
Rhodes - *Pódos* - *Rodos*

The Island of Many Worlds:
Layers of Belonging and Everyday Pluralism



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Hipparchus of Nicaea and Rhodes

Hipparchus of Nicaea was one of the most influential astronomers and mathematicians of antiquity. His contributions to the development of mathematical astronomy laid the foundation for later advancements in the field, particularly in the Greek and Islamic traditions. Hipparchus made significant strides in observational astronomy, trigonometry, and the construction of astronomical models that sought to describe the motion of celestial bodies with unprecedented accuracy. Recent studies have confirmed reports that Hipparchus compiled the first precise numerical catalogue of star coordinates in history, presumably extending to all stars visible to the naked eye from the latitude of Rhodes.¹

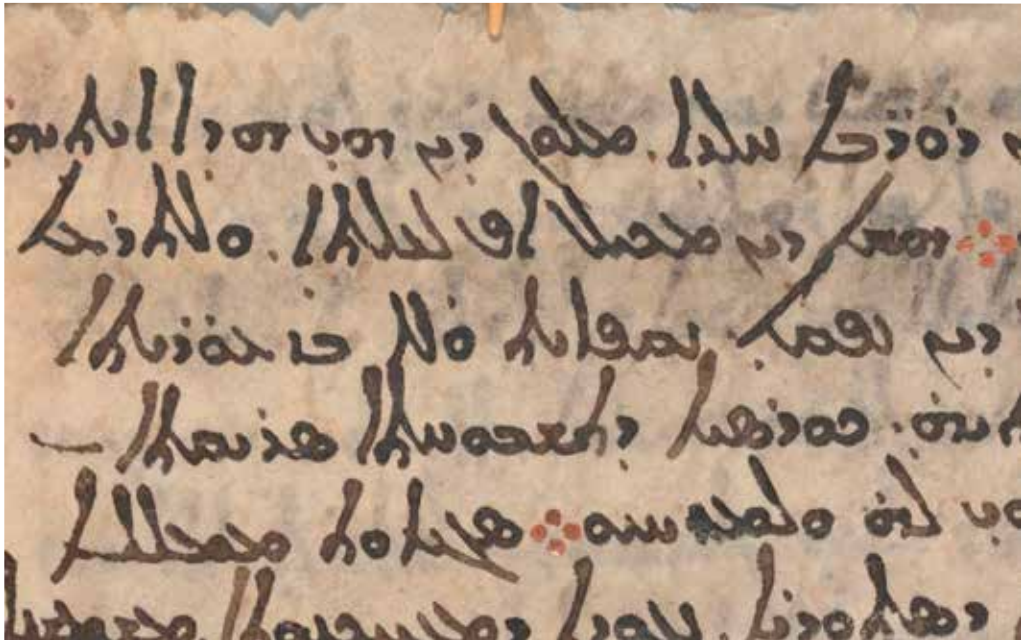
Multispectral imaging played a pivotal role in the recovery of excerpts from Hipparchus’ star catalogue by Gysembergh, Williams, and Zingg. The authors used multispectral images that revealed undertext on palimpsest leaves from the Codex Climaci Rescriptus, a manuscript overwritten in the medieval period. While the upper text was clearly legible to the naked eye, the erased undertext—written in Greek and containing star coordinates—was faint, obscured by the later Syriac writing, and largely invisible in standard light. The capture and processing of multispectral images by the Early Manuscripts Electronic Library, the Lazarus Project and the Rochester Institute of Technology in 2017 enhanced the contrast between different layers of ink and parchment, allowing the ancient Greek astronomical data to resurface.²

The process is illustrated in the sequence of images (**Figures 1-3**) below. The color image shows the manuscript as seen in normal light, where only the overlying Syriac text is visible. The processed multispectral image, produced by digitally combining selected spectral bands, reveals hidden traces of the Greek undertext, including numerical data that correspond to star coordinates. Finally, the tracings were prepared by the authors to provide visual annotation of the text deciphered from a set of several processed multispectral images.

