

TEXTS, STORMS, AND THE THERA ERUPTION*

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*Had the fierce ashes of some fiery peak
Been hurl'd so high they ranged about the globe?
For day by day, thro' many a blood-red eye . . .
The wrathful sunset glared.*

Tennyson, *St. Telemachus* (1892)

I. INTRODUCTION

TOWARD the end of the Aegean Bronze Age, after 15,000 years of quiescence, the volcano on the Cycladic island of Thera (Santorini) erupted with tremendous violence. Tons of volcanic debris completely buried the island's settlements. One of these, on the southern coast near the modern village of Akrotiri, was rediscovered in 1967.¹ As at Pompeii, thick ash deposits had effectively preserved a wealth of architecture, wall paintings, and small finds, giving rise to an important new field of Aegean Bronze Age art and archaeology. Prime among current Thera issues is debate over the eruption's absolute date, whose ultimate determination may have far-reaching historical implications.² Our inquiry offers a contribution to ongoing chronological discussions by suggesting that at least one datable text from Egypt recorded the effects of this cataclysmic eruption.

The Thera volcano lies midway along the Hellenic volcanic arc curving across the Aegean from the Saronic Gulf to the Anatolian coast just north of Rhodes. Beginning over

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TAW I C. Dumas, ed., *Thera and the Aegean World I* (London, 1978).

TAW II Idem, ed., *Thera and the Aegean World II* (London, 1980).

TAW III: 2 D. A. Hardy, J. Keller, V. P. Galanopoulos, N. C. Flemming, and T. H. Druitt, eds., *Thera and the Aegean World III*, vol. 2, *Earth Sciences* (London, 1990).

TAW III: 3 D. A. Hardy and A. C. Renfrew, eds., *Thera and the Aegean World III*, vol. 3, *Chronology* (London, 1990).

¹ For primary publication of the material, see S. Marinatos, *Excavations at Thera*, vols. 1-7 (Athens, 1968-76); Dumas, *Thera: Pompeii of the Ancient Aegean* (London, 1983); idem, *The Wall-Paintings of Thera* (London, 1992).

² Recent presentations of the relevant Thera evidence, with complete bibliography of previous work, include the Third Thera Congress papers in TAW III: 3; S. W. Manning, "The Thera Eruption: The Third Congress and the Problem of the Date," *Archaeometry* 32 (1990): 91-100; M. J. Aitken, H. N. Michael, P. P. Betancourt, and P. M. Warren, "The Thera Eruption: Continuing Discussion of the Dating," *Archaeometry* 30 (1988): 165-82; J. D. Muhly, "Egypt, the Aegean and Late Bronze Age Chronology in the Eastern Mediterranean," *Journal of Mediterranean Archaeology* 4 (1991): 235-47; and Manning, "Response to J. D. Muhly on Problems of Chronology in the Aegean Bronze Age," *Journal of Mediterranean Archaeology* 4

a million years ago, a dozen large-scale eruptions transformed Thera into an island the shape of a backwards C enclosing one or two calderas.³ Then, in the Late Bronze Age, the volcano exploded in one of the largest European eruptions of the past 100,000 years, fragmenting the northern part of the island and creating the present caldera. Extensive volcanological analyses, coupled with the latest findings in plate tectonics, have yielded general agreement on the sequence and magnitude of what occurred.⁴

II. THE BRONZE AGE ERUPTION

An earthquake, caused by plates shifting under the Aegean, probably set the Bronze Age eruption in motion.⁵ A few months to two years later, a small precursory ash fall heralded the dramatic, Plinian phase of the eruption, during which a column of pulverized magma shot 30 or 35 km into the air. The Aegean flowed into the crater and over the exposed magma in the vent, whereupon the eruption increased greatly in violence. Fresh volcanic material surged out laterally, succeeded by horizontal flows of gas-rich clouds laden with ash, pumice, and blocks. The entire eruption took eighteen hours at a minimum, more likely lasting several days. The accompanying atmospheric disturbances included periods of darkness, wind, lightning, rain, and deafening noise.

Of the 20 to 30 cu. km of ejecta, most was deposited locally. Winds and sea currents carried the rest eastward and southward, with significant accumulations (10–30 cm), as well as wave damage, mainly in the area of Kos, Rhodes, and the neighboring Anatolian coast.⁶ Probably the most serious wide-range environmental effect was a drop in surface temperature over much of the northern hemisphere, due to the volume of gases released into the atmosphere. This volcanic aerosol formed a stratospheric screen of sulphuric acid particles, which may have absorbed and reflected back solar radiation for as long as several years before dispersing.⁷ In addition, lower level filters of suspended silicate ash par-

(1991): 249–62. For absolute and relative chronology in the rest of the Aegean, see P. Warren and V. Hankey, *Aegean Bronze Age Chronology* (Bristol, 1989).

³ U. Eriksen, W. L. Friedrich, B. Buchardt, H. Tauber, and M. S. Thomsen, "The Stronghyle Caldera: Geological, Palaeontological and Stable Isotope Evidence from Radiocarbon Dated Stromatolites from Santorini," *TAW* III: 2, pp. 139–50.

⁴ See J. Keller's summary of the evidence presented at the Third Congress, *TAW* III: 2, p. 486, especially his remarks on remaining areas of disagreement.

⁵ For detailed descriptions of the main Thera eruption phases (Plinian, base surge, and ash flow), see H. Pichler and W. L. Friedrich, "Mechanism of the Minoan Eruption of Santorini," *TAW* II, pp. 15–35; F. W. McCoy, "The Upper Thera (Minoan) Ash in Deep-sea Sediments: Distribution and Comparison with Other Ash Layers," *TAW* II, pp. 57–78; D. M. Pyle, "New Estimates for the Volume of the Minoan Eruption," *TAW* III: 2, pp. 113–21; L. Wilson, "Energetics of the Minoan Eruption," *TAW* I, pp. 221–28, and "Some Revisions," *TAW* II, pp. 31–35.

⁶ H. Sigurdsson, S. Carey, and J. D. Devine, "Assessment of Mass, Dynamics, and Environmental

Effects of the Minoan Eruption of the Santorini Volcano," *TAW* III: 2, pp. 100–112.

