A History of the Magellanic Clouds and the European Exploration of the Southern Hemisphere

Michel Dennefeld

The Magellanic Clouds were known before Magellan’s voyage exactly 500 years ago, and were not given that name by Magellan himself or his chronicler Antonio Pigafetta. They were, of course, already known by local populations in South America, such as the Mapuche and Tupi-Guaranis. The Portuguese called them Clouds of the Cape, and scientific circles had long used the names of Nubecula Minor and Major. We trace how and when the name Magellanic Clouds came into common usage by following the history of exploration of the southern hemisphere and the southern sky by European explorers — which ultimately led to the founding of ESO.

This year we celebrate the 500th anniversary of the discovery of the navigable sea route that separates mainland South America from Tierra del Fuego — now known as the Strait of Magellan — by Fernão de Magalhães (Ferdinand Magellan in English) and his companions. It therefore seems an appropriate time to examine the “history” of the Magellanic Clouds, not least because the study of the Clouds was one of the main reasons for the foundation of ESO.

Magellan’s expedition entered the strait at Cabo de las Virgenes on 21 October 1520 and exited via Cabo Deseado on 28 November. The Clouds are mentioned right after they left the strait, in the best-known narrative of the voyage — that by Antonio Pigafetta, who writes:

Il polo antartico non ha stella alcuna della sorte del polo artico, ma si veggon molte stelle congregate insieme, che sono come due nebulæ [the Clouds], un poco separate l’una dall’altra, e un poco oscure nel mezzo. Tra queste ne sono due, non molto grandi né molto lucenti, che poco si muovono: e quelle due sono il polo antartico. (see Ramusio, 1550).

Obviously neither Pigafetta nor Magellan himself named them the “Magellanic Clouds” — nor indeed did they name the strait after Magellan! The discovery of the passage between the Mar del Oceano (the Atlantic) and the Mar del Sur (the Pacific) quickly became known to sailors and navigators venturing to these remote countries. The race to reach the Spice Islands (the Moluccas) and the competition between Portugal, which controlled the “eastern route” (via the Cape of Good Hope) and Spain which wanted to exploit the “western route” to take possession of new lands, lent great importance to the discovery. Before long this new strait came to be called the “Strait of Magellan” after its discoverer. Of course, the various water channels at the southern end of South America were well known by local fishermen (Alacalufes or Tehuelches), but unfortunately no written reports by locals seem to exist.

As regards the Clouds, history is less clear. Magellan was not the first to reach southern latitudes where the Clouds are visible. On each sea expedition, at least one pilot/astronomer was present to determine the ship’s position by astronomical means, so the Clouds could not have escaped their view. However, accounts are few. There are likely two reasons for this. First, the navigators were looking primarily for some star or asterism analogous to Polaris (the North Star) in the south in order to measure the latitude and obviously the Clouds would not serve that purpose. Second, at that time travel documents were kept secret in view of the competition between the various countries. So, to understand the “history” of the Clouds, one needs to follow the history of discoveries and travel in the south, and also the history of the mapping of the southern sky by European explorers and astronomers.

Local populations in South America of course had a knowledge of the southern sky long before Europeans reached that hemisphere. Unfortunately, little is known about their observations as information was transmitted orally and it is only in recent times that efforts have been made to record some of this knowledge before it is lost forever. For instance, the Tupi-Guaranis, in the region of Rio de Janeiro in Brazil, compare the Clouds to fountains (Hugua) where a tapir (in the LMC) or a pig (in the SMC) is drinking (Afonso, 2006). Interestingly, the Mapuche in Chile also compare the Clouds to water ponds, called Rúganko or Menoko in their local language. These water ponds are in the Wenu Mapu, the heavens above, and are associated with the Wenu Leufu, the river above, i.e., our Milky Way (for example Pozo Menares et al. 2014). The similar nature of the Milky Way and the Clouds was therefore recognised long ago.

Early explorers

Little is known about travel to the south by the Greeks or the Egyptians, although the latter traveled down the Red Sea to seek gold. The first systematic travel in this direction is by the Arabs, progressing along the east coast of Africa or directly to India. When the Portuguese and Spaniards reached India and the Moluccas, they found a lot of trading posts already established by Arabs in India, Indonesia and Malaysia. From there spices were traded, shipped to the Arabian peninsula by boat and then moved further inland. Several nautical sources are available to us, dating back to the Persians or the Arabs. The best known is the Kitab al-Fawaid (”Book of [nautical] principles”) of 1475 by the mu’alim (master of navigation) Ahmad ibn Majid: this knowledge was so precious that Vasco de Gama enrolled a “mu’alim Canaca” to cross the Indian ocean in 1498. It is clear from those treatises that the Arabs navigated by the stars. They used the Pole Star (Gah), and also the big chariot (Ursa Major; Na’s) or the Pleiades (at-Turayyâ) and then further down as-Suhayl (Canopus) or other southern stars — the stars of the Southern Cross were included in Centaurus; for more details, see Ferrand (1928). But the Clouds, although certainly seen, were of no use for navigation owing to their diffuse nature.