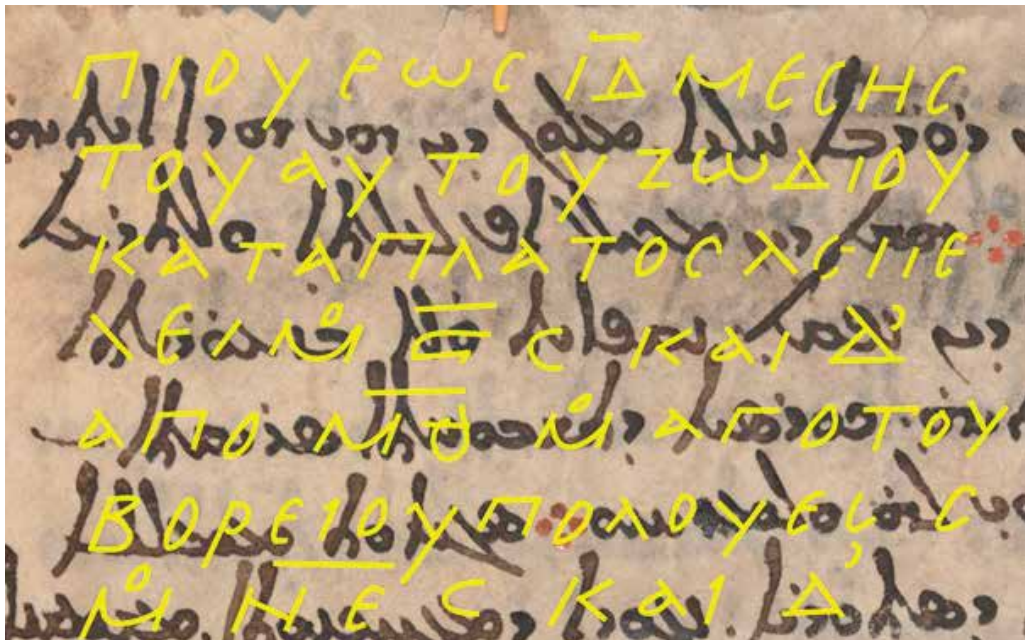
It is often stated that Hipparchus accomplished all or most of his scientific work in Rhodes, and he is sometimes styled ‘Rhodian’ even though no ancient sources connect this adjective with him. This paper reviews the evidence connecting Hipparchus to the island and city of Rhodes. The results of this study suggest that Hipparchus did indeed make astronomical observations in Rhodes over a period of several decades, although the only astronomical observations that were certainly made in Rhodes date from the last few years of his work as an astronomer.

Despite the scarcity of biographical material about him, Hipparchus is known to have been born in the city of Nicaea (modern-day Iznik) or its surrounding countryside, as attested by the ancient Roman authors Strabo (*Geography*, XII, 4, 9, 566 C.) and Aelian (*On animals* VII, 8) and the Byzantine encyclopedic lexicon Suda (ι 521, s.v. Ἱππαρχος). Claudius Ptolemy reports that he performed observations in Bithynia, viz. the region of Nicaea (see below). Centuries after his death, his native city of Nicaea issued coins depicting him, with the legend describing him as “Hipparchus of the Nicaeans”.³