⁷ Recent findings have called into question the traditional model of volcanic and other sulfate aerosols causing global cooling: R. J. Charlson and T. M. L. Wigley, "Sulfate Aerosol and Climate Change," *Scientific American* 270/2 (1994): 48–57. As for the Thera aerosol, the latest estimates vary on the amount of sulfur produced by the eruption, but it may have been relatively low per total volume of ejecta, like Katmai (1912) and Krakatau (1883) (Sigurdsson, Carey, and Devine, "Assessment" and Pyle, "New Estimates"). Manning cautions that these may be underestimates because the geological record is unlikely to preserve the highly soluble anhydrite, "which seems to be a key indicator of the high-sulphur content of the magma... [so] the true scale of the sulphur yield remains a mystery" ("Thera, Sulphur, and Climatic Anomalies," *Oxford Journal of Archaeology* 11 [1992]: 245–53). For general discussion of the many possible causes for global temperature drops, see H. and E. Stommel, *Volcano Weather: The Story of 1816, the Year without a Summer* (Newport, Rhode Island, 1983).

ticles produced visually impressive atmospheric phenomena for several years, particularly in Thera's general latitude.

Using a figure of 30 cu. km of ejected material, geophysicists have assigned this eruption a 6.9 on the Volcanic Explosivity Index (VEI), a logarithmic scale similar to the Richter one for earthquakes.⁸ The most comparable recent eruptions occurred in the Indonesian archipelago at Tambora in 1815 (VEI 7) and Krakatau in 1883 (VEI 6.3).

III. THERA OBSERVED

Many scholars have proposed that memories of the Thera eruption were preserved in later mythohistorical accounts, wherein composite descriptions of natural disasters usually served propagandistic, moralistic, or pseudohistorical purposes. Persistently cited texts with supposed Thera inspiration include: the Atlantis legend, the story of Deucalion and the flood, episodes in the tale of the Argonauts, the passages about the Phaiicians' fate in the *Odyssey*, and Egyptian and biblical lamentations.⁹ Evaluation of whether or not the Thera eruption directly influenced these or any other literary remembrances is beyond the scope of this paper.

Instead, our interest here lies in identifying any surviving documentary evidence bearing on the Bronze Age eruption. Of greatest chronological value would be texts from the late seventeenth to the end of the sixteenth centuries B.C., the range within which the posited eruption dates fall. Unfortunately, there are almost no extant historical texts from this period, neither from Egypt nor Mesopotamia, the best potential sources for contemporaneous written records. In Egypt, this is the end of the Second Intermediate Period and the rise to power of the Theban brothers Kamose and Ahmose, who expelled the Hyksos and founded the Eighteenth Dynasty of the New Kingdom. In Mesopotamia, this is the end of the Old Babylonian period, with the Hittites' sack of Babylon about 1595 B.C. ushering in a century with almost no historical material.

Despite the paucity of contemporaneous documentation, we suggest that relevant texts do exist. In searching for them, we have been guided by three classes of textual and conceptual models: (1) detailed accounts of the analogous Tambora and Krakatau eruptions and their aftereffects, (2) reports on subsequent Thera eruptions, and (3) ancient Near Eastern observations of volcanoes and other remarkable natural phenomena.

After Tambora erupted on 10 April 1815, numerous far-flung correspondents reported unusual sights and sounds, though their connection with the eruption was often not recognized. Journals, ship's logs, and letters described such phenomena as midday darkness two days later and 500 km distant; detonations heard 1,600 km away; and severe earthquakes over a wide area.¹⁰ The following year was unusually cold and rainy, in New England the "year without a summer." Across the northern hemisphere, intensely colored sunsets caused comment for several years.

By the time of Krakatau's eruption on 27 August 1883, technological advances, especially in telegraphic communication and photography, had greatly improved the ability to coordinate worldwide observations of atypical phenomena. As a result, it was possible to

⁸ R. W. Decker, "How Often does a Minoan Eruption Occur?" *TAW* III: 2, pp. 444-52, with tabulated information on worldwide explosive eruptions.

⁹ See J. V. Luce, *The End of Atlantis: New Light on an Old Legend* (London, 1969), for concise discussion of the Platonic passages and other texts involved.

¹⁰ *Planet Earth: Volcano* (Alexandria, Virginia, 1982), pp. 58-60, with textual and visual documentation for Tambora's eruption. See also Stommel and Stommel, *Volcano Weather* for observations in New England.

collect an unprecedented amount of data on this eruption and its immediate aftereffects.¹¹ These included total darkness experienced for two days 160 km away; explosions heard 4,653 km across the Indian Ocean; sun and moon appearing blue and green through volcanic particle filters; and sunsets so vividly red that fire alarms were sounded in New England. Over the next three to five years, global temperatures dropped on the average ½° C., while brilliant sunsets (Tennyson's "blood-red eye"), halos, coronas, and other atmospheric manifestations captured artistic and popular imagination.

No Thera eruptions in Classical and later periods approached the scale of the Bronze Age cataclysm. Nevertheless, accounts of these smaller eruptions provide a useful basis for extrapolation. In 197 B.C. "fires broke forth from the sea," the geographer Strabo wrote, "and continued for four days, so that the whole sea boiled and blazed."¹² The Byzantine chronicler Theophanes interpreted the A.D. 726 eruption as a sign of divine displeasure over Leo III's iconoclasm, since pumice reached the Macedonian and Anatolian coasts.¹³ The 1650 eruption occasioned reports of thunderous noises and fires visible from Crete.¹⁴ During a minor eruption in 1867, an English journalist on Crete saw smoke by day and fires by night along the northern horizon.¹⁵

Throughout the ancient Near East, careful attention was devoted to extraordinary natural phenomena,¹⁶ ranging from meteorites¹⁷ to oddly shaped flint nodules.¹⁸ As for volcanoes, the earliest known landscape, a wall painting from Çatal Hüyük, depicts a closely rendered Strombolian eruption with ash cloud rising above showers of spasmodically ejected bombs and blocks.¹⁹ Textual references to volcanoes and their attributes include such mentions as a "Starry Mountain" in the Khabur region, perhaps Kawkab, likely so named because of the way its lava flows emanate in a raylike pattern from its peak.²⁰

It follows that a volcanic event of Thera's magnitude should figure in Egyptian and Mesopotamian records. Study of the Tambora, Krakatau, and later Thera observations shows that we should not expect to find texts describing the actual eruption, but rather mention of one or more of the most spectacular volcanic aftereffects: daytime darkness, thunderous noises, atmospheric disturbances, and vividly colored skies, especially at sunset over a period of several years.

