

This paper translates part of manuscript MS408 using the linguistic key expounded in the paper *Linguistic Missing Links*: <http://ling.auf.net/lingbuzz/003737> and it improves upon some of the translations made in the paper *Linguistically Dating and Locating MS408*:
<http://ling.auf.net/lingbuzz/003808>

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Title: Consonants & Vowels, Castles & Volcanoes: The Earliest Volcanic Hazard Map.

Abstract.

This is a demonstration of the academic usefulness of applied linguistics. Rarely in the field of volcanology are scientists privy to detailed eyewitness documentation of eruption events and activity dating back to pre-scientific times. A newly examined manuscript, dating from the mid-15th century, includes a map containing such information, and is the earliest known example of a volcanic hazard map. The geographic area described is part of the Mediterranean Sea, where a number of volcanoes have played a significant role in the lives and belief systems of people ever since antiquity. The map was created due to the birth of a volcano that brought new hazards to the Medieval community and subsequently gave rise to a new island from the seabed.

Introduction:

On the evening of the 4th February, 1444, a submarine vent began to erupt close to the island of Vulcano in the Tyrrhenian Sea, west of Italy and north of Sicily. When word of the disaster arrived at Castello Aragonese, Ischia, a humanitarian rescue mission was launched, with Maria of Castile, Queen of the Crown of Aragon, at the helm. She was regent at the time, as the king was busy elsewhere, so she took responsibility. The flotilla arrived over a week after the initial eruption due to the distances sailed, but the survivors were duly fed and tended to, before being evacuated to safety.

In the aftermath a Dominican nun, from Ischia monastery, who had been party to the unfolding events, drew a map as a pictorial account of the adventure. Queen Maria was thus able to recount the story to courtly visitors and warn them of the volcanic hazards should they wish to explore the islands for themselves. The map was preserved for posterity because it was drawn on velum and incorporated into a manuscript, which managed to remain in suitably dry and sterile conditions for over half a millennium even though it changed hands a number of times over the centuries.

When the manuscript entered the consciousness of the scholarly world it became something of a mystery because no one was able to read it. And so it remained

until 2017 when its codex was deciphered, to reveal that it was written in a superceded language named proto-Romance, which subsequently evolved into the modern Romance languages. It is most similar to Aragonese, which is still spoken in parts of northeast Spain, as Ischia was part of the Crown of Aragon empire until the 15th century. The writing system had proved tricky to solve because it uses a unique set of alphabet symbols that differ from familiar Italics and serve as their own punctuation.

Actually, the language and writing system of the manuscript were already outdated at the time of its creation, as the language of nearby Naples had already evolved into early Italian, with the use of Italics. This anachronism was the result of the geographical and cultural isolation of island life. In addition, monasteries would retain obsolete languages and writing systems deliberately, partly for reasons of separation and secrecy but also to enable them to continue reading treasured and valuable documents.

In fact, Maria and her husband, King Alfonso V, were educated in Latin as children in Spain, and were people of the aristocratic Medieval world, so the Ischian monastic way of communicating would have seemed dated for them too. Maria remained Queen of Aragon until June 1458, when Alfonso passed away in Naples. Maria had moved back to the Iberian peninsula in 1454 where she died, at Valencia, in September 1458. When the manuscript subsequently found its way to the mainland, both its language and writing system had been consigned to history along with the ability to read and understand them.

The overall map is divided into nine circular vignettes on a three-by-three grid and has the equivalent area of six manuscript pages (See Fig. 1). The four corner vignettes are of particular interest here as they comprise the hazard map, which includes details such as explosive cap eruption, pyroclastic expulsion, magma ejection, magma flows, lava and pumice formation, fumarole chimneys, toxic and hypoxic gases, sulphur deposits, earthquakes and tremors and tsunamis. In fact, we see the birth of a new volcano in comparison with two other volcanoes, both in different stages of activity.