The most recent record we have of sky observations that include a possible mention of the Clouds seems to be the Suwar al-Kawakib (Book of Fixed Stars), written around 964 by the Persian astronomer Abd-al-Rahman al-Sufi. Ludwig Ideler, translating it into German from an extract by Kazvini (Ideler, 1809), includes the following statement:

DOI: 10.18727/0722-6691/5210
Unter den Füssen des Suhel (the classical name for Canopus) steht, wie einige behaupten, ein weisser Fleck, ... den man in Tehama El-bakar, den Ochsen nennt. This is believed to be the Large Cloud, which could be seen in good weather conditions from the south of Arabia, although no coordinates were given. In 1874, a translation into French was made by the Danish astronomer Hans Schjellerup directly from an original manuscript; this version is slightly different:

Le vulgaire croit qu’il y a au-dessous des pieds du Suhail quelques étoiles luisantes et blanches qui ne se font voir ni dans Irak ni dans Nadschd, et que les habitants du Tihamat nomment ces étoiles al-bakar, les Vaches.

Schjellerup refers to stars and not a cloud; and al-bakar does indeed mean cows or a herd, rather than a bull. The accompanying illustration of the constellation Argo-Navis shows a group of stars, with Suhail (Canopus, indicated by the red arrow in Figure 1) at the southern extremity of the ship’s rudder. The illustration on the globe brought back by John Malcolm (Dorn, 1829) shows also a conglomerate of stars south of Canopus rather than a cloud, but the position would be approximately correct.

The Clouds can be seen below about latitude +15 degrees so Chinese voyagers, having long-established contacts with the Arab world, would have seen them when navigating around India. Admiral Zheng He, for example, made seven voyages to Arabia, beginning in 1405. However, these explorations were stopped by the Xuande Emperor (who reigned 1425–1435), and orders were even given to destroy all documents relating to the voyages, so we have no records about their observations today (see Levathes, 1994).

Portuguese sailors were presumably the first western explorers to see the southern sky. While the report of Ca’da Mosto’s voyage (1455) mentions only the Southern Cross, the first reference to the Clouds seems to be that by Amerigo Vespucci during his third voyage in 1501–1502:

E fra le altre viddi tre Canopi: i due erano molto chiari, il terzo era fosco e dissimile dalli altri (Mundus Novus, 1504).

The two “clear” clouds and the third “dark and different from the others” are now interpreted as meaning the two Clouds and the Coalsack, although no precise coordinates are given. But a sketch showing southern stars at various times during the night also shows some accompanying nebulosity.

A fleet of 13 Portuguese ships, led by Pedro Álvares Cabral and bound for the Moluccas (the “Spice Islands” in Indonesia) to exploit the route opened by Gama, made a significant diversion and reached Brazil (called at that time Tierra de la Vera Cruz) at the latitude of Bahia (~ 14° S) in April 1500. One of the ships was immediately sent back to Portugal to transmit the news of the discovery, carrying with it three letters of report, all dated 1 May. The one by Mestre João (João Faras), physician and navigator, is of most interest to us as it contains a sketch of the southern sky (see Figure 2, left) where the Southern Cross can easily be identified, with the pointers α and β Cen called “guardas”, as well as some other stars like the southern triangle. The term “la bosya”, in the lower left, is the one used in the north to refer to the small chariot, Ursa Minor, in reference to the Pole Star. This clearly shows that, at least at the beginning, the aim was always to find an asterism able to represent the south pole to aid navigation; this was later abandoned in favour of using the altitude of the Sun to derive latitudes. But there is no mention of the Clouds here (the sketch shows that they would fall at the edge of the map), probably because they are low on the horizon in April–May.

