati, Ni Putu Ekatini Negari, and I Wayan Sudiarta, *Pedoman Umum Ejaan Bahasa Bali Dengan Huruf Latin* (Denpasar: Balai Bahasa Provinsi Bali, 2013).

the events they describe. Such sources emerged out of complex textual traditions, which means they cannot be treated as firsthand reports on disaster events.⁷ Surviving Indonesian manuscripts are almost always the result of many rounds of recopying and recompilation, which must be taken into account when they are mined for historical information.

These sources are not mere repositories of chronological data that can be straightforwardly correlated with scientific findings. Rather, they express the culturally inflected experiences of Javanese and Balinese people as they coped with and responded to disaster. Anthony Reid has warned against simplistic approaches to disaster history that are “out of touch with new research in history, typically reliant on colonial-era compilations and on naively literal translations of texts.”⁸ By understanding Javanese and Balinese experiences of disaster on their own conceptual terms, we gain richer insights into the role of disaster in Indonesian history.

Traditional sources on natural disaster do not simply consist of a factual core wrapped in layers of cultural meaning. Rather, cultural assumptions are present even in the basic construal and description of disaster experiences in the sources. It is particularly crucial to be aware of this when applying professional historical methods to sources produced in premodern contexts. For a fourteenth-century Javanese chronicler, the 1334 eruption of Mount Kelud was both a real event that destroyed human life and also a sign of the future majesty of a newborn prince. The distinction between historical fact and mythological perception is one that is imposed by the historian’s analysis; it is absent in the sources as they were originally produced. It is therefore more fruitful to treat these sources as expressions of people’s attitudes toward and experiences of disaster, rather than trying to peel away mythological perceptions from a putative factual core.⁹ It is by properly understanding the cultural attitudes that shaped these sources that we can successfully use them as evidence for historical disaster events.

Disasters and the Presence of Power

Indonesian cultural attitudes toward natural disaster were complex, but a key theme can be discerned from sources that span many centuries. Indonesian people have long considered natural disasters to be signs of the presence of power in the world. Such power is not limited to physical forces of the earth, but also includes what we

⁷ This applies to such sources as the *Babad Lombok* and the *Babad Suwung*, which have been studied in connection to the 1257 Samalas eruption on Lombok. As argued by Mutaqin and Lavigne, the information given in these texts “is not completely original but derived from other sources that are lost.” These texts are the product of oral and written transmission, by which they “were compiled, rewritten, and restructured” over centuries. They therefore cannot be read as firsthand eyewitness accounts, but nevertheless, they are very useful as records of collective memories about the impacts of a major volcanic eruption. Bachtiar W. Mutaqin and Franck Lavigne, “Oldest Description of a Caldera-Forming Eruption in Southeast Asia Unveiled in Forgotten Written Sources,” *GeoJournal* 86, no. 2 (2019): 557–66.

⁸ Reid, “Two Hitherto Unknown Indonesian Tsunamis of the Seventeenth Century,” 89.

⁹ This interpretive issue is frequently addressed in the scholarship on traditional Indonesian sources. See, for example, Adrian Vickers, “Balinese Texts and Historiography,” *History and Theory* 29, no. 2 (1990): 158–78; Nancy Florida, *Writing the Past, Inscripting the Future: History as Prophecy in Colonial Java* (Durham: Duke University Press, 1995), 392–406; Henri Chambert-Loir, “The *Sulalat al-Salatin* as a Political Myth,” *Indonesia* 79 (2005): 131–60; Husni Abu Bakar, “Playing Along the Perak River: Readings of an Eighteenth-Century Malay State,” *Southeast Asian Studies* 4, no. 1 (2015): 157–90.

could consider political power and spiritual power. The Javanese and Balinese drew connections between disasters, political change, and divine activity because they were all manifestations of the same underlying power. The eighteenth-century Javanese poem “Wiwaha Jarwa,” itself a rewriting of the eleventh-century “Arjunavivāha,” describes this as “the power of the heart that blazes in the world.”¹⁰ This idea of power is found in several different periods of history, though it changed dynamically to suit a variety of cultural and religious contexts. The Javanese theorizations of power studied by Benedict Anderson, largely on the basis of sources written after 1800, may therefore represent relatively recent expressions of much older attitudes.

In Javanese historical narratives, the rise of a powerful new leader was associated with a variety of natural phenomena, such as earthquakes, eruptions, and major weather events. These phenomena did not reflect negatively on this leader’s influence, and they were not necessarily considered bad omens. Rather, they signified that power was shifting away from an old order that had lost its luster toward a new focal point. For example, the chronicle *Deśavarṇana* (completed in 1365) describes the birth of the king Hayam Wuruk:

It is said that, at his birth in Śaka seasons–arrows–sun [1256],¹¹ the king was already confirmed as the sovereign.

As a child prince, he was the lord at Kahuripan; the portents that he is a prodigious person were

Rumbling earthquakes, ash rain, thunder and lightning twisting in the sky.

Mount Kampud erupted.¹² The criminals and traitors wailed, choking to death.¹³

The disasters are signs that the king is a “prodigious person.” The notion of a prodigy (*adbhuta*), which also connotes an “omen in nature,”¹⁴ includes what we would consider positive and negative aspects. In Old Javanese literature, *adbhuta* can mean “wonderful” and “marvelous,” but also “terrifying” and “monstrous.”¹⁵ The harmful effects of disaster

¹⁰ *sektining tyas prabawaning rat* (canto 27, stanza 19) [Modern Javanese]. Bernard Arps, “The Power of the Heart That Blazes in the World: An Islamic Theory of Religions in Early Modern Java,” *Indonesia and the Malay World* 47, no. 139 (2019): 325.

¹¹ There is a seventy-eight-year difference between the Śaka Era and the Common Era, but since the lunisolar Śaka calendar begins around the March equinox, there is a further two-and-a-half-month lag between the two. In this example, the Saka year 1256 ran from March 1334 to March 1335 CE. In this article, Western dates before 1582 CE are given as Julian dates, and those after 1582 CE are given as Gregorian dates.

¹² Kampud is most likely an archaic name for the present-day Kelud, a very active volcano in East Java. This hypothesis was first proposed in 1919 by van Stein Callenfels, based on references to Kampud in the fifteenth-century prose text *Tantu Panggelaran*. Further toponymic information from the Old Sundanese *Bujangga Manik*, which also dates from the fifteenth century, confirms the identification of Kampud with today’s Kelud. *Oudheidkundige Dienst in Nederlandsch-Indië: Oudheidkundig Verslag 1919* (Weltevreden: Albrecht & Co., 1919), 11–2; J. Noorduyn, “Bujangga Manik’s Journey through Java: Topographical Data from an Old Sundanese Source,” *Bijdragen tot de Taal-, Land- en Volkenkunde* 138, no. 4 (1982): 430–1.

¹³ *riñ śāka ṛtu śarena rakva ri vijil nṛpati tālas inastvakan prabhū / an garbheśvara nātha riñ kahuripan vihaganiran amānuṣādbhuta / liṅḍuñ bhūmi kətuḡ hudan havu gərəh kilat avilətan in nabhastala / guntur tañ himavān ri kāmpud ananāñ kujana kuhaka māti tan paḡap* (canto 1, stanza 4) [Old Javanese]. Th. G. Th. Pigeaud, *Java in the Fourteenth Century: A Study in Cultural History* (The Hague: Martinus Nijhoff, 1960), 1:3.

¹⁴ David Pingree, *Jyotiḥśāstra: Astral and Mathematical Literature, A History of Indian Literature*, vol. 7, fasc. 4 (Wiesbaden: Otto Harrassowitz, 1981), 67.

¹⁵ P. J. Zoetmulder, *Old Javanese-English Dictionary* (s-Gravenhage: M. Nijhoff, 1982), s.v. “adbhuta.”

are emphasized in this passage, but it is notable that the victims here are not innocent bystanders but “criminals and traitors.” This is in keeping with the chronicler’s depiction of Hayam Wuruk as imposing discipline on the kingdom: “every single evildoer ceased to be foolish, utterly afraid of the king’s valor.”¹⁶ The king’s power thus expresses itself in the natural disasters that accompanied his prodigious birth.