¹¹ See T. Simkin and R. S. Fiske, *Krakatau 1883: The Volcanic Eruption and Its Effects* (Washington, D.C., 1983), esp. pp. 154–59, 395–418, and color pls. 9–14, for descriptions and images of the atmospheric phenomena produced.

¹² Dumas, *Thera: Pompeii of the Ancient Aegean* (London, 1983), p. 15. The standard guide to Classical and later eruptions remains F. Fouqué, *Santorin et ses éruptions* (Paris, 1879).

¹³ Dumas, "Eruptions of the Santorini Volcano from Contemporary Sources," *TAW* I, pp. 819–20.

¹⁴ *Ibid.*, pp. 820–22.

¹⁵ S. Hood, "Traces of the Eruption Outside Thera," *TAW* I, p. 686.

¹⁶ Most recently on this, see D. J. W. Meijer, ed., *Natural Phenomena: Their Meaning, Depiction and Description in the Ancient Near East* (Amsterdam, 1992).

¹⁷ J. K. Bjorkman, *Meteors and Meteorites in the Ancient Near East* (Tempe, 1973).

¹⁸ B. J. Kemp, *Ancient Egypt: Anatomy of a Civilization* (London, 1989), p. 72 and fig. 24:9. One is reminded here of the hundreds of pumice lumps, each in

a conical cup, found with cultic paraphernalia at Nirou Khani, a Minoan site on the northern coast of Crete (Hood, "Traces," pp. 681–90); other evidence for pumice in Minoan cult comes from Zakro and Palaikastro.

¹⁹ J. Mellaart, *Çatal Hüyük: A Neolithic Town in Anatolia* (London, 1967), pp. 176–77 and pls. 59–60.

²⁰ A. Catagnoti and M. Bonechi, "Le volcan Kawkab, Nagar et problèmes connexes," *N.A.B.U.*, June 1992, pp. 50–53. We are grateful to Harvey Weiss for his description of Kawkab's present appearance as well as for reference to L. Dillemann's topographic guide to the volcanoes and other physical features of northern Mesopotamia: *Haute Mésopotamie orientale et pays adjacents* (Paris, 1962). Catagnoti and Bonechi's proposal to identify Sargonic Kakkaban with a settlement near Mt. Kawkab raises the possibility that the mountain itself could be a theophoric element in the name Ila-kakbabū, the father of Shamshi-Adad. For bibliography on this name and other instances of *kakkabu* in personal names, presumably simply meaning there "star," see I. J. Gelb, *Computer-aided Analysis of Amorite*, As-

IV. THE TEMPEST STELE OF AHMOSE

During the reign of Ahmose, founder of Egypt's Eighteenth Dynasty, a highly destructive storm occurred. To commemorate his reconstruction efforts, Ahmose erected a stele at Thebes, which was subsequently used as fill in the Karnak Temple's Third Pylon.²¹ On both sides of the stele, Ahmose recounts first the meteorological phenomena and devastations, then the restorations he undertook (see Appendix A, pp. 11–12 below). While sudden and violent storms were a recurrent feature in ancient Egyptian life and literature, only the Ahmose stele details such severe catastrophe: bellowing noise, darkness, torrent so that no torch could be lit, houses washed into the river and bobbing like boats, chapels, tombs, and temples damaged, collapsed, or reduced to "that which was never made" (l. 18). The remarkable nature of the event is stressed by the text itself, which attributes the disaster to divine displeasure (ll. 7–8), while yet declaring that it is greater than divine wrath and exceeds the gods' plans (l. 12).

Davis has drawn attention to the possible relevance of this text to the Thera eruption.²² Her reliance on Vandersleyen's original publication, however, has perpetuated his view of the storm as a localized Theban affair, which would rule out its being part of the Thera event. Vandersleyen based this interpretation upon his personal experience of typically localized storm patterns in modern Egypt.²³ Textual references that did not correspond to this interpretation were consciously emended in translation.

Three passages in the text explicitly extend the devastation to the entire country, not just the Theban area, and merit reconsideration in the light of the stele's potential importance as an eyewitness account of the aftereffects of the Thera eruption.

Line 12 *n šḥd.n tk3 ḥr t3.wy*

Ritner: "while a torch could not be lit in the Two Lands"

Vandersleyen: "sans qu'on puisse allumer de torche nulle part"

Davis: "with no one able to light the torch anywhere"²⁴

Although the text states explicitly that darkness extended to both halves of the Egyptian kingdom ("the Two Lands"), Vandersleyen chose to interpret the final phrase figuratively, despite the fact that *ḥr t3.wy* is not a standard Egyptian expression for "anywhere" (*bw nb, s.t nb.t*, etc.). Vandersleyen's critical note is instructive: "litt.: 'dans les deux terres'. Comme l'événement paraît très localisé et que la stèle est pauvre en hyperboles, la traduction explicite: 'dans toute l'Égypte' ne s'impose pas."²⁵ Here Vandersleyen has allowed

syriological Studies, no. 21 (Chicago, 1980), p. 304; H. B. Huffmon, *Amorite Personal Names in the Mari Texts: A Structural and Lexical Study* (Baltimore, 1965), p. 220. Sargonic and later northern Mesopotamian parallels for geographical features in Semitic name-giving have been discussed by W. G. Lambert, "The God Aššur," *Iraq* 45 (1983): 84–85. On the other hand, I. J. Gelb in L. Cagni, ed., *La lingua di Ebla* (Naples, 1981), p. 15, prefers "ʿIla (god) is his star."

²¹ C. Vandersleyen, "Une tempête sous le règne d'Amosis," *Revue d'Égyptologie* 19 (1967): 123–59 and idem, "Deux nouveaux fragments de la stèle d'Amosis relatant une tempête," *Revue d'Égyptologie* 20 (1968): 127–34.

²² E. N. Davis, "A Storm in Egypt during the Reign of Ahmose," *TAW* III: 3, pp. 232–35.

²³ Vandersleyen, "Une tempête," pp. 155–56.

²⁴ *Ibid.*, p. 133; Davis, "A Storm in Egypt," p. 232. For the common use of the preposition *ḥr* (literally, "on") in expressions for "in Egypt," see *Wb.* III, p. 131/28. In this and the following passages under discussion, textual commentary is limited exclusively to the few points of disagreement with published translations. For all other textual matters, the reader should consult the thorough analysis in the original publications by Vandersleyen.