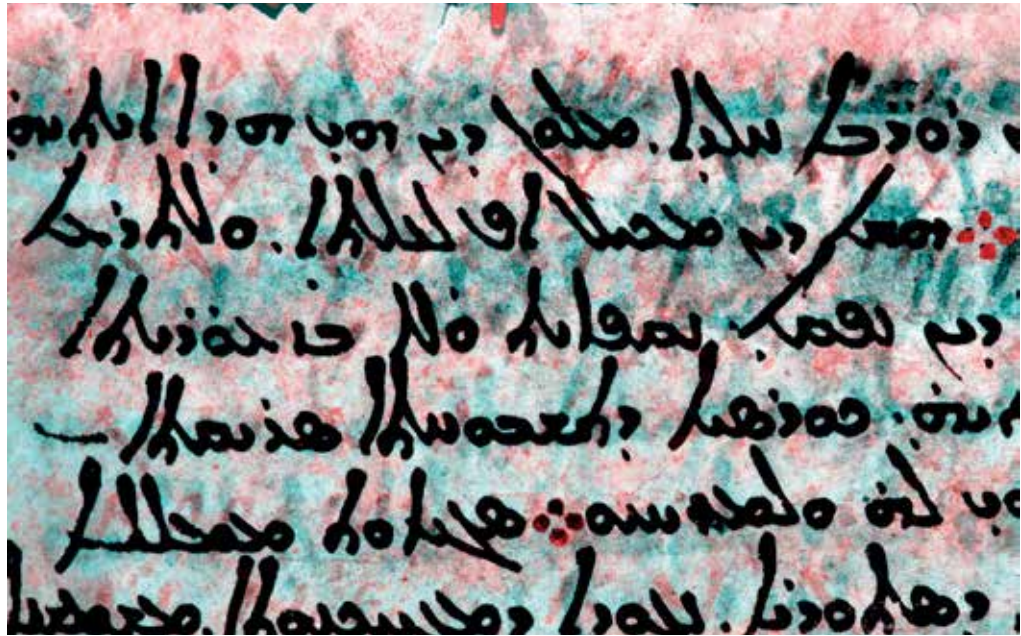
1 Gysembergh, V., Williams, P.J. and Zingg, E., 2022, ‘New Evidence for Hipparchus’ Star Catalogue Revealed by Multispectral Imaging’, *Journal for the History of Astronomy*, 53, pp. 383-393; *id.*, 2025, ‘A Note on the New Evidence for Hipparchus’ Star Catalogue’, *Journal for the History of Astronomy*, 56, in press.
2 The imaging team consisted of Di Bai, Ken Boydston, Helen Davies, Josephine Dru, Roger L. Easton, Christos Georgiades, Gregory Heyworth, Kyle Huskin, Damian Kasotakis, Vasilis Kasotakis, David Kelbe, Keith Knox, Mike Phelps, Nicole Polglaze, Dale Stewart, Sarah Zaman and Alexander Zawacki.
3 See illustrations online at: <https://rpc.ashmus.ox.ac.uk/coin/167946>; <https://isaw.nyu.edu/exhibitions/time-cosmos/objects/coin-hipparchus-globe>.



. Detail of f. 53v, beginning of the first column of undertext (Syriac overtext in dark brown, and faint traces of a few letters of the undertext). Courtesy Museum of the Bible Collection. All rights reserved. © Museum of the Bible, 2021.



. Detail of f. 53v (yellow tracings based on full set of multispectral images). Courtesy Museum of the Bible Collection. All rights reserved. © Museum of the Bible, 2021.



. Detail of f. 53v (multispectral image, by the Early Manuscripts Electronic Library and the Lazarus Project of the University of Rochester processed by Keith T. Knox: the enhanced Greek undertext appears in red below the Syriac overtext in black). Courtesy Museum of the Bible Collection. All rights reserved. © Museum of the Bible, 2021.

However, Rhodes was an important center of intellectual life in the 2nd c. CE and seems to have attracted astronomers specifically.⁴ In three instances, Claudius Ptolemy quotes observations by Hipparchus and specifies that they were made in Rhodes.

Hipparchus of Nicaea, *On the Moon's Motion in Latitude*, Fragment 17 Dicks = Ptolemy, *Almagest*, I, p. 363, 13 – 364, 1 Heiberg (5 August -127)

Πάλιν, ἵνα καὶ ἐκ τῶν ὑπὸ τοῦ Ἰππάρχου τετηρημένων τοιούτων παρόδων φανερὸν ἡμῖν τὸ ἐπὶ τῶν ὁμοίων διάφορον γένηται, παραθησόμεθα καὶ τούτων μίαν, ἣν φησι τετηρηκέναι τῷ ν' ἔτει τῆς τρίτης κατὰ Κάλιππον περιόδου κατ' Αἰγυπτίους Ἐπιφί ις' τοῦ διμοῖρου τῆς πρώτης ὥρας παρεληλυθότος. δρόμος μὲν οὖν, φησὶν, ἦν σμα', τοῦ δὲ ἡλίου διοπτρευομένου κατὰ Λέοντος μοίρας η' 2' ιβ' ἢ σελήνη ἐφαίνετο ἐπέχουσα Ταύρου μοίρας ιβ' γ', καὶ ἀκριβῶς δὲ ἐπεῖχεν ἔγγιστα τὰς αὐτάς. γίνεται ἄρα ἡ μεταξὺ τοῦ ἡλίου καὶ τῆς σελήνης ἀκριβῶς θεωρουμένη διάστασις μοιρῶν πς ιε. ἀλλὰ τοῦ ἡλίου ὄντος περὶ τὰ πρῶτα μέρη τοῦ Λέοντος ἐν Ῥόδῳ, ὅπου ἡ τήρησις ἐγένετο, ἢ τῆς ἡμέρας ὥρα χρόνων ἐστὶν ις γ'· (...)