The map is not intended to be geographically accurate, as the cartographer was more concerned with condensing the relevant information into a convenient space on the page. For example, the Phleorean Islands are shown in close proximity with the Aeolian Islands because the true distance between them is not important to the narrative. Also, the scale and orientation of each vignette is designed to suit the square format. Nevertheless, it is perfectly easy to understand the portrayal of locations and events, as well as the various hazards encountered, by loosening one's modern conception of the purpose and design of maps. This map is drawn from casual observation and memory rather than measurements and charts, with emphasis on narrative, description and beliefs.

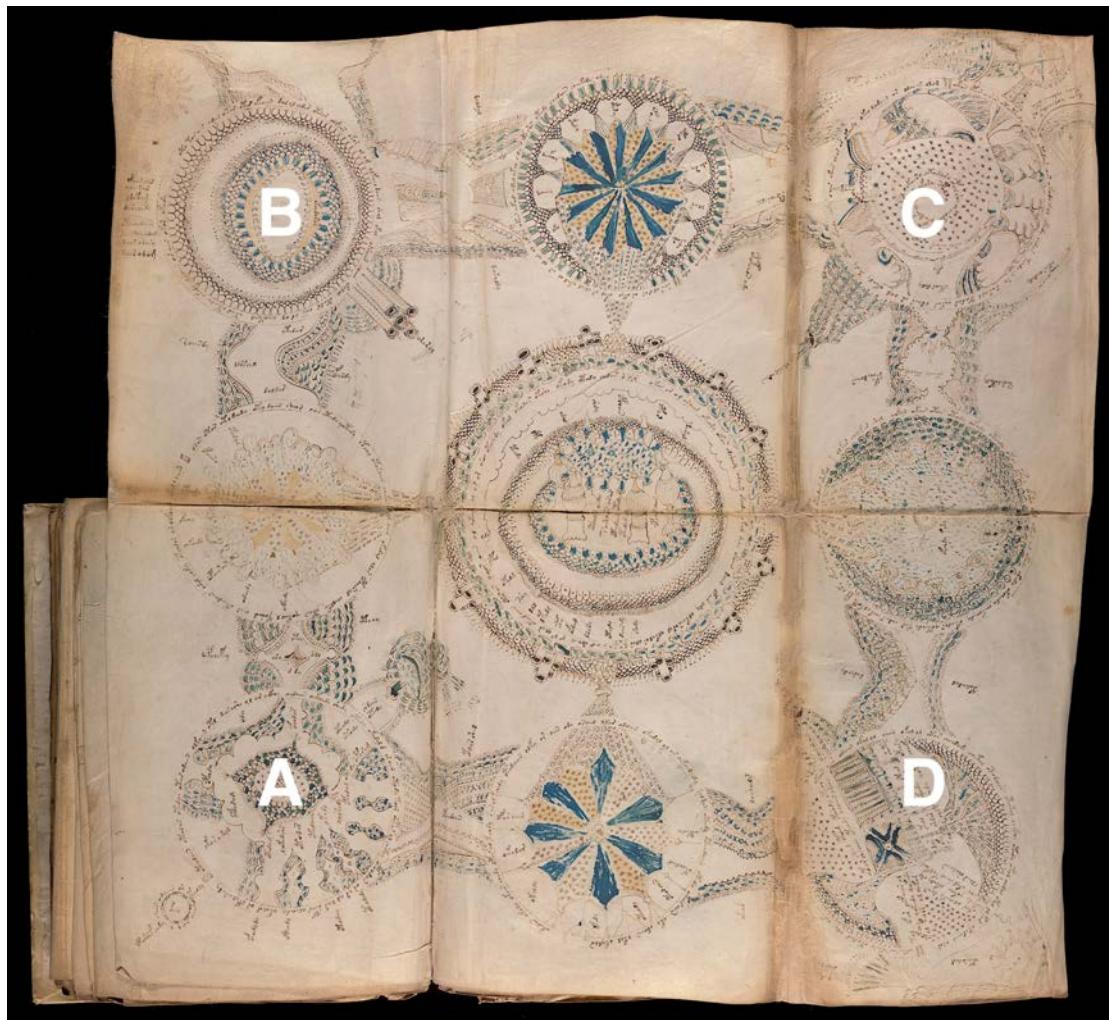


Figure 1. Showing the entire unfolded map with the four vignettes that provide volcanic hazard information: A, B, C, D.

