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Volcanically-Induced Nile Flood Failure Promotes Internal Revolt and Suppresses Interstate Conflict in Hellenistic Egypt, 305-30 BCE

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Explosive volcanic eruptions are a primary driver of abrupt short-term climatic changes. State-of-the-art revisions to polar ice-core chronologies now allow us to track the impacts of a sequence of major and closely-recurring volcanic eruptions on the great Ptolemaic kingdom centred in Egypt, between 305-30 BCE. This was a formidable Mediterranean cultural and economic power in the efflorescent Hellenistic era of the first four centuries BCE, a period bracketed by Alexander the Great on one end and Cleopatra on the other, and known for its considerable advancement in science and material culture. In this paper we show a link between major volcanic eruptions that register through elevated sulphate deposition in the polar ice, and a suppression of the agriculturally-critical Nile summer flood, identifiable in annual Nilometer measurements from Rhoda, Cairo, between 641 and 1469 CE. This likely relates to a volcanic perturbation of the East African monsoon, responsible for the rainfall in the Ethiopian highlands that drives the annual summer flood, and the effect can also be identified in ancient papyri that indicate the quality of the Nile flood in the first several centuries BCE. Volcanic eruptions in this period are also shown to correspond in timing with the initiation of a series of hitherto poorly understood internal revolts against Ptolemaic rule in Egypt, while also corresponding in timing to the cessation of major interstate conflicts (the nine “Syrian Wars”, running 274-96 BCE) between the Ptolemaic kingdom and their powerful Near Eastern rival, the Seleukid empire. Subsistence crises driven by volcanically-induced suppression of the Nile flood are likely to have played a key causal role in these events, an understanding that helps to advance our knowledge of the major historical events of the formative Hellenistic era, which set the scene for the rise of the Roman Empire. Our findings also suggest the potential of integrating human and natural archives to identify causal links between climate change and human history, while highlighting the vulnerability of the region to future eruptions.