Again, to display the amount of the equation (sc. of lunar anomaly) under similar conditions which is derived from Hipparchus' observations of such positions, we will adduce one of these. He says that he made the observation in the fifty-first year of the Third Kallippic Cycle, Epiphi [XI] 16 in the Egyptian calendar [-127 Aug. 5], when

4 For a vivid, though at times exaggerated, portrayal of intellectual life in ancient Rhodes, see L. Rossetti and P. Liviabella Furiani, “Rodi”, in G. Cambiano, L. Canfora and D. Lanza (edd.), *Lo spazio letterario della Grecia antica*, vol. 1, tome 2, Rome, 1993, pp. 657-715.

2/3 of the first hour had passed. ‘The speed was [that of day] 241’, he says, ‘and while the sun was sighted in Leo 8 7/12° the apparent position of the mon was Taurus 12 1/3°, and its true position was approximately the same’. So the true observed distance between moon and sun was 86:15°. But when the sun is near the beginning of Leo, **at Rhodes (where the observation was made)**, 1 hour of the day is 17 1/3 time-degrees. (...) (Transl. after G. Toomer)

Hipparchus of Nicaea, *On the Moon’s Motion in Latitude*, Fragment 18 Dicks = Ptolemy, *Almagest*, I, p. 369, 4sq. (2 May -125)

ἀναγράφει τοῖνον ὁ Ἰππάρχος ἐν Ῥόδῳ τετηρηκέναι διὰ τῶν ὀργάνων τόν τε ἥλιον καὶ τὴν σελήνην τῷ ρ⁷ζ' ἔτει ἀπὸ τῆς Ἀλεξάνδρου τελευτῆς κατ' Αἰγυπτίους Φαρμουθὶ ια' ὥρας β' ἀρχομένης (...).

Now Hipparchus records that **he observed the sun and the moon with his instruments in Rhodes** in the 197th year from the death of Alexander, Pharmouthi [VIII] 11 in the Egyptian calendar [-126 May 2], at the beginning of the second hour (...). (Transl. after G. Toomer)

Hipparchus of Nicaea, *On the Moon’s Motion in Latitude*, Fragment 19 Dicks = Ptolemy, *Almagest*, I, p. 374, 16-19 (7 July -125)

(...) εἰλήφαμεν πάλιν ἐκ τῶν ὑπὸ τοῦ Ἰππάρχου τετηρημένων, ὡς ἔφαμεν, ἐν Ῥόδῳ διαστάσεων τὴν διωπτευμένην τῷ αὐτῷ ρ⁷ζ' ἔτει ἀπὸ τῆς Ἀλεξάνδρου τελευτῆς κατ' Αἰγυπτίους Παῦνι ιζ' ὥρας θ' καὶ γ' (...)

(...) we have again selected **from the distances [between sun and moon] observed by Hipparchus, as already mentioned, in Rhodes**, the observation he made in the same year [as the preceeding one], being the 197th year from the death of Alexander, Payni [X] 17 in the Egyptian calendar [-125 July 7], at 9 1/3 hours. (...) (Transl. after G. Toomer)

In a fourth case, Ptolemy quotes an observation made in Rhodes without naming its author, but we know from another passage of the *Almagest* (p. 525 Heiberg) that Hipparchus used this observation to determine the period of lunar eclipses, and it is therefore generally assumed that he made the observation himself.

Hipparchus of Nicaea, *On the moon’s motion in latitude*, Fragment 22 Dicks = Ptolemy, *Almagest*, I, p. 477, 3 sq. (27 January -140)

Πάλιν δὴ τῷ λζ' ἔτει τῆς τρίτης κατὰ Κάλιππον περιόδου, ὃ ἐστὶν χζ' ἀπὸ Ναβονασσάρου, κατ' Αἰγυπτίους Τυβὶ β' εἰς τὴν γ' ὥρας ε' ἀρχομένης ἐν Ῥόδῳ ἤρξατο ἐκλείπειν ἡ σελήνη καὶ ἐπεσκοτήθη τὸ πλεῖστον ἀπὸ νότου δακτύλους γ.