²⁵ Vandersleyen, "Une tempête," p. 140, textual note 24.

his interpretation to determine his text, even while granting that the stele's literal wording is significant, being "poor in hyperbole."

Line 15 *wn-in hm=f hr smn.t t3.wy . . . hr smn.t s.t m hḏ.w . . .*

Ritner: "Then His Majesty began to re-establish the Two Lands . . . to provide them with silver. . . ."

While both Vandersleyen and Davis here retain the explicit mention of "the Two Lands,"²⁶ the former's critical note suggests that the reference should be an otherwise unattested designation of the "two banks" of the Nile at Thebes, "puisque les événements semblent assez localisés."²⁷

Line 18 *ḥ^c.n wḏ.n hm=f srwd r.w-pr.w nty.w w3 r ḏ^cm (?) m t3 pn r ḏr=f*

Ritner: "Then His Majesty commanded to restore the temples which had fallen into ruin in this entire land."

Again, Vandersleyen and Davis maintain the phrase "in this entire land," though its significance is denied in the critical apparatus.²⁸ As in line 12, the clear reference to the entire country is reinterpreted as an expression for "anywhere": "Etant donné le caractère très localisé des pluies d'orages en Egypte, *t3 pn r ḏr=f* doit représenter un adverbe général: 'partout', plutôt qu'une hyperbole étendant le désastre à toute l'Egypte."²⁹

Because Vandersleyen knew that contemporary storms are localized in Egypt, the real wording of the text seemed unacceptable hyperbole. In each of these three passages, however, this assumption has resulted in forced translations of quite common phraseology. Nothing in the text corroborates the supposedly "local" character of the storm. Since the king was en route to Thebes when the storm struck (l. 14) and the stele was subsequently erected in that city, it is hardly surprising that modern commentators would have fixed the tempest in that region. The recorded movements of the king in "Thebes and an area not far to the north" have been conflated with the assumed path of the storm. Thebes, however, is mentioned only once in the text. In contrast, the passages here re-analyzed specifically indicate the storm's widespread nature, occasioning meteorological disturbances (l. 12), damage (l. 18), and restoration (ll. 15, 18) throughout the entirety of Egypt. Such a situation would be well beyond common experience and would explain the otherwise unique phraseology of the stele and the motivation for its erection. The "hyperbole" of the Egyptian stele derives directly from the remarkable nature of the historical events that it details.³⁰

The widespread nature of these events further refutes a recent suggestion by Goedicke, who would link the storm with the Thera eruption but localize its effects in the eastern Delta on the basis of the disputed place where Ahmose is residing at the opening of the

²⁶ Ibid., p. 142; Davis, "A Storm in Egypt," p. 233.

²⁷ Vandersleyen, "Une tempête," p. 143, textual note 36.

²⁸ Ibid., p. 145; Davis, "A Storm in Egypt," p. 233. The term generally read *w3s*, "ruin," is here accompanied by a phonetic complement "m," indicating either a distinct term or an abusive spelling deriving from

ḏ^cm, "electrum." For the reading, see *Wb.* V, p. 539 and the commentary in Vandersleyen, "Une tempête," p. 148, textual note 53.

²⁹ Vandersleyen, "Une tempête," pp. 148–49, textual note 54.

³⁰ Hyperbole is certainly encountered in royal monuments, but Egyptian hyperbole is typically stereo-

narration.³¹ Goedicke's suggestion that this represents the harbor of Avaris is otherwise untenable; a realignment of stele fragments places the supposed Delta locality of *Sdf³-t3.wy*, "south of Dendera," in Upper Egypt.³²

A new mention of the text by Manning underscores the significance of our retranslation for a proper evaluation of the stele.³³ Relying upon inaccurate interpretation, Manning briefly dismisses the events of the text as purely Theban and thus lacking "direct association" with Theran events.³⁴ Further, he wrongly assumes that the references to flooding are related to the inundation and thus to distant storms in the equatorial monsoonal rainbelt.³⁵ As is now evident, the flooding was the direct result of unprecedented rainfall extending throughout all of Egypt itself.

Once the storm is recognized as a national catastrophe, in conformity with the Egyptian wording, the potential connection with the Thera eruption is greatly strengthened. This linkage is underscored by Ahmose's meteorological descriptions, including pervasive darkness, unusual skies, and tremendously loud noises. In addition, as part of his restoration efforts, he mentions replacing sacred items, reenclosing sanctuaries, and reerecting fallen statues and offering tables. These actions may imply that earthquakes were among other calamities surely listed in the now-missing portions of the stele. In our view, the Tempest Stele of Ahmose provides a near-classic eyewitness report of the effects of an eruption of Thera's magnitude.

V. MESOPOTAMIAN SOURCES

We know of no surviving, contemporaneous Mesopotamian counterpart to the Ahmose stele. There are, however, a number of references to atmospheric phenomena, which, we suggest, are entirely consistent with the spectrum of volcanic aftereffects, especially those lasting several years. They occur in Sumerian literary contexts from the end of the third millennium, in Akkadian omen collections of uncertain date, and in scattered Akkadian literary contexts (see Appendix B, pp. 12–14 below). The phenomena noted include: sunset skies fiery red, as though ablaze; lunar and solar halos;³⁶ and fiercely glowing skies associated with earthquakes, darkness, and storms. Though, for the most part, the omens treating atmospheric phenomena are from late periods, some may well bear witness to earlier events.³⁷ Unfortunately, it is not possible to link any observations

typed, employing customary clichés. In sharp contrast, the details recounted by the Ahmose stele are unique, and this very unconventionality lends credence to the historical validity of the text.

³¹ H. Goedicke, "The Chronology of the Thera/Santorini Explosion," *Ägypten und Levante* 3 (1992): 60–61.

³² W. Helck, *Historisch-biographische Texte der 2. Zwischenzeit und neue Texte der 18. Dynastie*, 2d ed. rev. (Wiesbaden, 1983), p. 104. Vandersleyen had initially suggested an identification with Deir el-Ballas; see idem, "Une tempête," pp. 151–53.

³³ S. W. Manning, *The Absolute Chronology of the Aegean Early Bronze Age* (Sheffield, 1995), Appendix 7, pp. 200–216.

³⁴ Ibid., pp. 205–6 and 214–15.

³⁵ Ibid., pp. 206 and 215. Contra Manning, p. 215, the loud noises are not "only symbolic."