The association of royal power with natural disaster in Java continued well into the Islamic period. A version of the Javanese dynastic genealogy *Babad Tanah Jawi*, compiled in Surakarta in 1836 out of older materials, describes the natural disasters that accompanied the military victory of Senapati, who became a powerful king in Mataram in the late sixteenth century:

Then the wind rustled
 And lighting shot through the sky
 Trees snapped and collapsed
 As the storm cut them down
 Then came the thundering rain mixed with wind
 A sign that *jinn*s had come
 Immediately there were shrieks in the air
 It sounded like the sky was being torn apart
 Like the whole mountain was erupting
 Everything roared loudly
 The depths of Mount Merapi
 Echoed and cracked
 The crater thundered
 Ash rain fell
 Boulders and pebbles rolled down
 Volcanic mudslides flowed
 It is said there were many huge rocks
 With volcanic mud in the river Opak
 Flowing down.¹⁷

¹⁶ *hantyan durjana mary ābuddhi kala kevala matakut i vīrya sañ prabhu* (canto 1, stanza 5) [Old Javanese]. Pigeaud, *Java in the Fourteenth Century*, 1:4.

¹⁷ *nulya umyus mesat ing langit / bayu-bajra narajang / sempal kayu erug / pracandhanya amarapal / prapta udan kumerug awor lan angin / pratandha yèn jin prapta // tan antara surak anèng langit / gurnitanya kadi langit rebah / kadya gunung guntur kabèh / prakatha padha umung / antaraning wukir marapi / nauri nulya bengkah / kawah gumaludhug / udan awu ingkang prapta / gumalundhung watu wadhas [padhas] lan karikil / longsor ladhu lumampah // watu ageng kathah kang winarni / sareng ladhu anèng kali umpak / angili ngisor parané* (canto 39, stanzas 25–27) [Modern Javanese]. *Babad Tanah Djawi* (Batavia: Balai Pustaka, 1939–1941), 5:68–69, accessed April 7, 2021, <https://www.sastra.org/kisah-cerita-dan-kronikal/babad-tanah-jawi/1014-babad-tanah-jawi-balai-pustaka-1938-41-1024-jilid-05>.

Here too the disaster is seen as a sign (*pratandha*) of the presence of power. But there are important differences in the ways that these two sources depict power. Whereas the *Deśavarṇana* attributes divine power to the king's own person, the *Babad Tanah Jawi* externalizes that power to the *jinn*s. This is related to the fact that the *Deśavarṇana* was written by a Buddhist scholar, while the *Babad Tanah Jawi* was the product of an Islamic royal court. In the religious environment of fourteenth-century Java, it was acceptable to attribute aspects of divine power (*śakti*) to living humans like the monarch. For instance, the *Deśavarṇana* speaks of a previous Javanese king's conquest of territory in Sumatra as being "the result of his being a divine incarnation."¹⁸

Once Islam became the dominant religion in Java in the sixteenth century, it was more problematic to directly associate humans with divine power. The Islamic doctrine of God's transcendence, and the absolute distinction between Creator and Creation, is emphasized in a Javanese treatise of the late sixteenth century, *The Admonitions of Seh Bari*: "The attributes of the Lord are not like the attributes of created beings, and the attributes of created beings are not like the attributes of the Lord."¹⁹ The notion of a king being a "divine incarnation" (*devamūrti*) would have been heretical to the orthodox author of *The Admonitions*. But Javanese Islam has always been diverse, and it could accommodate different ways of construing the association between human politics and divine power. The notion of natural disaster as a sign of the presence of power in the world is a consistent thread running through the pre-Islamic and Islamic periods of Javanese history. Despite the five-hundred-year gap between them, both the *Deśavarṇana* and the *Babad Tanah Jawi* depict natural disasters and political change as interconnected consequences of the presence of power in the world.

The theme of political change has been studied closely by scholars of Javanese cultural history. Benedict Anderson argued that the Javanese conceived of power as a fluid entity, capable of concentration and dissipation.²⁰ Soemarsaid Moertono elucidated the term *wahyu* ("the substance of great power"), which was visualized in Javanese texts as a streaking light in the sky that marked an individual's destiny to become a powerful ruler.²¹ The downfall of an old king meant the transfer of power to a new challenger, and therefore, it was accompanied by disasters signifying that change.²² For instance, an eruption of Kelud in 1811 was seen by Javanese people as presaging the British invasion of Java. Similarly, a series of eruptions and earthquakes of Merapi in the years 1822–25 were interpreted as a portent of brewing unrest that eventually led to the Java War (1825–30).²³ The 1901 eruption of Kelud was later interpreted as a portent of the greatness of Indonesia's first president

¹⁸ *sangka ri kadevamūrtinira* (canto 41, stanza 5) [Old Javanese]. Pigeaud, *Java in the Fourteenth Century*, I: 31.

¹⁹ *tegesé sifat ing pangèran tan kadi sifat ing makluk, sifat ing makluk tan kadi sifat ing pangèran* [Early Modern Javanese]. G. W. J. Drewes, *The Admonitions of Seh Bari: A 16th-Century Javanese Muslim Text Attributed to the Saint of Bonang*, *Bibliotheca Indonesica* 4 (Leiden: KITLV Press, 1969), 46.

²⁰ Anderson, *Language and Power*, 19–23.

²¹ Moertono, *State and Statecraft in Old Java: A Study of the Later Mataram Period, 16th to 19th Century*, *Modern Indonesia Project Monograph Series* (Ithaca: Cornell University Press, 1968), 56.

²² Moertono, *State and Statecraft in Old Java*, 74.

²³ Peter Carey, *The Power of Prophecy: Prince Dipanegara and the End of the Old Order in Java, 1755–1855*, *Verhandelingen van het Koninklijk Instituut voor Taal-, Land- en Volkenkunde* 249 (Leiden: KITLV Press, 2007), 515.

Sukarno, who was born in the same year.²⁴ In all of these Javanese texts and traditions, disaster indicated the arrival of a new power, in tandem with the dissipation of an old one. This connection between natural disaster and political change existed because both were consequences of the presence of power itself, blazing in the world.

The Ambivalence of Disaster Augury

This cultural attitude is also reflected in Javanese and Balinese practices of augury; that is, the interpretation of natural phenomena as signs to predict the future. The basis of disaster augury is the assumption that disasters indicate the presence of power and that power brings about certain characteristic outcomes. Hints of this practice appear in the description of Hayam Wuruk's birth discussed above, in the use of the term "portent" (*vihaga*). This Sanskrit loanword has the literal meaning of "sky-goer," i.e., "bird." The link between birds and augury is known in many cultures, including Indian traditions in which the term *śakuna*, "bird," similarly refers to omens in nature.²⁵ The chronicler's use of augury terms like "prodigy" (*adbhuta*) and "portent" (*vihaga*) suggests that the idea of natural disasters as portents may have been familiar to fourteenth-century readers.²⁶

Disaster augury in Java and Bali generally involves earthquakes rather than volcanic eruptions. This preference may reflect the influence of Indian disaster augury, which only concerns earthquakes since there are no active volcanoes on the subcontinent. Between the eleventh and fifteenth centuries, Javanese inscriptions use the term "circle" (*maṇḍala*) to refer to the cardinal directions and their presiding deities.²⁷ The term *maṇḍala* is associated with earthquake augury in the Sanskrit divination treatises *Gargasamhitā* and *Bṛhatsamhitā*.²⁸ It is therefore quite possible that these or similar texts were known in Java at an early time.²⁹ Tenth-century Javanese texts like the *Brahmāṇḍapurāṇa* and *Agastyaparva* reveal a general familiarity with Indic traditions of divination and astrology, though they do not explicitly mention earthquake augury.³⁰ Later Balinese divinatory tradition traces its origins, via Java, to the legendary Indian sage Garga.³¹ This circumstantial evidence

²⁴ Bob Hering, "Soekarno: The Man and the Myth: Looking through a Glass Darkly," *Modern Asian Studies* 26 (1993): 496.

²⁵ Pingree, *Jyotiḥśāstra*, 67–80.

²⁶ To my knowledge, the implications of this passage for early Javanese augury practices has not yet been explored by scholars.

²⁷ J. G. de Casparis, *Indonesian Chronology*, Handbuch der Orientalistik 1 (Leiden: E. J. Brill, 1978), 21.