Looking at Fig. 1; vignette A illustrates the erupting volcano that prompted the rescue mission and the drawing of the map. It rose from the seabed to create a new island given the name Vulcanello, which later became joined to the island of Vulcano following another eruption in 1550. Vignette B depicts the volcano of Ischia, vignette C shows the islet of Castello Aragonese, and vignette D represents the island of Lipari. Each vignette includes a combination of naively drawn and somewhat stylized images along with annotations to explain and add detail. The other five vignettes describe the remainder of the story but don't include hazard information, so are not included here.

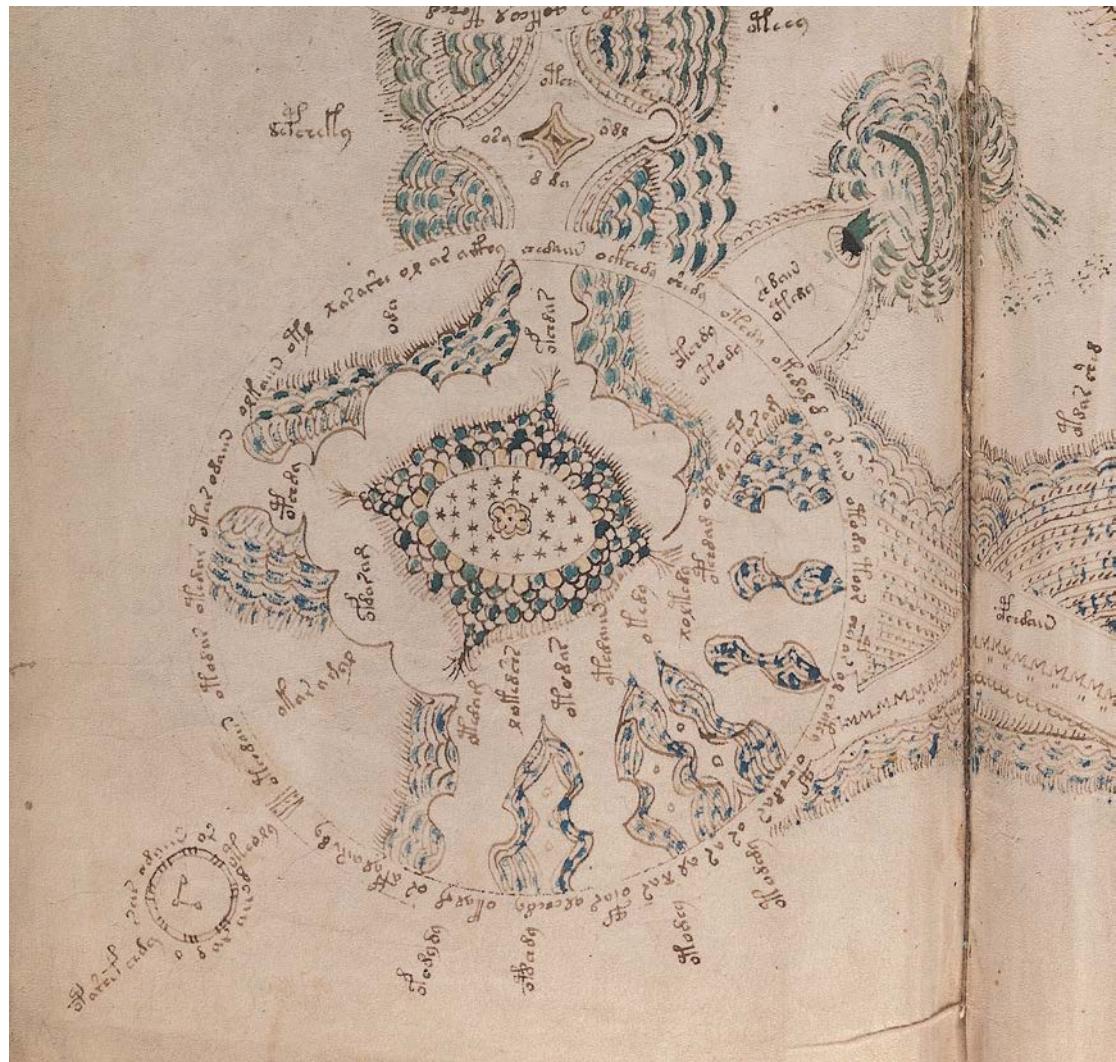


Figure 2. Showing vignette A: The eruption of Vulcanello that resulted in a new island and which subsequently became joined to Vulcano.