³⁶ Translated from earlier Babylonian prototypes, similar omens describing the effects of lunar halos survive even in Demotic Egyptian texts of the second century A.D. (R. A. Parker, *A Vienna Demotic Papyrus on Eclipse- and Lunar-Omina* [Providence, 1959]).

³⁷ On this genre of omen texts, see J. Bottéro, "Symptômes, signes, écritures en Mésopotamie ancienne," in J. P. Vernant et al., *Divination et rationalité* (Paris, 1974), pp. 100–103; S. M. Moren, "The Omen Series Šumma Alu: A Preliminary Investigation," (Ph.D. diss., University of Pennsylvania, 1978); A. L. Oppenheim, *Ancient Mesopotamia: Portrait of a Dead Civilization* (Chicago, 1977), pp. 224–25. On the trustworthiness of using other genres of omen

of volcanic aftereffects, if such they be, with specific eruptions. We hazard further speculation, nevertheless, that embedded in some of these texts may lie records of the Thera eruption, which was, after all, the major volcanic event of its place and time.

In 197 B.C., Thera exploded again, less violently, occasioning mention by Strabo, Seneca, Plutarch, Pausanias, Eusebius, and other Classical authors, who seem to have based their accounts on now-missing eyewitness documents or on local oral traditions.³⁸ We propose that the Babylonian astronomical diaries may afford the only extant, contemporaneous record of the aftereffects of this eruption. In February and March of 197 B.C., Babylon experienced exceptional weather: storms, heavy rains, flooding of the Euphrates, dense fog, and solar and lunar halos.³⁹ Was the culprit Thera? If so, the diaries provide independent corroboration of the eruption date, hitherto fixed by three converging strands of textual evidence in the Classical sources.⁴⁰ More significantly from our point of view, the diaries apparently record volcanically produced atmospheric phenomena. This greatly strengthens the case for Mesopotamian observation of the aftereffects of the cataclysmic Bronze Age eruption.

VI. CHRONOLOGICAL IMPLICATIONS

The absolute date of the Thera eruption is still undetermined, with the two main contenders about a century apart. The later, so-called traditional date is based chiefly on ceramic sequences and Egyptian synchronisms, yielding 1500 B.C. as a *terminus ante quem*, and 1535–1525 B.C. currently deemed the most likely decade.⁴¹ The earlier, revi-

texts for historical purposes, see J. J. Finkelstein, "Mesopotamian Historiography," *Proceedings of the American Philosophical Society* 107 (1963): 461–72, wherein he argues (p. 463) that they "take precedence both in time and in reliability over any other genre of Mesopotamian writing that purports to treat of the events of the past." E. Reiner cautions that "such historical omens have their relevance for the Mesopotamian scene, yes, but as 'historiettes', not history" ("New Light on Some Historical Omens," in *Anatolian Studies Presented to Hans Gustav Güterbock on the Occasion of His 65th Birthday* [Istanbul, 1974], p. 261). J. Cooper goes further, asserting that most apodoses seem "historically groundless" ("Apodotic Death and the Historicity of 'Historical Omens,'" in B. Alster, ed., *Death in Mesopotamia* [Copenhagen, 1980], p. 102, with full references to earlier scholarship on the issue); skeptical assessment also by M. Liverani in *Akkad, the First World Empire: Structure, Ideology, and Tradition* (Padua, 1993), p. 44.

³⁸ Fouqué, *Santorin*, pp. 1–6, with translations and discussion; see also n. 12 above.

³⁹ We are grateful to Robert Biggs for suggesting that we look at the diaries; Alice L. Slotsky kindly analyzed the records for volcano weather and discussed numerous points. For translations of the relevant entries, see A. J. Sachs and H. Hunger, *Astronomical Diaries and Related Texts from Babylonia* (Vienna, 1989), pp. 247–53 (SE 114). We should also note that the diary (SE 129) for the winter and early spring of

183 B.C. reports overcast skies followed by severe cold, perhaps caused by the eruption of the eponymous Vulcano in Italy.

⁴⁰ Evaluated in Fouqué, *Santorin*, pp. 1–6: (1) Strabo says the Rhodians "who were then in control of the sea" (ca. 197 B.C.) were the first to explore and build a temple on the new Thera island created by the eruption; (2) Plutarch regards the eruption and newly formed island as the fulfillment of an oracle foretelling unusual natural events when the Trojan descendants, i.e., the Romans, conquered their adversaries, in this instance the Macedonians, whose loss at the battle of Cynoscephalae in 197 B.C. put Greece under Roman control; and (3) Eusebius, who places the eruption in the third to fourth year of the 145th Olympiad, or 197 B.C. Of these linkages, neither Strabo's nor Eusebius's permits assignment of the eruption month. As for Plutarch's, the causal connection may have been compressed to fit his propagandistic purpose, since the Second Macedonian War began in 200 B.C., the first peace overture was early in 198 B.C., the decisive battle in 197 B.C., and the treaty passed by the Senate in 196 B.C. (M. Cary, *A History of Rome* [London, 1962], pp. 200–203). We thank Victor Bers for guidance in Classical matters.

⁴¹ P. Warren, "Further Arguments against an Early Date," *Archaeometry* 30 (1988): 176–79; Warren and Hankey, *Aegean Bronze Age Chronology*, p. 215; Muhly, "Chronology."

sionist date is based on data from radiocarbon and Aegean and East Mediterranean dendrochronological samples, ice-cores, bristlecone pine frost rings, and Northern Irish bog oak rings.⁴² These point with some consistency to the 1630–1620 B.C. decade for hemispherewide climatic disturbance and volcanic ash fall, putatively caused by Thera.⁴³

The complexity of the issue is well illustrated in the most recent survey by Manning, who acknowledges that on the basis of new calibration data “the whole mid-16th century B.C. is now more attractive to the radiocarbon ages known from Thera.”⁴⁴ Manning, however, prefers a seventeenth century B.C. date as the “working hypothesis,”⁴⁵ while admitting that “a lower, mid-16th-century-B.C. date for the eruption, and the close of the LMIA period, remains also as a reasonable possibility.”⁴⁶

The Tempest Stele of Ahmose may contribute to the ultimate resolution of this issue. According to high Egyptian chronology, Ahmose ruled 1550–1525 B.C.; low chronology puts him at 1539–1514 B.C.⁴⁷ As Vandersleyen has pointed out, the stele must have been carved before Ahmose’s year 22, since his name was written differently during the last three years of his reign.⁴⁸ Thanks to recent archaeological work at the Hyksos capital of Avaris (Tell ed-Daba^ca) in the eastern Delta, we may now be able to date more narrowly the stele and, in turn, the Thera eruption.