So one had to wait until Andrea Corsali travelled to India and wrote two letters from Kochi (Cochin), in 1515 and 1517, describing his voyage and experiences. The first contains a description of the southern sky (Figure 2, right). The various stars are more difficult to recognise than in Faras’s letter, but the Southern Cross is there, and the two Clouds are also
This, from 1515, seems to be the first available representation of the Clouds. It is not clear when the mentions of the Cross and the Antarctic Pole were added: Rychard Eden, in his translation of d’Anghiera’s De Orbe Novo (1555) has this figure with the names — but some earlier manuscripts don’t! Several versions of this figure have been published, not always correctly attributed: some even attributed it to Magellan whose travel reports never included any sketch! D’Anghiera in his compilation of travels (d’Anghiera, 1516, in Latin), says “the Portuguese have gone beyond the fifty-fifth degree of the other pole, where… they could see throughout the heavenly vault certain nebulae, similar to the Milky Way, in which rays of light shone” (translation by F. McNutt). There is no mention of where he got this from but the description resembles Vespucci’s.

Magellan’s voyage and his immediate followers

Turning now to Magellan’s voyage itself, the details are known largely thanks to the lively reporting of Antonio Pigafetta, “Vicentino Cavagliere di Rodi”, who accompanied the expedition to discover the world, and to seek fame (as Pigafetta admits in the introduction to his report). Although the original report, which was written for the Duke of Mantova, has disappeared, several copies or translations quickly appeared, in French, Italian, and Latin.

In an early (shortened) French edition by J. A. Fabre, which is the translation of an original of Pigafetta (circa 1526), one can read, after the passage about the Strait:

Le pôle Antarctique n’est point tant étoilé comme est l’Arctique. Car on y voit plusieurs étoiles petites congrégées (packed) ensemble, qui sont en guise de deux nuées (the two Clouds) un peu séparées l’une de l’autre, et un peu offusquées (obscured), au milieu desquelles sont deux étoiles non trop grandes ni moul reluisantes et qui petitement se meuvent. Et ces deux étoiles sont le pôle Antarctique.

In this description, which has no accompanying sketch, it seems that the pole is represented by two small stars in the middle of the two Clouds (possibly γ and ν Hydri), unlike in Corsalli’s figure. But Pigafetta was not an astronomer, merely a writer who was sensitive to the beauty of the southern sky. His description of the voyage (and hence the Clouds) has probably survived better because it is livelier than the technical reports by navigators. Yet this was not the case in the years immediately following Magellan’s discovery of the Strait, when the most printed and distributed document/report was a letter by Maximilianus Transylvanus, secretary to Charles V, first printed in 1523. But it contains no mention of observations, the sky or the Clouds. D’Anghiera mentioned the Clouds in an earlier report (1516), but says nothing about the sky when describing Magellan’s trip (d’Anghiera, 1524).

But where are the reports of the navigators and astronomers who accompanied Magellan’s expedition? The chief pilot was then Andrés de San Martín, but he was killed, along with more than 20 others, on 1 May 1521 by Humabon, Rajah of Cebu; his papers, which are lost today, nevertheless survived for a while, probably confiscated by the Portuguese in December when the Trinidad returned there. A later report of this voyage by Antonio de Herrera (1601) gives much more detail about the astronomical observations, which must come from San Martín’s log-book. I also found a mention of this survival in Bibliotheca Hispana Nova by Nicolas Antonio Hispanilensis (1773) and Barros (1553) says that he had “in hand” some papers and a book written by San Martín, collected in the Moluccas by Duarte de Resende. San Martín’s observations subsequently percolated into reports by several other authors, and other pilot’s reports are also available, but in none of them do we find any mention of the Clouds. Once again, this provides proof that the main interest was initially to find stars able to mark the southern celestial pole but not to map the sky, and even this approach was largely abandoned once the solar technique had been mastered.

After several expeditions to exploit the discovery of the new route, the fifth trip by Spaniards to the Strait was organised by the Bishop of Plasencia, who sent three ships under Alonso de Camargo, departing in August 1539. After one ship was lost in the Strait, Camargo proceeded in the third ship and went north along the west coast of Chile, becoming the first European to explore this part of the world. He made port at Valparaíso and

![Figure 3. Voyages of Magellan and Drake (from Encyclopedia Britannica), with additional dates of some earlier explorations made by the Portuguese.](Image)
It therefore seems clear that by then the name of Magellan was being associated by navigators with the Strait, but not necessarily with the Clouds. This is also indicated by the report of one of the most successful expeditions to the Strait, conducted by the brothers Nodal in 1618–1619, who made the journey in less than 10 months and, remarkably, with no losses. It was said to have been organised to recognise the “new strait of São Vicente and the one of Magellan”, because “it had become difficult owing to the number of years during which notice of the navigation had been lost,” as Sir Clements Markham’s translation (Markham, 1911) has it. This report mentions some celestial observations (including the sight of the great Comet of 1618) but there is no mention of the Southern Cross or of the Clouds, as if these were already common knowledge. Clearly, by this point the Sun was the preferred way of determining latitude, together with tables in the Hidrographia Nautica of Cespedes (1606).