²⁸ Amrit Gomperts, "Sanskrit Jyotiṣa Terms and Indian Astronomy in Old Javanese Inscriptions," in *Fruits of Inspiration: Studies in Honour of Prof. J. G. de Casparis, Retired Professor of the Early History and Archeology of South and Southeast Asia at the University of Leiden, the Netherlands, on the Occasion of His 85th Birthday*, ed. M. J. Klokke and K. R. van Kooij, Gonda Indological Studies 11 (Groningen: Egbert Forsten, 2001), 105–7; Audrius Beinorius, "Tracing the Will of the Stars: Indian Astrology and Divination About Natural Disasters and Threats," in *Historical Disaster Experiences: Towards a Comparative and Transcultural History of Disasters across Asia and Europe*, ed. Gerrit Jasper Schenk (Cham: Springer, 2017), 226–28.

²⁹ Gomperts, "Indian Astronomy in Old Javanese Inscriptions," 119–21.

³⁰ Jan Gonda, ed., *Het Oud-Javaansche Brahmāṇḍa-Purāṇa: proza-tekst en kakawin*, Bibliotheca Javanica 5 (Bandoeng: Nix & Co., 1933), 167–80; J. Gonda, "Agastyaparwa: Een Oud-Javaansch Proza-Geschrift," *Bijdragen tot de Taal-, Land- en Volkenkunde van Nederlandsch Indië* 90 (1933): 349–51.

³¹ Peter Wilhelm Pink, *Wariga: Beiträge zur Balinesischen Divinationsliteratur*, Veröffentlichungen des Seminars für Indonesische und Südseesprachen der Universität Hamburg 13 (Berlin: Dietrich Reimer Verlag, 1993), 422, 453.

raises the possibility that earthquake augury, as prescribed in the Sanskrit treatises, may once have been practiced in pre-Islamic Java.

When we move into the early modern period, there is more extensive evidence for the practice of earthquake augury. Methods for interpreting earthquakes are explained in handbooks called *palinḍon* in Javanese and Balinese, and *takbir gempa* in Malay, which work by correlating the timing of earthquakes to a particular calendar cycle. The outcomes predicted by this system of augury are not the direct consequences of the disaster. Rather, the timing of disasters allows for the prediction of future outcomes, both positive and negative. While disasters could cause severe harm to life and property, they could equally presage good outcomes: the birth of a just king or a prosperous harvest season. For example, a Malay *takbir* text copied in 1833 in Tegal, North Java, explains:

And again, if there is an earthquake in the year Zāi and the month Ramadan, so it is a sign that prosperity will be easy and there will be happiness in that year. And again, if there is an earthquake in the year Zāi and the month Syawal, so it is a sign that there will be hard strife, and disease will be severe, and there will be powerful demons in that year.³²

Early nineteenth-century Javanese *palinḍon* texts from Yogyakarta and the Merapi-Merbabu mountains present a similar system, with an added distinction between day and night:

If there is an earthquake in the month Rabī' al-'Ākhir in the day, it is a sign that many people will die in the state; if in the night, it is a sign that much water will emerge.³³

Balinese *palinḍon* texts give interpretations for earthquakes that occur on particular weekdays. For example, a divination handbook in verse (*wariga matembang*) copied in 1940 gives:

If there is an earthquake on a Saturday, much disease and death will come, the world will be in dearth, it will [be] hard to combat sickness.³⁴

Earthquake augury is also represented in Balinese paintings, as an illustrated grid corresponding to the months in which earthquakes occur. These paintings associate each of the twelve Indic months with a particular god and give a brief description of

³² *dan lagi jika lindu pada tahun zāi dan bulan ramadan, maka adalah alamatnya itu rezeki murah dan lagi sukacita adanya dalam tahun itu adanya; dan lagi jika lindu pada tahun zāi dan bulan syawal, maka adalah akan alamatnya itu fitnah akan keras dan penyakit akan sangat dan syaitan terlalu keras adanya dalam tahun itu* [Classical Malay]. Surianiah binti Pakih, "Manuskrip 'Ta'bir Mimpi': Analisis Dan Transliterasi Teks" (Kuala Lumpur, Universiti Malaya, 1993), 75.

³³ *lamun lindhu ing wulan rabengulakir ing rahina lamat akèh wong mati ing negara iku; lamun lindhu ing wengi lamat [pa]da metu banyuné* [Modern Javanese]. This wording is found in the manuscript L 328 (Box 29) from the Merapi-Merbabu region, held in the National Library of Indonesia. I have standardized its distinctive spelling. Ghis Nggar Dwiadmojo, "Koneksi Pusat Dan Pinggiran: Perbandingan Teks Primbon Palinḍon Kraton Yogyakarta dan Palilinḍon Merapi-Merbabu," *Jumantara: Jurnal Manuskrip Nusantara* 11, no. 1 (2020): 28.

³⁴ *lamun linuh ring sori, sasab mrana akèh rauh, jagaté kamranan, éweh ngarepin panyakit* (f. 19r) [Modern Balinese]. *Wariga Matembang* (manuscript), copied by I Ketut Warta of Toya Mumbul, January 8, 1940, accessed March 15, 2021, <https://palmleaf.org/wiki/gaguritan-wariga-02>.

the event that are augured by an earthquake in that month. The ceiling of the Kṛta Ghoṣa pavilion in Klungkung, painted in the mid-twentieth century by the artist Pan Seken and his assistants, contains a *palinḍon* illustration with text corresponding to each month (Figure 1). For example, an earthquake in the second month is associated with the goddess Gaṅgā:



Figure 1a and 1b: Two panels from the ceiling of the Kṛta Ghoṣa depicting the prosperity (panel a) that is presaged by the occurrence of an earthquake in the second month, due to the yogic practice of the goddess Gaṅgā (panel b) (photographs courtesy of Adrian Vickers).

The second month, *bhaṭārī Gaṅgā* is practising yoga, the world is well, all outcomes are achieved, everything is cheap.³⁵

Adrian Vickers described the illustration accompanying this month's entry:

The fruit-picking continues, accompanied by scenes of flirtatious dancing and a prince blessing one of his followers. . . . In the second month there is abundance, a surplus to be used for the god's and the *raja's* public storehouse, the *gobarāja*. The close relationship between the rice farming of the Sudra [commoners] and the wealth of the *raja* is present in the juxtaposition of the image of a prince with farmers planting and tilling the soil.³⁶

These examples show that, despite differences in language and religious context, the practice of earthquake augury in Java and Bali shared many commonalities. All of these augury systems are based on a twelve-month calendar of either Indic or Islamic origin, though they sometimes make extra specifications of the year, day, or time of day. They predict similar kinds of outcomes, such as political strife, drought, famine, and disease. It is risky to extrapolate back in time from these nineteenth- and twentieth-century materials. Without explicit sources from earlier periods, we cannot determine to what extent the specifics of augury practices may have changed and developed over the centuries. However, the commonalities among these texts make it at least plausible that earthquake augury has old roots in Indonesia, potentially going back to pre-Islamic Java.

Augury practices highlight some important features of Indonesian experiences of earthquakes. They were ambivalent phenomena, presaging both positive and negative outcomes depending on their timing. An earthquake in itself was not considered to be the ultimate cause of each month's outcomes. The Balinese tradition makes it clear that the earthquakes merely indicate the presence of divine agency, which is attributed to specific deities by means of the calendar cycle. This divine power was the ultimate cause of the positive and negative impacts that are summarized in the augury systems. As Vickers argued, "[e]vents, good and bad, are indirect manifestations of divine power working in the world, and are not related to intentions."³⁷ By treating disasters not as freak events that occurred at random, but rather as interpretable signs of power whose effects were predictable, the Javanese and Balinese may have been attempting to normalize the impacts of those disasters.

The Impacts of Disaster in Early Java

I now turn to a consideration of the impacts of natural disaster on premodern society in Java. Modern historians have tended to emphasize, and occasionally to overstate, the damaging impacts on society that such disasters caused. Though they took disasters seriously, the Javanese traditionally viewed these events as a normal part of life rather than as exceptional calamities. As Greg Bankoff observed in the Philippines, the

³⁵ *śāsīh ka 2, bhaṭārī Gaṅgā sira mayoga, rahayunya ikañ rat, sarwa phala dadi, sarwa murah* [Old Javanese]. This text appears directly to the left of the figure of *Gaṅgā* in Figure 1b. Adrian Vickers, "Kṛta Ghoṣa, the Ordered Realm: A Study in Balinese Narrative Art" (Bachelor of Arts Honours thesis, University of Sydney, 1979), 179n25.