Again, in the thirty-seventh year of the Third Kallippic Cyclee, which is the 507th from Nabonassar, Tybi [V] 2/3 in the Egyptian calendar [-140 Jan. 27/28], at the beginning of the fifth hour [of night] **in Rhodes**, the moon began to be eclipsed; the maximum obscuration was 3 digits from the south. (Transl. after G. Toomer)

In fact, the assumption that Hipparchus is the author of this observation calls for an important qualification, to account for the fact that Ptolemy did not name Hipparchus as its author in this case, although he could have (as demonstrated by the three instances of observations for which he did specify Hipparchus’ authorship). While it is plausible that Hipparchus chose for this purpose

an observation that he considered to be highly reliable, this may well have been an observation which was made by an individual who worked with him, such as a fellow astronomer, a student or a servant. That other individuals may have made astronomical observations at Hipparchus’ behest is in turn suggested by the recent discovery of fragments from Hipparchus’ Star Catalogue. Although we do not have explicit ancient sources about how Hipparchus’ catalogue was compiled, the precision of the extant fragments implies a highly labor-intensive observational program that may have been beyond the power of one man. Be that as it may, even if this observation was not made by Hipparchus, the fact that it was made in Rhodes and then deemed by Hipparchus reliable enough for him to use in his calculations can be taken as further evidence of Hipparchus’ connection with Rhodes.

Accordingly, there is secure evidence of Hipparchus’ connection with Rhodes from -140 to his latest dated observations in -125, although observations explicitly performed by Hipparchus in Rhodes are limited to a three-year timespan from -127 to -140. The argument for his presence in Rhodes turns on the inference that his sequence of equinox observations, also reported by Ptolemy, must have been made in one and the same place as the observations discussed above:

Hipparchus of Nicaea, *On the displacement of the tropical and equinoctial points*, Fragment 5 Dicks = Ptolemy, *Almagest*, I, p. 194, 3 – 196, 21

Now since Hipparchus is somewhat disturbed by the suspicion, derived from a series of observations which he made in close succession, that this same revolution [of the sun] is not of constant length, we shall try to show succinctly that there is nothing to be disturbed about here. (...) For, in his treatise ‘On the displacement of the solsticial and equinoctial points’, he first sets out those summer and winter solstices which he considers to have been observed accurately, in succession [Ptolemy mentions the solstice observations but leaves out the details]. Then he sets out, first, the times of autumnal equinoxes which he considers to have been very accurately observed: [from -161 Sept. 27 to -142 Sept. 26]. Next he sets out the spring equinoxes which have been observed with a similar accuracy: [from -145 Mar. 24 to -127 Mar. 23]. (Transl. after G. Toomer)

Some have doubted that the earliest observations in this series were performed by Hipparchus, because the whole series would span more than thirty years.⁵ However, a recently published papyrus contains a solstice observation explicitly performed by Hipparchus and dating from 26 June -157:

P. Fouad 267A, ll. 11-12 recto (published by Fournet and Tihon 2014)

(...) the observation made by Hipparchus in the 166th year (counting) from (the death) of Alexander, Pachon 28th, [missing] hour of day (...) (transl. A. Jones)

This new text provides strong evidence that the complete series of solstice and equinox observations reported by Ptolemy, starting in -161, originated with Hipparchus. In order to optimize accuracy, it would have been desirable for all of these observations to be made with the same instrument, such as an equatorial ring, in the same place. We may thus infer from Hipparchus’ latest observations, which were certainly made in Rhodes, that the earlier observations in the series were also made there.

5 See e.g. G.J. Toomer, *Ptolemy’s Almagest*, p. 133, n. 8.

This is consistent with the fact that in the *Commentary on the Phenomena of Eudoxus and Aratos*, the only text of Hipparchus that has come down to us through the medieval manuscript tradition, he writes that he is working under the hypothesis of a 36° latitude, which is a very near approximation of the latitude of Rhodes:

Hipparchus, *Commentary on Eudoxus' and Aratus' Phenomena*, p. 182, 19 – 184, 2 Manitius

ἐξῆς δὲ ὑποτάξω περὶ ἐκάστου τῶν ἀπλανῶν ἄστρον ἐπὶ κεφαλαίου, τίνι τε τῶν δώδεκα ζῳδίων συνανατέλλει καὶ συγκαταδύνει, καὶ ἀπὸ πόστης μοίρας τοῦ ζῳδίου ἀρξάμενον ἕως πόστης μοίρας ἔσχατον ἀνατέλλει ἢ [συγκατα] δύνει ἐν τοῖς περὶ τὴν Ἑλλάδα τόποις καὶ καθόλου ὅπου ἐστὶν ἡ μεγίστη ἡμέρα ὥρων ἰσημερινῶν ἰδ' καὶ ἡμωρίου.