Between years 11 and 15, Ahmose destroyed the Hyksos palace, which had been built about 1560 B.C. New excavations have revealed that it had wall paintings with Aegean stylistic and iconographical features.⁴⁹ Hundreds of these fresco fragments have been recovered from a garden, scattered among debris accumulated from the time of Ahmose to the reign of Amenhotep II. Within the same post-Hyksos stratigraphic horizon, excavations

⁴² P. I. Kuniholm, “Overview and Assessment of the Evidence for the Date of the Eruption of Thera,” *ZAW* III: 3, pp. 13–18, with complete references and evaluations of each category of data. Add now the latest Greenland ice-core: G. A. Zielinski et al., “Record of Volcanism since 7000 B.C. from the GISP2 Volcano-Climatic System,” *Science* 264 (1994): 948–52 (suggested Thera date 1623 B.C., with caveats). The authors emphasize (951 and personal communication) that any matching between ice core sulfate concentrations and eruptions before 1 B.C. is tentative. M. Rose’s report that this new ice-core “has confirmed an early date” is overly optimistic and disregards the caveats noted above (“Revising Bronze Age Chronology,” *Archaeology* 48:1 [1995]: 20).

⁴³ Possible corroboration comes from the Chinese Bamboo Annals, which report in epigrammatic style odd atmospheric phenomena and summer frosts at the beginning of the Shang Dynasty; this linkage depends on taking 1620 B.C. as the fall of the preceding Xia Dynasty, and on attributing the abnormalities in China to the Thera eruption (K. D. Pang, “Three Very Large Volcanic Eruptions in Antiquity and Their Effects on the Climate of the Ancient World,” *Eos* 66 [1985]: 816). Certainly a major atmospheric disturbance took place in the early seventeenth century B.C., but it was not necessarily brought about by Thera. If the event was indeed volcanically induced and not, say, caused by fluctuations in sunspot activity, the culprit could even have been an eruption in the southern hemi-

sphere. Such is believed to be the case, for instance, with the A.D. 177 Greenland ice-core ash layers, borne there from New Zealand (Sullivan, “Santorini Volcano Ash”). Similarly, in A.D. 536–37, several chroniclers around the Mediterranean reported marked cold and strange atmospheric phenomena, but there are no known European or Near Eastern eruptions then. R. B. Stothers proposes that a volcano in Papua, New Guinea was responsible (“Mystery Cloud of A.D. 536,” *Nature* 307 [1984]: 344–45). On the problems in linking volcanism, climate change, and time, see T. Simkin, “Distant Effects of Volcanism—How Big and How Often?,” *Science* 264 (1994): 913–14.

⁴⁴ Manning, *Absolute Chronology*, p. 200.

⁴⁵ *Ibid.*, p. 214.

⁴⁶ *Ibid.*, and cf. p. 212: “equally likely or indeed more likely.”

⁴⁷ K. A. Kitchen, “The Basics of Egyptian Chronology in Relation to the Bronze Age,” in P. Åström, ed., *High, Middle or Low?: Acts of an International Colloquium on Absolute Chronology*, pt. 1 (Göteborg, 1987), pp. 37–55.

⁴⁸ Vandersleyen, “Deux nouveaux fragments,” p. 132.

⁴⁹ For initial publication of selected fresco fragments, see M. Bietak, “Minoan Wall-paintings Unearthed at Ancient Avaris,” *Egyptian Archaeology* 2 (1992): 26–28. On the historical and art historical implications of this material, see V. Hankey, “Egypt, the Aegean and the Levant,” *Egyptian Archaeology* 3 (1993): 27–29.

have also yielded numerous pieces of rounded pumice, shells, and snails, suggestive of water deposition. Elsewhere in the eastern Delta, cores have produced deposits of volcanic materials that correspond very closely with Thera ejecta in terms of age, size, index of refraction, and chemical composition.⁵⁰

Should analysis of the Tell ed-Daba^c pumice likewise point to its Thera origin, and should the Ahmose stele in fact describe the eruption's wake throughout Egypt, we could then date the Thera eruption and the stele between years 11/15 and 22 of Ahmose: 1539/35–28 B.C. (high) or 1529/24–17 B.C. (low).⁵¹ These dates fit neatly with traditional proposals for the eruption decade. There may even be support from the available radiocarbon data, inasmuch as graphing the probability density for the date reveals a peak at 1619 B.C. and another at 1530 B.C.⁵²

Epigraphic evidence may also favor a date near 1530 B.C. In year 22 of Ahmose, his treasurer Neferperet erected a stele to record the opening of a new quarry for extensive temple constructions throughout Egypt.⁵³ So late in Ahmose's reign, these building projects seem unlikely to have been part of his post-Hyksos program, but rather, we propose, prime among the countrywide restoration efforts hailed in the Tempest Stele (ll. 18–19).

VII. CONCLUSIONS

Many have posed this question: if the Thera eruption was so cataclysmic, why is there no mention of it in texts from neighboring literate areas? As many have answered, the problem is that in both Mesopotamia and Egypt, the eruption occurred inopportunistically during periods for which there is a dearth of historical documentation. Nevertheless, later Mesopotamian omen texts may provide us with indirect glimpses of the spectacular atmospheric phenomena that must have been engendered by Thera. More directly, Ahmose's Tempest Stele of about 1530 B.C., with its straightforward description of storms, darkness, noise, and damage throughout Egypt, may very well stand as an eyewitness account of the Thera eruption. If so, Ahmose not only expelled the Hyksos and founded the Eighteenth Dynasty, but also led Egypt through the greatest volcanic event of the Bronze Age world.

⁵⁰ D. J. Stanley and H. Sheng, "Volcanic Shards from Santorini (Upper Minoan Ash) in the Nile Delta, Egypt," *Nature* 320 (1986): 733–35.