³⁶ Vickers, "Kṛta Ghoṣa, the Ordered Realm," 169.

³⁷ Adrian Vickers, *Balinese Art: Paintings and Drawings of Bali, 1800–2010* (Tokyo: Tuttle Publishing, 2012), 65.

frequency of natural disasters has seen them “integrated into the schema of daily life to form what can be called *cultures of disaster*.”³⁸ While it is undeniable that disasters could cause great harm, early Javanese society appears to have been resilient to their effects, rather than being profoundly destabilized by them. Inscriptions and archaeological traces between the tenth and fifteenth centuries provide evidence of the damage caused to property, as well as successful efforts to rebuild and recover from them.

The early Javanese state sought to protect the property rights of individuals and families in the event of disaster. An inscription issued in 907 commanded the village of Rukam to do service for a religious foundation, “because the *sīma* of *rakryān* Sañjīvana, the king’s grandmother, was lost in an eruption.”³⁹ The term *sīma* refers to a piece of land whose fiscal revenues and labor obligations are diverted to a particular beneficiary. The destruction of that productive land in the eruption had resulted in a loss of income and labor for Sañjīvana. As compensation for this, the inscription authorized her to claim the village of Rukam and its labor as a benefice. The recently discovered Warunggahan inscription (issued in 1305) describes the loss of a land title document in an earthquake:

That was the charter lost at the time of the earthquake, which was the reason that the offspring of *pāduka mpuñku Śrī Buddhaketu* were sorrowful and did not know what to do. For the benefits of the *sīma* were not secure in the option of the offspring of *pāduka mpuñku*, accompanied by their relatives, due to the lack of a charter.⁴⁰

To protect the entitlements of Buddhaketu’s heirs, the king issued the Warunggahan charter as a replacement for the one that had been lost in the earthquake. This decision shows that the Javanese legal system was able to mitigate the disruption to property rights caused by disasters.

Pragmatic responses to the impact of disaster are also apparent in the archaeological record. Temple sites affected by disasters exhibit signs of rebuilding and repair, which suggests that their destructive effects could be mitigated. Several shrines (*candi*) in Central Java were covered by volcanic material after their construction.⁴¹ The volcanic deposits that engulfed *candi* Sambisari and *candi* Kedulan are considerably younger (circa thirteenth century) than the estimated period of the shrines’ construction (circa ninth century).⁴² The absence of volcanic deposits in the intervening four-hundred-year period suggests an ongoing occupation and maintenance of these temple sites, including

³⁸ Greg Bankoff, *Cultures of Disaster: Society and Natural Disaster in the Philippines* (London: RoutledgeCurzon, 2003), 4.

³⁹ *sañka yan hilañ deniñ (g)untur sīmān rakryān sañjīvana nini haji* (1r.2) [Old Javanese]. The text is a normalized transcription of a reading by Arlo Griffiths and me, to be published as part of a digital corpus of Javanese epigraphy supported by the DHARMA project.

⁴⁰ *ika tañ praśasti hilañ ri kālaniñ bhūmikampa, nimittani oka pāduka mpuñku śrī buddhaketu, an śoka tañ vrin gatya apan tañ apagəh ri kabhuktyaniñ sīma ri hiḍəpni oka pāduka mpuñku śrī buddhaketu, iniriñ de sama sənak ri tan hananiñ praśasti* (6v1–3) [Old Javanese]. I have normalized the text prepared by Arlo Griffiths, “Prasasti Warunggahan: Sebuah Data Baru Dari Masa Awal Majapahit,” *Amerta: Jurnal Penelitian and Pengembangan Arkeologi* 36, no. 1 (2018): 25.

⁴¹ Indung Putra et al., “Candi Kimpulan (Central Java, Indonesia) Architecture and Consecration Rituals of a 9th-Century Hindu temple,” *Bulletin de l’École française d’Extrême-Orient* 105 (2019): 94.

⁴² C. G. Newhall et al., “10,000 Years of Explosive Eruptions of Merapi Volcano, Central Java: Archaeological and Modern Implications,” *Journal of Volcanology and Geothermal Research* 100, no. 1–4 (2000): 45.

the cleaning out of fallen ash, until the thirteenth century. Rather than immediately abandoning temple sites that were affected by volcanic eruptions, the Javanese seem to have gone to considerable lengths to remove volcanic material.

Candi Liyangan, a temple site on the northeastern slope of the Sindoro volcano, exhibits evidence of rebuilding after structural damage. This site was discovered in 2008 buried under several meters of volcanic deposits. The presence of burned organic materials strongly suggests a major pyroclastic flow that buried the entire temple.⁴³ But beneath this layer, the retaining wall on the southern part of the site exhibits a heterogeneous arrangement of stones, as well as reuse of several stone blocks. This appearance contrasts with the polished construction of the other retaining walls, which raises the possibility “that the site was partially destroyed—due to a *lahar* or a landslide—while it was still in use and that it was repaired with the means available.”⁴⁴ These early efforts at rebuilding may have been thwarted by the major pyroclastic events that ultimately buried the site, though a full account of the site’s history must await a proper stratigraphic analysis.

I have emphasized here the capacity of early Javanese society to respond pragmatically to the impacts of natural disaster. This historical trend accords well with Michael Dove’s observations of present-day communities living on the slopes of Javanese volcanoes, who see eruptions as “routinized catalysts for productive change,” thereby “naturalizing, familiarizing, and ‘domesticating’ the threat from the volcano.”⁴⁵ I am not seeking to downplay the great harm that earthquakes and volcanic eruptions could cause, but I am suggesting that they did not necessarily cause a fundamental destabilization of Javanese state and society.⁴⁶ Through the repair and rebuilding of damaged sites, and through compensation for lost property, the Javanese were able to recover from the effects of natural disaster. The epigraphical and archaeological evidence suggests that it is more accurate to view earthquakes and eruptions as a significant but managed risk in Javanese society, rather than a cause of unmitigated destruction.

Merapi and the Shift of the Royal Center

By recognizing the true extent of the impact of natural disasters, we can gain a better understanding of how they have shaped the course of Indonesian history. One of the perennial problems in early Javanese history is the shift of the center of royal government in the 920s. From the early eighth to the early tenth century, the epigraphic and architectural record shows that the Javanese state was based in Central Java. But from the late 920s onward, royal inscriptions indicate that the center of government had moved to East Java, where it remained for several centuries thereafter. Charters issued

⁴³ Véronique Degroot, “The Liangan Temple Site in Central Java,” *Archipel* 94 (2017): 199.

⁴⁴ Degroot, “Liangan Temple,” 201.

⁴⁵ Michael R. Dove, “Perception of Volcanic Eruption as Agent of Change on Merapi Volcano, Central Java,” *Journal of Volcanology and Geothermal Research* 172 (2008): 330.