Vignette A.

The eruption of Vulcanello is seen in both plan-elevation and in side-elevation cross-section, with a surprising level of detail and annotation that must have come from firsthand observation. In addition, there is the diagram of a nautical inclinometer over the water, in the far corner, complete with wording to warn sailors of shipping hazards.



Figure 3. Showing a detail of vignette A. Describing the emergence and flow of magma from Vulcanello crater.

The illustration in Fig. 3 shows the emergence and flow of magma from Vulcanello crater. There are nine annotations, top to bottom, that describe the process as witnessed. They read: *o'péna* [pœna] (**of rock**) *o'qunas* [cunas] *asa* (**the cradle/birth it is**) *amena sa* (**its lead/start**) *rolen æt* (**turning fire**) *o'monas* (**of unity**) *amenaus* (**threatening**) *o'lena* (**of energy**) *formena* (**forming**) *o'péna* [pœna] *sa* (**of rock it is**). Thus, we see the magma spilling from the crater, flowing together and then cooling to form rock.



Figure 4. Showing detail of vignette A. Describing the hazards around the periphery of Vulcano crater.

The illustration in Fig. 4 shows the hazards presented by the magma as it cools to form lava around the periphery of the erupting Vulcanello crater. There are eight annotations, clockwise from top. The first four annotations refer to conditions on land. They read: ***alas a asar*** (**area is roasting hot**) ***ona*** (**good/safe**) ***o'qué nas*** (**this is flowing**) ***omina opas asa*** (**dangerous passage it is**). The second four annotations refer to conditions in the water. They read: ***omone na*** (**large mass floating**) ***omone a*** (**a large mass**) ***opna na*** (**membrane floating**) ***o'quo nana*** (**of where small**). It is interesting to note that the floating lava is pumice, which is indicated by the circular bubbles drawn on the images.



Figure 5. Detail from vignette A. Showing the diagram of a nautical inclinometer.

The illustration in Fig. 5 shows the diagram of a nautical inclinometer - a device for measuring the yaw and pitch of a ship in order to keep it level, similar to a balance scale. The annotations read: ***op (necessary) a æequ (to equal/level) é na (it is to float) tas (the hull/bowl) o'naus os (of the ship) o'meor a (for to pass) o n [offici nostri] (our duty), [ill]as aus [auspicio] n [nostro] (to those under our protection)***. The lower annotations are based on common abbreviated Latin phrasing. Clearly it was very important to right a ship to avoid taking on water or capsizing whilst passing, especially when low in the water with a cargo of passengers. Given the seismic activity and the winter weather the sea must have been rather choppy and hazardous.



Figure 6. Detail from vignette A. Showing the side-profile of the erupting Vulcanello in cross-section.

The illustration in Fig. 6 shows a side view of Vulcanello erupting in cross-section. Above the dome, the cap can be seen, drawn as an arc, being elevated by the explosive blast of the eruption. The cap is inside a cloud of pyroclastic gas, hot ash and airborne material. Clusters of debris are seen projecting right with the annotation *omnas en* (**everything in**) to indicate where most of the debris fell into the water. Inside the volcano there is the annotation *æ nais omnia* (**birth of the menace**) and below the volcano there is the annotation [*d*]oména omona (**big man's domain**). The 'big man' is Vulcan, King of the Underworld, who was believed to reside beneath nearby Vulcano, hence its name. The eruption of Vulcanello, or Vulcanino (Vulcan's baby), was therefore viewed as the spawning of the devil child of Vulcan.