⁵¹ Questionable evidence linking the storm to year 11 of Ahmose is found in the notations on the verso of the Rhind Mathematical Papyrus ("problem" 87, col. III). These dockets record unseasonable thunder and rain on two consecutive days at the very beginning of year 11 of an unnamed ruler, generally assumed to be the last Hyksos ruler Khamudi, less likely Ahmose. See Vandersleyen, *Les guerres d'Amosis*, Monographies Reine Elisabeth I (Brussels, 1971), pp. 34–40; Wolfgang Helck, *Historisch-biographische Texte der 2. Zwischenzeit und neue Texte der 18. Dynastie*, Kleine ägyptische Texte 5 (Wiesbaden, 1975), p. 78, no. 113; and cf. Charles Nims, *Thebes of the Pharaohs* (London, 1965), p. 199, n. 2 (references courtesy of E. Wente).

⁵² Michael and Betancourt, "Further Arguments for an Early Date," pt. 2 in "The Thera Eruption," fig. 3;

see also fig. 4, which charts the probability of the eruption's having occurred before 1550 B.C. (3 in 4) or after 1550 B.C. (1 in 4). At present, the available radiocarbon evidence exhibits "a greater degree of dispersion than one would wish," with a "trend to a date in the 17th century" rather than a statistically unequivocal result (C. Renfrew, "Summary of the Progress in Chronology," *TAW* III: 3, p. 242). Radiocarbon dates expected from material just beneath ash layers at Trianda and Mochlos, should those volcanic deposits prove to be of Thera origin, ought to produce much-needed clarification of the radiocarbon dating picture.

⁵³ Sethe, *Urkunden der 18. Dynastie*, *Urk.* IV/1 (Leipzig, 1906), pp. 24–25; idem, *Urkunden der 18. Dynastie: Übersetzung zu den Heften 1–4* (1914; repr. Berlin, 1984), pp. 13–14; and see also S. Harvey, "Monuments of Ahmose at Abydos," *Egyptian Archaeology* 4 (1994): 5.

APPENDIX A

A NEW TRANSLATION OF THE TEMPEST STELE OF AHMOSE

Robert K. Ritner

This translation follows the revised text edition in Helck,⁵⁴ line numbers following the parallel version on the recto. A damaged scene shows the king, accompanied by a female figure, facing a lost image of Amon-Ra, and offering "foodstuffs, fresh vegetables, and everything that the earth produces."

- (1) [Long live the Horus "Great of Manifestations," He of the] Two Ladies "Pleasing of Birth," the golden Horus "Who Binds the Two Lands," King of Upper and Lower Egypt, Neb-pehty-ra, son of Ra, Ahmose, living forever. Now then, His Majesty came [. . .]
- (2) Ra himself had appointed him to be King of Upper Egypt. Then His Majesty dwelt at the town of Sedjefa-tawy
- (3) [in the district just to] the south of Dendera, while A[mon-Ra, Lord of the Thrones of the Two Lands was] in Thebes. It was His Majesty
- (4) who sailed south to offer [bread, beer, and everything good] and pure. Now after the offering [. . .]
- (5) then attention was given in [. . .] this [district (?)]. Now then, the cult image [of this god . . .]
- (6) as his body was installed in this temple while he was in joy.
- (7) Now then, this great god desired [. . .] His Majesty [. . .] while the gods declared their
- (8) discontent. The gods [caused] the sky to come in a tempest of r[ain], with darkness in the western region and the sky being
- (9) unleashed without [cessation, louder than] the cries of the masses, more powerful than [. . .], [while the rain raged (?)] on the mountains louder than the noise of the
- (10) cataract which is at Elephantine. Every house, every quarter that they reached [. . .]
- (11) floating on the water like skiffs of papyrus opposite the royal residence for a period of [. . .] days,
- (12) while a torch could not be lit in the Two Lands. Then His Majesty said: "How much greater this is than the wrath of the great god, than the plans of the gods!" Then His Majesty descended
- (13) to his boat, with his council following him, while the crowds on the East and West had hidden faces, having no clothing on them
- (14) after the manifestation of the god's wrath. Then His Majesty reached the interior of Thebes, with gold confronting(?) gold for this statue so that he (i.e., Amon-Ra) received that which he desired.
- (15) Then His Majesty began to reestablish the Two Lands, to drain the flooded territories without his [. . .], to provide them with silver, with
- (16) gold, with copper, with oil, and cloth of every bolt that could be desired. Then his Majesty made himself comfortable inside the palace (life! prosperity! health!).

⁵⁴ Helck, *Historisch-biographische Texte*, pp. 104–10.

- (17) Then His Majesty was informed that the mortuary concessions had been entered (by water), with the tomb chambers collapsed, the funerary mansions undermined, and the pyramids fallen,
- (18) having been made into that which was never made. Then His Majesty commanded to restore the temples which had fallen into ruin in this entire land: to refurbish
- (19) the monuments of the gods, to erect their enclosure walls, to provide the sacred objects in the noble chamber, to mask the secret places, to introduce
- (20) into their shrines the cult statues which were cast to the ground, to set up the braziers, to erect the offering tables, to establish their bread offerings,
- (21) to double the income of the personnel, to put the land into its former state. Then it was done in accordance with everything that His Majesty had commanded.

APPENDIX B

VOLCANIC PHENOMENA IN MESOPOTAMIAN SOURCES?

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The purpose of this note is to indicate possibilities of volcanic imagery in Mesopotamian sources, without going into the many problems presented by the passages cited. Even those who have never seen a volcanic eruption may have recourse to volcanic imagery and may, at a distance, transform figurative language derived from volcanic phenomena into terms more familiar from their own environment. For example, Sumerian laments, describing utter destruction of human settlement, refer to "(flaming) 'potsherds'" (*šika bar₇-bar₇*) raining from the sky, "deep shadow(?) of a fiery glow(?)" (*izi gi₆-edin-na*), dust, abnormal darkness and light, and other phenomena suggestive of volcanic activity or its aftermath.⁵⁵ In these sources, "(flaming) 'potsherds' raining down" is usually interpreted as a hailstorm, but even if this proposal could be contextually correct, the origin of the topos may well be a description of volcanic activity that survived in Sumerian literature of the outgoing third millennium B.C. Although the Sumerian passages are far too early for the Thera eruption, they raise the possibility that the aftereffects of some earlier eruption left their imprint on Mesopotamian literature.