⁴⁶ For a less sanguine assessment of early Javanese resilience in the face of natural disaster, see Jan Wisseman Christie, “Under the Volcano: Stabilizing the Early Javanese State in an Unstable Environment,” in *Environment, Trade and Society in Southeast Asia: A Longue Durée Perspective*, ed. David Henley and Henk Schulte Nordholt, *Verhandeling van het Koninklijk Instituut voor Taal-, Land- en Volkenkunde* 300 (Leiden: KITLV Press, 2015), 46–61.

by King Siṅḍok, who took the throne sometime between August 928 and July 929, show him occupying a number of royal palaces in the vicinity of present-day Jombang.⁴⁷

It has long been theorized that the shift of royal government was caused by a rapid evacuation of Central Java due to a powerful volcanic eruption. J. W. IJzerman was the first to suggest that some form of natural disaster caused a mass flight of the population from Central to East Java.⁴⁸ The eruption theory was further developed in the early twentieth century, culminating in the claim by R. W. van Bemmelen that an eruption of Merapi “depopulated and desorganized [*sic*] the prosperous Hindu State of Central Java, converting the surrounding fertile fields into barren ash-covered deserts.”⁴⁹ The most influential proponent of this theory among historians of Indonesia was Boechari, who proposed that a catastrophic eruption of a Central Javanese volcano (presumed to be Merapi) around 925 forced the Javanese state to relocate to East Java.⁵⁰ More recently, Jan Wisseman Christie drew on studies of pyroclastic deposits at Merapi, as well as her own archaeological and epigraphical research, in support of this hypothesis.⁵¹

Despite these efforts, the eruption theory for the shift of government is not conclusive. This is because of two problems with the evidence: first, the radiocarbon age estimates for volcanic deposits are not precise enough to confirm a direct correlation with the shift of government in the late 920s, and second, no epigraphic source explicitly mentions eruptions as the cause of the shifting royal center.⁵² Stratigraphic analysis has revealed the ongoing nature of Merapi’s eruptions in the late first millennium, showing “evidence that Merapi eruptions have affected temples of the area . . . though not necessarily during a single large eruption” and that “explosive eruptions of widespread impact occurred before, during and after the period of temple construction.”⁵³ More recent research has confirmed that “the eruptive activity of Merapi over the past 2,000 years has been almost continuous.”⁵⁴ The eruption theory for the shift of government is thereby weakened, because ongoing volcanic activity at Merapi coincided not only with the departure of the

⁴⁷ Boechari, “Some Considerations on the Problem of the Shift of Matarām’s Centre of Government from Central to East Java in the 10th Century,” in *Melacak Sejarah Kuno Indonesia Lewat Prasasti / Tracing Ancient Indonesian History through Inscriptions* (Jakarta: Kepustakaan Populer Gramedia, 2012), 160.

⁴⁸ J. W. IJzerman, *Beschrijving der Oudheden Nabij de Grens der Residentie’s Soerakarta en Djogdjakarta* (Batavia: Landsdrukkerij, 1891), 4–5.

⁴⁹ Van Bemmelen suggested that this disaster happened in 1006, based on a misinterpretation of a reference to a “catastrophe” (*pralaya*) in the Pucangan inscription. The epigraphical record makes clear that the shift of government from Central to East Java happened in the early tenth century, not the early eleventh. Unfortunately, the erroneous 1006 date is still occasionally found in publications on Java’s volcanic history. R. W. van Bemmelen, *General Geology of Indonesia and Adjacent Archipelagoes*, vol. IA, *The Geology of Indonesia* (The Hague: Government Printing Office, 1949), 560.

⁵⁰ Boechari, “Shift of Matarām’s Centre of Government,” 180–1.

⁵¹ Wisseman Christie, “Under the Volcano,” 46–61.

⁵² By contrast, instances where political conflict was the main reason for evacuating a royal center are explicitly discussed in Old Javanese inscriptions, such as the fall of Dharmawangsa Teguh’s palace in 1017 (Pucangan inscription), the temporary ousting of Sarveśvara from his palace at Katang-Katang (Kemulan inscription dated 1194), and the destruction of the Singhasari palace in 1292 (Kudadu and Sukhamerta inscriptions). Boechari, *Melacak Sejarah Indonesia Lewat Prasasti* (Jakarta: Gramedia, 2012), 104, 108, 206.

⁵³ Newhall et al., “10,000 Years of Explosive Eruptions of Merapi Volcano, Central Java,” 45–6.

⁵⁴ Ralf Gertisser et al., “The Geological Evolution of Merapi Volcano, Central Java, Indonesia,” *Bulletin of Volcanology* 74 (2012): 1227.

royal center from Central Java in the early tenth century, but also with its first appearance there in the early eighth century and its heyday in the mid-ninth century.

There is still not enough evidence for the theory that a volcanic eruption was the primary cause of the shift of government in the 920s. It is certainly plausible that ongoing eruptive activity placed stress on the Javanese state's infrastructure and that such stresses may have contributed to the decision to move the palace. However, the hypothesis of a single catastrophic eruption of Merapi that compelled this shift of government requires stronger physical and textual evidence than is currently available. An alternative may be to look beyond the well-studied Merapi in search of "[a] bigger eruption from a more distant volcano, less given to regular small eruptions than Merapi, [which] may have caused the crops to fail."⁵⁵ But the shift of the royal center to East Java does not necessarily mean there was a wholesale collapse of society in Central Java. It may instead be more viable to imagine Javanese society experiencing volcanic eruptions as a harmful but manageable phenomenon, for which they had effective strategies of resilience.

The Recording of Disaster Events

Having taken stock of Indonesian cultural attitudes toward natural disaster and their impacts, we are ready to turn to some historical records of specific disaster events. The Javanese and Balinese paid close attention to the chronological aspects of disaster. Specific occurrences of earthquakes and volcanic eruptions were recorded in chronicles, sometimes precisely to the day. Even though disasters were unpredictable, they were viewed as concrete historical events whose timing was both quantifiable (through dated records) and interpretable (through augury). This shows how disaster events were incorporated into the chronological practices of Javanese and Balinese people. They did not occur in some mythical realm beyond time but were comprehended within the timekeeping of normal life. It is this chronological orientation that makes certain Indonesian sources very useful to historians of disaster, as long as they are handled properly.

Natural disasters are regularly mentioned in Javanese and Balinese chronicles. This was a mindful choice by the compilers of these texts. Eruptions and earthquakes were included because they were signs of power in the world, just like battles and coronations. The chronological precision of these entries reflects close attention to the idea of the "moment" (*duk*).⁵⁶ Connections between particular kinds of events and specific moments in time were judged in terms of their "accordance" (*tut*) with each other.⁵⁷ Just as earthquake calendars interpreted the timing of earthquakes as presaging certain outcomes, the chronicling of disaster events drew attention to the irruption of power into significant moments in time. An examination of how these chronicles

⁵⁵ Anthony Reid, "Revisiting Southeast Asian History with Geology: Some Demographic Consequences of a Dangerous Environment," in *Natural Hazards and Peoples in the Indian Ocean World: Bordering on Danger*, ed. Greg Bankoff and Joseph Christensen (Palgrave Macmillan, 2016), 41.

⁵⁶ This polysemous word also has meanings of "hit," "strike," "stab," and "meet." At its core, the word refers to the point of encounter between otherwise separate things, whether in time or space. P. J. Zoetmulder, *Old Javanese-English Dictionary*, s.v. "duk."

⁵⁷ Vickers, "Balinese Texts and Historiography," 169.

positioned natural disasters within a temporal framework can give us valuable insight into Indonesian concepts of historical time.

A sixteenth-century Javanese chronicle called the *Pararaton* (The Monarchs) gives a precise chronology of disaster events in the pre-Islamic period. The *Pararaton* is a heterogeneous compilation of historical materials spanning the thirteenth to fifteenth centuries.⁵⁸ Its central concern is the history of the Rājasa royal dynasty that ruled Java in this period, but it also mentions eleven natural disasters that occurred in the period 1311–1483. The chronicle entries for natural disasters are interspersed among other entries pertaining to political events (see Table 1). The Javanese viewed natural disasters as an effect of power in the world, which is why such events were considered fit for inclusion in a royal chronicle like the *Pararaton*. Each of these entries follows a standard format: the type of disaster, a specifier, the phrase “in Śaka,” a chronogram in words, and a year numeral. Of particular interest is the manner in which the disasters are specified, using a label derived from a base word plus a prefix *pa-*. This is the standard way to label events in the *Pararaton*; for example, the Javanese military expedition against the Sumatran kingdom of Malayu is referred to as the *pamalayu*.⁵⁹

The specifiers for six of the eight eruptions are based on the names of weeks in the Javanese *wuku* calendar, which is why I have included “the week” in my English translations. This convention of specifying eruption events by a *wuku*-based label is not unique to the *Pararaton*, as it also appears in the eighteenth-century *Babad ing Sangkala*.⁶⁰ A plausible interpretation of these week-based labels is that they indicate the week in which the eruption event occurred. The use of the *wuku* calendar to label eruption events suggests a possible connection to disaster augury. In modern Java and Bali, it is earthquakes rather than volcanic eruptions that are commonly used for augury, as discussed above. Nonetheless, the *wuku* system is closely connected to divination in general, so it is plausible that the *Pararaton* may represent an older type of disaster augury that is no longer known in the modern Javanese and Balinese traditions.