Figure 7. Showing vignette B. Plan elevation of Ischia volcano.

Vignette B shows a plan view of the volcano on the island of Ischia. King Alfonso V had Castello Aragonese joined to Ischia with a stone causeway, which was completed in 1442, and can be seen to the right. Ischia volcano was active at the time, but only mildly.

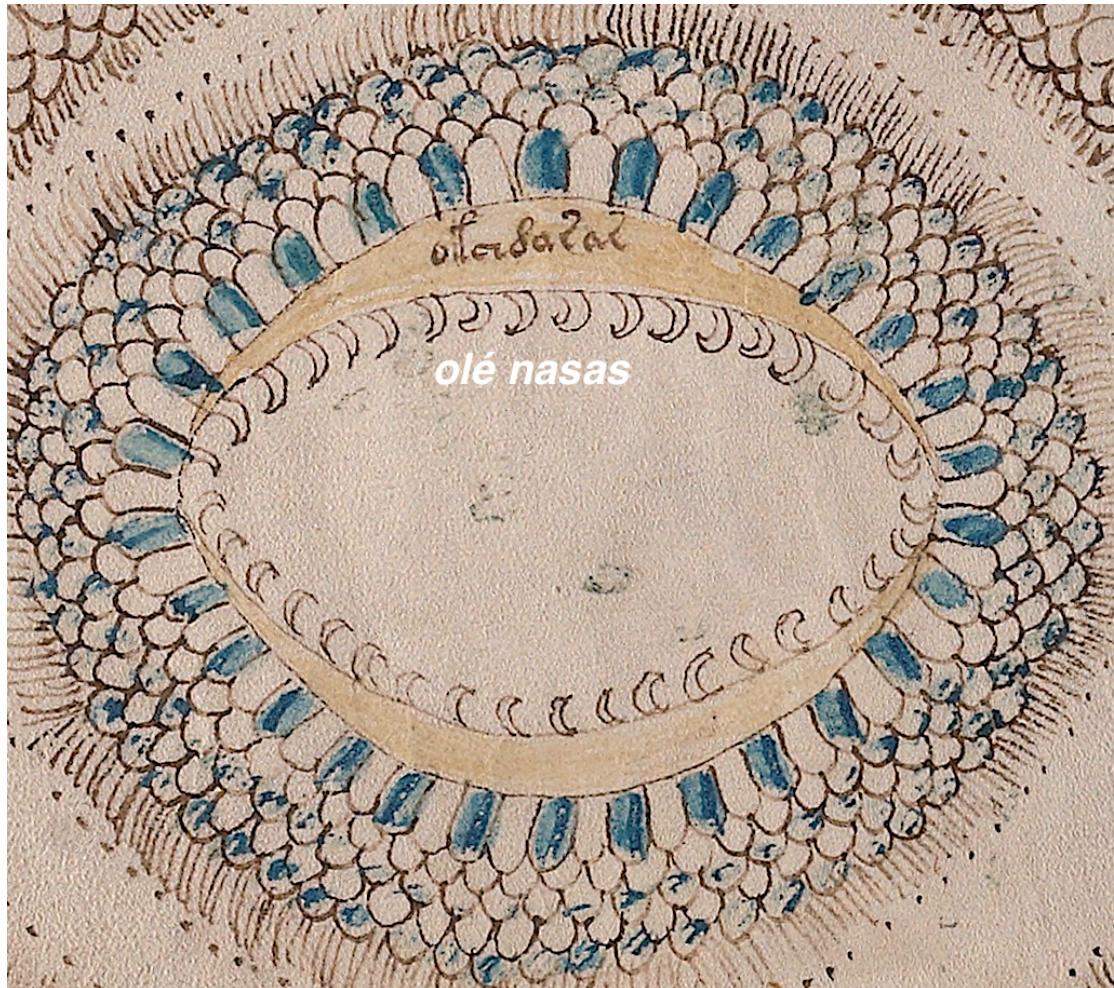


Figure 8. Detail from vignette B. Showing the crater of Ischia volcano.