In the following, I will show for every constellation, in a summary form, which of the twelve signs of the zodiac it rises and sets with, and with which degree of the given sign it starts to rise or set and with which degree it finishes, for the regions of Greece and in general for **every place where the longest day lasts 14 and a half hours (sc. a latitude of 36°)**.

While it is possible that Hipparchus assumed a latitude of 36° for other reasons, the evidence reviewed above strongly suggests that this hypothesis was due to the fact that Rhodes was the center of Hipparchus' astronomical activity at least for the period from -161 to -125.

There is a single strand of evidence that places Hipparchus' astronomical activity elsewhere. In his *Phases*, Ptolemy writes that Hipparchus performed meteorological observations in Bithynia:

Ptolemy, *Phases*, p. 26, 23 – 27, 11

Καὶ τούτων ἀνέγραψα τὰς ἐπισημασίας καὶ κατέταξα κατὰ τε Αἰγυπτίους καὶ Δοσίθεον, Φίλιππον, Κάλλιππον, Εὐκτῆμονα, Μέτωνα, Κόνωνα, Μητρόδωρον, Εὐδοξον, Καίσαρα, Δημόκριτον, Ἴππαρχον. τούτων δὲ Αἰγύπτιοι ἐτήρησαν παρ' ἡμῖν, Δοσίθεος δ' ἐν Κῷ, Φίλιππος ἐν Πελοποννήσῳ καὶ Λοκρίδι καὶ Φοκίδι, Κάλλιππος ἐν Ἑλλησπόντῳ, Μέτων καὶ Εὐκτῆμων Ἀθήνησιν καὶ ταῖς Κυκλάσι καὶ Μακεδονίᾳ καὶ Θράκῃ, Κόνων δὲ καὶ Μητρόδωρος ἐν Ἰταλίᾳ καὶ Σικελίᾳ, Εὐδοξος ἐν Ἀσίᾳ καὶ Σικελίᾳ καὶ Ἰταλίᾳ, Καῖσαρ ἐν Ἰταλίᾳ, Ἴππαρχος ἐν Βιθυνίᾳ, Δημόκριτος ἐν Μακεδονίᾳ καὶ Θράκῃ.

I have compiled and ordered their weather-signs (sc. marked by the stars previously listed by Ptolemy) according to the Egyptians, Dositheus, Phillippus, Callippus, Euctemon, Meton, Conon, Metrodorus, Eudoxus, Caesar, Democritus and Hipparchus. Among these authors, the Egyptians made their observations here, Dositheus in Cos, Philippus in the Peloponnese and Locris and Phocis, Callippus in Hellespont, Meton and Euctemon in Athens, the Cyclads, Macedonia and Thrace, Conon and Metrodorus in Italy and Sicily, Eudoxus in Asia and Sicily and Italy, Caesar in Italy, Hipparchus in Bithynia, Democritus in Macedonia and Thrace.

Bithynia is the region of Hipparchus' birth-place Nicaea, and it is possible that these meteorological observations date to his youth in Nicaea. However, another possible interpretation is that Hipparchus continued to have ties with Nicaea and also did astronomical work there, despite much of his work being conducted in Rhodes. Indeed, this would be consistent with what we know of other ancient astronomers such as Eudoxus of Cnidus, who despite founding a school in Cyzicus is said to have had an 'observatory' in Cnidus and whose political involvement with his native city

was honored by a municipal decree.⁶

In sum, while the explicit evidence for Hipparchus' presence and activity in Rhodes is limited to the years -127 to -125, there is every reason to assume that he started working there as soon as -161. This does not preclude the possibility that Hipparchus maintained ties with, and worked in, Nicaea during that period, which may be supported by a possible reading of the passage from Ptolemy's *Phases*. Finally, because we have very little biographical information about Hipparchus, it is also possible that he traveled more widely during the period in question, although there is no positive evidence for this.⁷



⁶ See V. Gyseembergh, *Eudoxe de Cnide. Témoignages et fragments*, Paris, 2024, pp. XXI-XXVI.

⁷ For the equinox of 24 March 146 BCE (Almagest III.1, p. 135 Manitius), sometimes misunderstood to have been observed in Alexandria by Hipparchus, the observation made using the ring in Alexandria is reported to differ by five hours from the one made by Hipparchus himself.