It is tempting to try to match the week name and year numeral given in the chronicle entries, in order to more precisely date each eruption event. Unfortunately, two technical problems prevent this. First, the *wuku* calendar operates on a thirty-week cycle, which runs independently of the lunisolar Śaka year. The short length of this cycle means that any named week (e.g., Watugunung) often occurs twice within a given Saka year. Second, this section of the *Pararaton* is significantly affected by distortions in the manuscript transmission, which affect the reliability of the Śaka years supplied in the text.

For example, the entry for the November 20, 1683 eruption of Agung adds that “I Dewa Agung Jambe came to power in Klungkung.”⁶¹ Dutch records confirm that this person reigned at Klungkung as the highest-ranked of Bali’s several kings from.

⁵⁸ Wayan Jarrah Sastrawan, “How to Read a Chronicle: The *Pararaton* as a Conglomerate Text,” *Indonesia and the Malay World* 140 (March 2020): 1–22.

⁵⁹ J. L. A. Brandes, *Pararaton (Ken Arok) of het Boek der Koningen van Tumapël en van Majapahit* (Batavia: Albrecht & Co., 1896).

⁶⁰ M. C. Ricklefs, *Modern Javanese Historical Tradition: A Study of an Original Kartasura Chronicle and Related Materials* (London: School of Oriental and African Studies, University of London, 1978), 18.

⁶¹ *jeneng I Déwa Jambé di Kalungkung* [Modern Balinese]. Hägerdal, “Candrasengkala,” 37.

Table 1: List of chronicle entries for natural disasters in the *Pararaton*⁶²

Page	Text	Translation	CE Year
25.28	guntur paluñge i śaka api api tañan tuñgal, 1233	Eruption of Lungge ⁶³ in Śaka fires–fires–hands–single, 1233	1311
28.16	guntur pabañupiñdah i śaka, 1256	Eruption of moving water ⁶⁴ in Śaka 1256	1334
29.34	hana gunuñ añar i śaka naga leñ karnaniñ voñ, 1298	There is Mount Anyar [a new mountain] ⁶⁵ in Śaka serpents–holes–ears–of–person, 1298	1376
29.35	guntur pamaḍasiha i śaka ṛṣi śūnya guṇa tuñgal, 1307	Eruption of [the week] Madangsia in Śaka sages–emptiness–qualities–single, 1307	1385
30.27	guntur prañbakat i śaka mukaniñ voñ kaya naga, 1319	Eruption of [the week] Prangbakat in Śaka faces–of–person–bodies–serpents, 1319	1397 [?]
31.18	guntur pajuluñpujut i śaka kaya veda guṇaniñ voñ, 1343	Eruption of [the week] Julungpujut in Śaka bodies–Vedas–qualities–of–person, 1343	1421
31.23	pahilan aguñ i śaka nāga yugānahut voñ, 1348	Great famine in Śaka serpents–ages–biting–person, 1348	1426
32.2	paliñdu i śaka pakṣa guṇānahut vulan, 1362	Earthquake in Śaka wings–qualities–biting–moon, 1362	1440
32.8	guntur pakuniñan i śaka vèlut viku anahut vulan, 1373	Eruption of [the week] Kuningan in Śaka eels–monks–biting–moon, 1373	1451
32.17	guntur palañḍep i śaka pat ula teluñ wit, 1384	Eruption of [the week] Lanḍep in Śaka four–snakes–three–stem, 1384	1462
32.25	guntur pavatugunuñ i śaka kayāmbara sagara iku, 1403	Eruption of [the week] Watugunung in Śaka bodies–sky–seas–tail, 1403	1481

⁶² I have extracted all the disaster entries and listed them here in chronological order. The column “Page” refers to the first edition by Brandes, in the format [page number.line number]. J. L. A. Brandes, *Pararaton (Ken Arok) of het Boek der Koningen van Tumapël en van Majapahit* (Batavia: Albrecht & Co., 1896).

⁶³ The interpretation of the term Lungge is uncertain, as it is unknown either as a wuku name or as a toponym. An unpublished manuscript of this text (Leiden University Library collection, Codex Orientalis 20.031, which I have denoted witness N of the *Pararaton*) gives the reading *guntur paluñguhe* (“eruption at [the time of] his establishment”). This “establishment” may refer to the ascension of the king Jayanagara in the preceding chronicle entry. If this alternative reading is correct, then this entry demonstrates yet again the link between natural disaster and political power. Sastrawan, “*Pararaton as a Conglomerate Text*,” 22.

⁶⁴ This entry probably refers to an eruption of Kelud. The year coincides with that of the Kelud eruption mentioned in the *Deśavarṇana*, as discussed above in connection with Hayam Wuruk. The reference to moving water is consistent with the ejection of water from a crater lake, a harmful eruptive product that is typical of Kelud. The *Tantu Panggelaran* gives an origin story for this crater lake as a physical expression of the anger of the goddess Umā. Th. G. Th. Pigeaud, *Java in the 14th Century: A Study in Cultural History* (Leiden: KITLV Press, 1962), 4:8; J.-C. Thouret et al., “Origin, Characteristics, and Behaviour of Lahars Following the 1990 Eruption of Kelud Volcano, Eastern Java (Indonesia),” *Bulletin of Volcanology* 59 (1998): 462–64; Fukashi Maeno et al., “Eruption Pattern and a Long-Term Magma Discharge Rate over the Past 100 Years at Kelud Volcano, Indonesia,” *Journal of Disaster Research* 14, no. 1 (2019): 27–39; Stuart Robson, trans., *Threads of the Unfolding Web: The Old Javanese Tantu Panggelaran* (Singapore: ISEAS Yusof Ishak Institute, 2021), 44.

⁶⁵ This summit may have been a recent formation within the Kelud summit vent complex, hence the appellation Gunung Anyar (“new mountain”). In the *Bujangga Manik*, this toponym is listed directly before Kampud/Kelud itself, strengthening the hypothesis that it may refer to a peak in or near the Kelud complex. Noorduy, “*Bujangga Manik’s Journey Through Java*,” 430.

Table 2: List of chronicle entries for natural disasters from various Balinese chronicles.⁶⁶

CE Dates	Volcano	Sources
circa 1612	Batur ⁶⁷	<i>Babad Bhumi</i> #62 & #109, <i>Korn</i> 2 #23, <i>Korn</i> 4 #24, <i>Korn</i> 5 #52, <i>Pangrincik Babad</i> #31, <i>Tattwa Batur Kalawasan</i> #27
circa 1616	Agung	<i>Babad Gumi</i> #33 & #34, <i>Babad Bhumi</i> #57 & #110, <i>Korn</i> 5 #54, <i>Babad Tusan</i> #29, <i>Tattwa Batur Kalawasan</i> #33, <i>Pangrincik Babad</i> #35
circa October– November 1665	Agung	<i>Babad Gumi</i> #54
November 20, 1683	Agung	<i>Babad Gumi</i> #65
February 10, 1696	Batur	<i>Babad Bhumi</i> #119, <i>Pasasangkalan</i> #15, <i>Korn</i> 1 #78
October 12, 1703	Batur	<i>Pasasangkalan</i> #16, <i>Korn</i> 1 #79
June 18, 1706	Batur	<i>Pawawatekan</i> #77
October 21, 1710 –February 1, 1711	Agung	<i>Babad Gumi</i> #77, <i>Pasasangkalan</i> #18, <i>Korn</i> 1 #81
circa 1784	Batur	<i>Babad Bhumi</i> #128
June 13–21, 1820	Agung	<i>Babad Bhumi</i> #132, <i>Babad Bhumi</i> #133

the mid-1680s through to the 1720s.⁶⁸ The entry's juxtaposition of the eruption and Dewa Jambe reinforces the long-standing association between natural disaster and the rise of a new ruler, both of which were signs of power in the world

The 1710–11 Eruption of Mount Agung

One particular chronicle entry is of unique value for the historical study of natural disasters in Bali. The *Babad Gumi* entry (#77) for the 1710–11 eruption of the Agung volcano is exceptional for its level of descriptive detail, its chronological precision, and the fact that it seems to be a near-contemporary record of the disaster. The entry begins with the word *péling*, “commemoration,” which indicates that it belongs to the genre of commemorative notes (*pangélingan*) that were appended to the end of texts.⁶⁹ Such notes usually contain information about current events at the time when a text was being written or copied.