The image in Fig. 8 shows a plan view of Ischia volcano crater. The yellowish edges are deposits of sulphur and the crescent shapes are wisps of smoke rising from the crater rim. The annotation reads [d]olé nasas (**harmful/dangerous traps**). The sulphur was once harvested, but it was a hazardous job, because the fumes created a toxic and oxygen-free sump, so people would collapse and die from poisoning and hypoxia.



Figure 9. Detail from vignette B. Showing fumarole chimneys and small tsunamis caused by earthquake tremors.

The image in Fig. 9 shows the fumarole chimneys emerging from the side of Ischia volcano. The annotation at their mouth reads: ***osas or [ora] (now displeased)***. They were evidently rather active at the time, which was interpreted as Vulcan's annoyance. The deposit chimneys no longer survive today, but the fumaroles are still active. The annotation to the right reads: ***o'quas[s] na (of shaking/quaking waves)***. A series of small tsunamis can be seen running along the shoreline and radiating from beneath the fumaroles due to earth tremors from Ischia volcano.



Figure 10. Showing vignette C. The islet of the citadel Castello Aragonese with the causeway connecting it to Ischia to the left.

Vignette C shows Castello Aragonese and its walled citadel built upon a rock islet close to the island of Ischia and connected by the aforementioned causeway, seen to the left. Ischia volcano dominated the view from the citadel, so it is seen in side profile on the periphery of the vignette.



Figure 11. Detail from vignette C. Showing the view of Ischia volcano from the citadel of Castello Aragonese. The crater is seen to be only mildly active.

The image in Fig. 11 shows the view of Ischia volcano from Castello Aragonese. The annotation coming from the mouth of the volcano read: *ani æ sa asais* (**anus for his heat**). The volcano was mildly active but not eruptive, and the emissions were seen as Vulcan's flatus, due to the unpleasant sulphurous odour.



Figure 12. Showing vignette D. Lipari port, including the aid tents for the survivors and the volcano of Vulcano as seen from the port.

The image in Fig. 12 shows the port of Lipari island, where the survivors were taken to be fed and tended to. On the periphery of the vignette we can see the side view of the volcano of Vulcano, as seen from the port.



Figure 13. Detail from vignette D, showing the view of the volcano of Vulcano, as seen from Lipari port. Sitting above the crater there is the symbolic crown of Vulcan, King of the Underworld.

The image in Fig. 13 shows the view of the volcano of Vulcano as seen from the port of Lipari. The annotation coming from the volcano mouth read: *osas sa* (**his displeasure**). These words refer to Vulcan's perceived annoyance and the reason for the eruption of Vulcanello according to the prevailing belief system. The crenellations drawn encircling the crater form a crown, or a castle turret, to symbolize their belief that Vulcano was the home of Vulcan, King of the Underworld: i.e. the Devil. Therefore, it was viewed as the most regal of the Mediterranean volcanoes in Medieval times. This is evidently because Vulcano was more consistent in its activity, whilst the other volcanoes fluctuated in activity, suggesting that it was his main residence according to naïve Medieval logic.

Thus there are, in fact, three castles on the map: one real and two imagined. There is the earthly citadel of Castello Aragonese (Fig. 10), the devilish volcanic and epoymous fortress of Vulcan (Fig. 13) and the heavenly spires of God's castle in the sky, seen among the clouds, where those who perished have ascended enroute from Lipari to Ischia (Fig. 14).



Figure 14. The heavenly castle seen among the clouds enroute between Lipari and Ischia.

Fig 14. shows a representation of heaven as a castle in the sky, where the deceased are imagined to travel. The annotation reads ***o'ména omor na (the direction of death's flight)*** clearly demonstrating the Christian belief in a celestial afterlife.

The remainder of the map is given over to telling the story of the rescue mission, and is not discussed here, even though it is undoubtedly very interesting and valuable from the historic and humanistic points of view, as is the rest of the manuscript. Of course, much of the detail about the hazards has comparative value for cross-referencing today. All of the geological features still exist but have dynamically altered in the 600 years since the map was created, so the significance to volcanologists is self-evident. For example, Ischia volcano and Vulcanello are both currently dormant and Vulcano has a mildly crater.