Halos around the sun and moon, strangely luminous formations, and the apparently delayed setting of the sun, all phenomena associated with volcanic activity, are amply attested in Mesopotamian sources, especially omen collections.⁵⁶ Omens of solar and lunar halos, for example, are well known from collections from Emar and Boğazköy, derived from Mesopotamian prototypes of early and mid-second millennium B.C.⁵⁷

⁵⁵ These passages have been discussed in brief by P. Michalowski, *The Lamentation over the Destruction of Sumer and Ur* (Winona Lake, Indiana, 1989), p. 79; P. Attinger, "Remarques à propos de la 'Malédiction d'Accad,'" *Revue d'Assyriologie (RA)* 78 (1984): 117, with references to earlier discussions; see further, S. N. Kramer, *Lamentation over the Destruction of Ur*, *Assyriological Studies*, no. 12 (Chicago, 1940), p. 36,

ll. 188 ff.; *CAD*, s.v. *išhilsu*; and A. R. Millard, "The Sign of the Flood," *Iraq* 49 (1987): 63-69.

⁵⁶ Bjorkman, *Meteors and Meteorites*, p. 123.

⁵⁷ M. Leibovici, "Un texte astrologique akkadien de Boghazköi," *RA* 50 (1956): 15; D. Arnaud, *Recherches au pays d'Aštata Emar*, vol. 6, pt. 4 (Paris, 1987), nos. 651 and 653.

Two Akkadian words, *anqullu*, here translated “fiery glare,” and *ašqulātu*, here translated “fiery glow(?),” may, in some instances, refer to the aftereffects of volcanic eruptions, at some point visible in Mesopotamia.⁵⁸ It is usually impossible to date the references, even approximately, but rough dates for the manuscripts that preserve the passages quoted are provided here. The texts may or may not be centuries older than the manuscripts.

1. *Anqullu*, “fiery glare.” This was considered a major occurrence on the order of an eclipse or earthquake, as seen from the subscription of a ritual and prayer (MS eighth century B.C.): (Ritual and prayer to be performed when the king does something and there is) “either [an eclipse of the moon or of the sun or of Venus, or an obscurity(?) . . . or an earthquake or . . . or a fiery glare or a fiery glow(?) . . .”

The “fiery glare” could be connected with a brush or swamp fire, abnormal behavior(?) of wild and domestic animals, and catastrophic mud(?). It could be seen as having terrestrial or celestial origin, and could cover the whole sky, as in the following astrological omens, all portending public disaster (MS seventh century B.C.):⁵⁹

If a fiery glare of a brush/swamp fire overwhelms the land, the battle cry of a mighty enemy will surround the land.

If a fiery glare of wild beasts overwhelms the land, a rebellious king will be killed.

If a fiery glare of livestock overwhelms the land, the land will be weakened, public policy will be disrupted.

If a fiery glare of mud overwhelms the land, fall of kingship.

If a fiery glare of heaven overwhelms the land, fall of . . .

If a fiery glare of earth overwhelms the land, fall of . . .

If a fiery glare covers the face of the sky, the Lord will turn the temper of the land to wickedness, the gods will [] the fatherly responsibility of the land.

The fiery glare is clearly associated with falling stones in a seventh century B.C. oracle: “I (the god) rained stones of a fiery glare (= volcanic stones?) upon them.”

Fiery glare is associated with destructive wind in a poem that refers to events in the twelfth century B.C., though the manuscript dates to the Achaemenid period:

When the heavens(?) changed their appearance,

The fiery glare and destructive wind obliterated their faces,

Their gods were frightened off, they went down to the depths,

Whirlwinds, destructive wind engulfed the heavens.

Mesopotamian religious poetry of the first millennium B.C. associates the fiery glare and its related phenomena with both the sun (Shamash) and the god of thunder (Adad).

Whatever the interpretation of individual passages, the evidence is strongly in favor of seeing in *anqullu* a Mesopotamian word for the fiery glare seen in the sky, at least in some instances as a consequence of distant volcanic activity.

2. *Ašqulātu* “fiery glow(?)” The etymology of this word suggests something perceived as hanging from the sky. The word is attested in extispicy known from manuscripts of about the eighteenth century B.C., possibly preserving material of earlier date. Unlike the

⁵⁸ References to the original sources may be found in the *CAD* and *AHW*, s.vv. *anqullu*, *ašqulātu*.

⁵⁹ C. Virolleaud, *ACh Šamaš* 14.1 ff.

instances of "fiery glare" cited above, "fiery glow(?)" appears in apodoses of omens, suggesting an atmospheric term generalized, perhaps as a term for "disaster." For example, "If the 'diaphragm' is white, a fiery glow(?) will sei[ze] the land," or, "a fiery glow(?)" of (= a portent for) my army." The phenomenon seems to be more localized and to have a more specific shape than "fiery glare," as in the following omen: "If a fiery glow(?) hangs down from the sky as far as the middle of the sky, public policy will be disrupted" (MS seventh century B.C.). While these descriptions are consistent with the appearance of volcanic aftereffects, *ašqulālu* might also refer to other atmospheric phenomena, such as a tornado funnel⁶⁰ or noctilucent clouds formed by meteoritic dust.

One cannot yet point to Mesopotamian sources that could be associated with the Thera eruption. There is abundant evidence that Mesopotamians knew of volcanic phenomena. The earlier material, from the end of the third millennium, suggests a closer encounter than does the apparently later material centering around the "fiery glare" and its related phenomena. Therefore the Akkadian passages concerning the "fiery glare" seem the best possibility at present for recollections of Thera.

Postscript: while this article was in press, P. M. Warren kindly made available his ISIS Fellowship lecture, "The Minoan Civilisation of Crete and the Volcano of Thera," *Journal of the Ancient Chronology Forum* 4 (1990-91): 29-39. In addition to providing a lucid review of all the classes and attendant problems of the chronological evidence, Warren also documents new and hitherto unpublished finds of stratified pumice in the Aegean (pp. 31-33). He discusses as well the recent radiocarbon analyses done by an Oxford team, whose conclusions point to a 70 percent likelihood of a seventeenth century eruption, 30 percent for a sixteenth century one (p. 33). As for the Tempest Stele, relying upon Davis/Vandersleyen, Warren understandably places the "devastating storm conditions around Thebes" (n. 42). It is to be hoped that our new treatment of the Ahimose stele will accord the storm its proper due as a meteorological event of far-reaching proportions, one of the major aftereffects, we strongly suspect, of the Thera eruption.

⁶⁰ U. Jeyes, *Old Babylonian Extispicy Texts in the British Museum* (Leiden, 1989), p. 154: "cyclone."