A commemoration of the time when Mount Agung was devoured by Kālāgni Rudra.⁷⁰ The day it began to burn was 21 October 1710. Eventually, on 2 December,

⁶⁶ The designation of each source and the enumeration of its entries follows that of Hägerdal.

⁶⁷ In some of the sources, this eruption is attributed to a mountain called Daya. It is unclear whether the name Daya was considered equivalent to Batur, but it seems that all of these entries do in fact refer to Batur.

⁶⁸ Helen Creese, “Śrī Surawīrya, Déwa Agung of Klungkung (c. 1722–1736): The Historical Context for Dating the Kakawin Pārthāyana,” *Bijdragen Tot de Taal-, Land- En Volkenkunde* 147, no. 4 (1991): 408.

⁶⁹ Vickers, “Balinese Texts and Historiography,” 170–77.

⁷⁰ Kālāgni (“Fire of Time”) is an epithet of the god Rudra, identified with Śiva, in his role as destroyer of the world at the end of each cosmic era. The eruption is understood here not merely as a physical phenomenon but as a consequence of the god’s power. Stella Kramrisch, *The Presence of Śiva*, 1st Indian ed. (Varanasi: Motilal Banarsidass, 1988), 274–75.

came the ash rain. Then on 12 December, there was an eruption of fire. Then on 16 December,⁷¹ a rain of little stones poured down. It was like the sky was split asunder and the earth was being pulverized. Everyone was in panic and people were fleeing desperately. There was an eruption of big stones and sludge. Many villages were destroyed, as well as the dry rice fields and the irrigated rice fields. Ravines became hills and hills became ravines. The wellsprings were destroyed, engulfed by fire. The number was more than 3 – people of Paleg – 10 – people of Bantas – Kayuaya – Bukit – Tigarón – the number of deaths, young and old, was more than 600 – the village of Tianyar – destroyed as far as its forest – Sukadana as well.⁷² Remember the lifetime of the earth, when the earth's lifetime ends, 1,700 years. Devoured by Kālāgni Rudra was Mount Agung, as well as Tulamben, the forest of Batudawa, Muntig, Abang, Pidpid and the forest of Babi. The destruction went as far as the betel plants, the fruit trees and the coconut trees, as far as the dry rice fields. The aqueducts were destroyed and could not be quickly rebuilt. Everything was destroyed. The rivers Bungbung and Yeh Lajang both destroyed the paddy fields, and the bathing place of Babi was all filled up. The river Bangkak destroyed dry rice fields of Susut. The rivers Selat and Barak destroyed the paddy fields. It started in 1710 and went to 1711, and it was violently destructive.⁷³

A briefer entry (#18) in the *Pasasangkalan* chronicle gives some additional information about this eruption, using the volcano's alternative name, Tolangkir:⁷⁴

⁷¹ The week name is not specified in this date, so it could have fallen on any conjunction of the weekdays Kliwon and Anggara around this time. I choose December 16, 1710, which is the first Kliwon Anggara after the preceding date. I see no strong reason to follow Hägerdal's alternative proposal of January 20, 1711. Throughout this entry, the weekday Anggara is abbreviated to *a*, rather than the standard abbreviation *ang*. Hägerdal, "Candrasengkala," 40.

⁷² Here the grammar of the Balinese text is ambiguous, with short phrases and words separated by punctuation. To propose a grammatical English translation here would involve unjustifiable guesswork about the intended syntax of the Balinese original. I have instead used dashes to more fairly represent how the Balinese is expressed.

⁷³ *péling duk ing gunung agungé kapangan déning kalagni rudra, dina mimiti geseng, wa, a, wara dungulan, kresnapaksa caturdasi, sasih 4, rah 3, tenggek 3, awekasan, teka ring dina, u, a, kruwelut, udan awu, malih ring dina, u, su, mrakih, guntur apuy, malih ring dina, ka, a, wudan watu alit-alit, kredhek, kaya bentar ikang akasa, kaya bubur ikang prethiwí, gégér ikang kabéh, amrih-mrih awak, mwah guntur watu ageng-ageng mwah nyanyad, akwéh desa rusak, mwah gaga sawah, jurang dadi gunung, gunung dadi jurang, mwah anakan yéh pejah liput apuy, kwéhnya rangkung, 3, wwang paleg, 10, wong bantas, kayuaya, bukit, tigarón, kwéhnya pejah anom wredhah, rangkung 600, desa tyanyar, teka ning alasnya rusak mwah sukhadana, élingakna tuuh ikang bhumi, yan tutug tuuh bhumi ika, sepaha satus temwang, ana kapangan déning kalagni rudra, ikang gunung agung, mwah tulamben, alas batudawa, muntig, abhang, pidpid, mwah alas babi, teka ning basé buah nyuh, teka ning carik rusak, pangalapan rusak, tan kena tangun gelis, kabéh padha rusak, tukad bungbung, yeh lajang, padha mangrusak sawah, mwah kayéhan babi rusak pada urugen, tukad bangkak mangrusak carik, susut, tukad selat, tukad barak, padha mangrusak sawah, mamimiti, rah, 2, teka ning, rah, 3, maksi mangrusak (ff. 7r–8r) [Old Javanese/Modern Balinese]. Kirtya manuscript 808 (shelf Va). See also Hägerdal, "Candrasengkala," 40–41.*

⁷⁴ The equivalent entry #81 in the *Korn 1* chronicle expands on the information about this eruption given in the *Pasasangkalan*. However, *Korn 1* appears to be a late copy of the *Pasasangkalan* and deviates considerably from its original. It may even be the case that a previously separate entry, concerning the nobleman I Gusti Ngurah Balé Agung, has been interpolated into *Korn 1*'s account of the 1710–11 eruption. Due to its uncertain reliability, I have excluded this entry from the discussion. Hägerdal, "Candrasengkala," 88–89.

The time when a flood of hot water flowed northward from Tolangkir, killing the people of Bukit and the people of Cahutgut, the people of Bantas, the people of Kayuaya. In the end they were destroyed, killed by that torrent, on 1 February⁷⁵ 1711.⁷⁶

These descriptions of the 1710–11 eruption invite comparison with the famous 1963–64 eruption of Agung, which was the most powerful Indonesian eruption of the twentieth century.⁷⁷ A remarkable feature of the *Babad Gumi*'s description is its breakdown of the emergence of different volcanic products by date, essentially giving us a record of the 1710–11 eruption sequence. Balinese terms like “little stones” (*watu alit-alit*), “big stones” (*watu ageng-ageng*), “ash rain” (*udan awu*) and “sludge” (*nyanyad*) can be identified as typical products of this volcano in modern eruptions.⁷⁸ Of particular interest is the chronicle's claim that the first observed phenomenon was that the mountain “began to burn” (*mimiti geseng*) on October 21, 1710. Similarly, lava was the first major product to be observed on February 18, 1963.⁷⁹ Such detailed information on the 1710–11 eruption sequence can be used in conjunction with stratigraphic and other kinds of scientific analysis to better discern historical patterns in Agung's eruptive behavior.

The extent and severity of damage caused by Agung's eighteenth-century eruption was similar to that of the twentieth-century eruption. The chronicle's estimated death toll of “more than 600” in 1710–11 is comparable, as a proportion of total population, to the 1963–64 toll of approximately 1,700 deaths.⁸⁰ Most of the villages where the chronicles report deaths are located to the northeast of the Agung summit, overlapping closely with areas affected by pyroclastic and lahar flows in 1963. The chronicles describe flash flooding and damage to irrigation systems along rivers that flow southeast and southwest, mapped in Figure 2. The damage to farms, gardens, and waterworks is strongly emphasized in these accounts, since it directly threatened food security in the affected districts. These descriptions confirm that the 1710–11 eruption was a major event, which prompts us to reevaluate the geological data for Agung's early modern eruption history.

⁷⁵ In his conversion of this date, Hägerdal interpreted the solar element *Suryāgni* as “one of the days in the Balinese calendar which are associated with Surya” and went on to suggest *Sukra Pahing* falling on February 6, 1711 as such a day. A more plausible interpretation, supported by Damais's study of Balinese calendars, is that *Surya* is a synonym of *Radité* (Sunday), which gives *Radité Pahing* falling on February 1, 1711. Louis-Charles Damais, “Études d'épigraphie Indonésienne, V: Dates de Manuscrits et Documents Divers de Java, Bali et Lombok,” *Bulletin de l'École française d'Extrême-Orient* 49, no. 1 (1958): 26; Hägerdal, “Candrasengkala,” 170.