Figure 15. Map to show the true geography of the Tyrrhenian Sea, with Ischia to the north and the Aeolian Islands (inc. Vulcano, Vulcanello and Lipari) to the south.

The image in Fig. 15 shows the true distance between Ischia and the Aeolian Islands. The cartographer of the Medieval map used creative licence to contract the Tyrrhenian Sea for the sake of the square format.



Figure 15. The island of Ischia, showing the positions of Ischia volcano and the citadel of Castello Aragonese, as illustrated in vignettes B and C.

The image in Fig. 15 shows that Ischia volcano was a dominant part of the landscape seen from the citadel of Castello Aragonese, and slightly to the left, as shown on the map.



Figure 16. The islands of Vulcano, Vulcanello and Lipari, showing the volcanoes of Vulcano and Vulcanello, and the port of Lipari, as illustrated in vignettes A and D.

The image in Fig. 16 shows the islands of Vulcano, Vulcanello and Lipari rotated clockwise by approximately 90° as they are seen on the Medieval map to suit the square format. At that time, Vulcanello was a new and separate island.

All of the words translated here can be easily located, either among the modern Romance languages (Aragonese, Catalan, French, Galician, Italian, Occitan, Portuguese, Romanian, Spanish, etc.) or in Latin. The language of the manuscript is described as proto-Romance, because it developed from spoken Latin across the Mediterranean, following the collapse of the Roman Empire, and then became sequestered differently into the various Romance languages as they continued to evolve during the Renaissance. The alphabet used in the manuscript is related to modern Italics, as it runs from a to z, but many symbols have different graphic origins and they also serve as their own punctuation. It was a local writing system that failed to catch on, among others, when written communication became standardized on mainland Italy in the 15th century.

Map text symbol to Italic conversion key.			
Symbol	Italic	Symbol	Italic
ᾳ	a (trapped)	ᾳ	a (free)
ᾳω	ais	ᾳω	aus
ᾳ	æ (ae, a, e, i)	ᾳ	d
ϲ	e (short)	ϲϲ	e'e (intonation)
ϲτ	é/œ (long)	ϲ	i
ӏ	l (ll)	ӏӏ	ele (elle)
ӏӏ	m (mm)	ӏӏ	eme (emme)
ӏ	n (nn)	օ	o
ӏ	p (pp)	ӏӏ	epe (eppe)
ӏ	qu	ӏӏ	eque
ӏ	r (rr)	ӏ	s/z (ss, zz)
ӏӏ	s/z (ss, zz)	ӏ	sa/za
ӏ	t (tt)	ӏ	ta
ւ	u	ւււ	v, f, fv, ph, pv

Figure 17. Key table for converting the map annotation symbols into familiar Italics in order to decipher the text into proto-Romance.

Conclusion.

It seems reasonable to conclude that the hazard map was based on eyewitness information and that its creation was prompted by the significance of the eruption in forming a new volcanic island, as well as the rescue mission it set in motion.

Although Medieval understanding of volcanic activity was determined largely by belief system, in the absence of scientific knowledge and mindset, the cartographer has included some surprisingly detailed observation, clearly indicating that the map was intended to provide hazard information in addition to the narrative.

The map provides an interesting combination of factual observation and imagined cause. The geological events are attributed to the malevolence of their Pagan god Vulcan, whilst the survival of the victims is attributed to the benevolence of their Christian god. Thus, the theme is one of good against evil in their eyes, rather than a pragmatic scientific apprehension.

And yet, the map provides scientific detail because it was practical information for the safety of anyone who might find themselves in the vicinity. As such, it can be considered the earliest known volcanic hazard map and may well have been used as such for a number of years before Queen Maria relocated to Spain and the manuscript was left on the shelf at Castello Aragonese, only to embark on its own journey of adventure in centuries to come.

Copy of map.

In order to retrieve a high resolution version of the manuscript map *Tabula regio novem*, download jpg file No. 158 from Download Options (bottom-right) at this link: <https://archive.org/details/voynich>