⁷⁶ *duk balabur wédang mily angalor saking tolangkir amatyani wong bukit miwah wong cahutgut, wong bantas, wong kayuaya, samapta éntya pinatyan déning lwah ika, wara ugu suryāgni palguna lék, swanita ro, tri sirah, i śaka siki gūṇa karenga awani* [Old Javanese/Modern Balinese]. Hägerdal, “Candrasengkala,” 169–70.

⁷⁷ Stephen Self and Michael R. Rampino, “The 1963–1964 Eruption of Agung Volcano (Bali, Indonesia),” *Bulletin of Volcanology* 74 (2012): 1522–24.

⁷⁸ Self and Rampino, “The 1963–1964 Eruption of Agung Volcano,” 1524–28; Karen Fontijn et al., “A 5000-Year Record of Multiple Highly Explosive Mafic Eruptions from Gunung Agung (Bali, Indonesia): Implications for Eruption Frequency and Volcanic Hazards,” *Bulletin of Volcanology* 77 (2015).

⁷⁹ Self and Rampino, “The 1963–1964 Eruption of Agung Volcano,” 1524.

⁸⁰ “Angka2 terachir: 1476 Orang tewas, jg. tertimbun lahar belum dapat diambil,” *Suara Rakjat*, April 1, 1963; M. T. Zen and D. Hadikusumo, “Preliminary Report on the 1963 Eruption of Mt. Agung in Bali (Indonesia),” *Bulletin Volcanologique* 27 (1964): 275–82; M. Poffenberger, “Toward a New Understanding of Population Change in Bali,” *Population Studies* 37 (1983): 46.

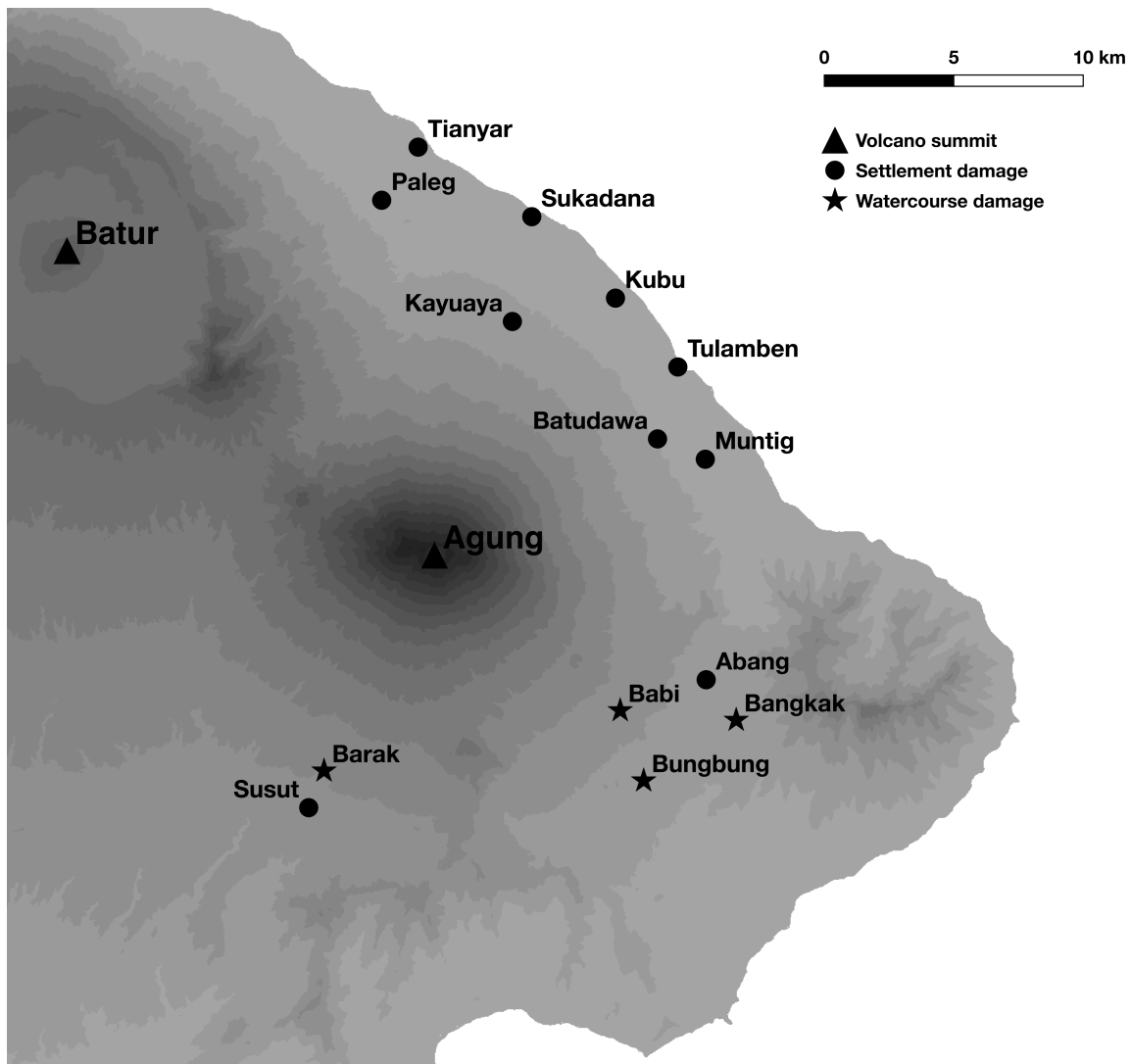


Figure 2: Map of the impacts of the 1710–11 eruption of Agung as mentioned in Balinese chronicles. Altitude is shaded in increments of 200 meters

Conclusion

In this article, I have explored how Indonesians experienced earthquakes and volcanic eruptions over more than a thousand years. For many people, disasters signified the presence of power in the world. Such power included not only the geophysical power of the disaster itself, but the political power of great leaders and the spiritual power of deities and supernatural beings. Since disasters were a sign of the presence of power, they could be interpreted as signs of future events using calendar-based augury. Indonesians were not passive in the face of disasters, nor did they conceive of them as wholly negative. Instead they pragmatically responded to disasters as a normal part of

life. The Javanese state in the ninth and tenth centuries had the means to compensate or repair property that was damaged by earthquakes and eruptions. This encourages us to reconsider some of the grander claims about the catastrophic impacts of natural disaster in Indonesian history. For example, modern arguments that the tenth-century Central Javanese state was destroyed by a volcanic eruption are not well supported by the available geological and textual evidence.

Traditional records can offer useful information about specific disaster events in Indonesia, especially those that are not mentioned in foreign sources. The *Pararaton* chronicle provides a dated list of disaster events in East Java through the fourteenth and fifteenth centuries. However, these dates cannot necessarily be taken at face value, due to the unstable transmission of this text through its manuscript copies. Balinese chronicles similarly offer a historical record for eruptions of the Agung and Batur volcanoes during the seventeenth and eighteenth centuries. Of these, the *Babad Gumi*'s detailed account of the mighty 1710–11 eruption of Agung can help us to reevaluate the volcanic history of the island. While they can be immensely useful, these sources have their own complex histories and cannot be interpreted in a naively literal way, as if they were straightforward repositories of historical fact ready to be synthesized with scientific findings. Rather, the very construal of disaster events in these chronicles are shaped by the cultural assumptions embedded within them.

In keeping with recent approaches that stress the relevance of culture in how people have experienced disasters in history, I have demonstrated how an in-depth understanding of cultural attitudes is crucial to properly interpreting the available evidence for natural disasters in Indonesia. Such an approach allows us to include a much broader range of sources than are usually considered in studies of natural disasters: legal charters, divination manuals, royal chronicles, temple ruins, and augury paintings. When interpreted in ways that are sensitive to their cultural assumptions, all of the sources discussed in this article can give us valuable insights into Javanese and Balinese experiences of disaster. These insights can fruitfully contribute to the comparative and transcultural approaches that have shown such promise in recent studies of natural disaster in global history.