First mappings of the Southern Sky

The Spaniards’ interest in the Spice Islands progressively declined, as they were merely active in getting silver and gold back from Peru and had sold their rights on Moluccas to Portugal. The Dutch launched their first expedition, known as the “eerste Schipvaart”, under Cornelis de Houtman, who left Holland for the Indies on 2 April 1595. On board were his brother Frederick and Pieter Dirkszoon Keyser (Latinised as Petrus Theodori). Keyser had been trained by the cartographer Petrus Plancius, who instructed him to make a record of the southern sky for his celestial globes. This is the first known systematic measurement of the southern sky, probably mostly carried out when the fleet stopped for several months in Madagascar. Unfortunately, Keyser died in Indonesia (reached only in June 1596), but the measurements were probably brought back by Frederick de Houtman in August 1597. During a second voyage with his brother, Frederick complemented those observations further, returning in July 1602. None of Keyser’s notes survived, but de Houtman brought back measurements which were long hidden as an appendix to his dictionary and grammar of the Malay and Malagasy languages (Houtman, 1603), later reprinted as a catalogue of southern circumpolar stars in a French translation by Aristide Marre (1851). They have clearly been used on various celestial globes by Hondius (1598; 1601), Willem Blaeu (1602) and ultimately by Bayer in his Uranometria (1603) where he explicitly mentions Petrus Theodori as the originator of his 12 new constellations (although it is actually Plancius, not Theodori, who is behind these twelve constellations of the southern sky, still in use today with small modifications). Interestingly, no mention of the Clouds is made in Houtman’s catalogue but they do appear on Hondius’s earlier globes. For instance, of Dorado (where the LMC was the preferred way of determining latitude, together with tables in the Hidrographia Nautica of Cespedes (1606). A detailed analysis of these early mapping attempts can be found in Dekker (1987).

Houzeau (1885) claims that Theodori returned in 1597, bringing back “une énumération des Constellations du Sud en douze astérismes antarctiques...”, one of which was “le Nuage” (the Cloud). Houzeau initially counted 12 new constellations including the Cloud, but then ends up with 21, eight of which were already listed by Ptolemeus: his total now...
amounted to 13 (21 – 8), including two new ones (Crux and Musca) but excluding the Clouds! While it is clear that Houzeau was misled about Theodori by the comment in Bayer’s Uranometria, it is less clear where his idea of the constellation le Nuage comes from. Maybe he was influenced by the presentation of the Clouds in the earlier globes of Hondius (see Figure 4) or Blaueu. There are unfortunately many approximate statements in this paper. As for globes, see a detailed description of some of them in van der Krogt (1993) or at the National Maritime Museum in Greenwich, but these are all references to the Nubeculae, not to the name Magellan.

It is clear from these early records that neither the Clouds nor the Southern Cross were of any real interest to the sailors anymore, rather they were merely a curiosity in the sky. The Portuguese, of course, knew them and occasionally mentioned them as the Clouds of the Cape. The development of celestial cartography proceeded and usually included the Clouds, but with their Latin names, Nubecula Minor and Nubecula Major (see, for example, the maps in Bayer’s third edition of 1661; or in the atlases of Cellarius, 1660; Pardies, 1675; Flamsteed, 1725; Ottens, 1729). Schiller (1627), in his curious biblical map, includes Tucana, Hydrus and Nubecula Minor in his idiosyncratic constellation of St Raphaël. In his Uranographia, where the names of 30 Dor or 47 Tuc come from, Bode (1801) uses both German and French, but does not mention Magellan.

Two major efforts to get better celestial cartography in the south were undertaken after Plancius. The first was by Edmond Halley from the island of St Helena, where he had been sent by John Flamsteed the first English Astronomer Royal; he observed during 1677 and published the Catalogus Stellarum Australium (Halley, 1679). His work is known because of the inclusion of a new (fleeting) constellation, Robur Carolinum, to please King Charles II. He mentions in an appendix that:

*Proxima, ex iis quas observavi, est in Cauda Apodis, in distancia paulo ultra 8 graduum, Duae Nubeculae, quae a Nautis Nebulæ Magellanicae appellantur, exacte referent Galaxiae albedinem & Telescopio inspectae, hinc inde Nebulas Parvas & exigus Stellae ostendunt...*

It appears it was clear to him that the name Magellanic Clouds was used only by sailors, and that those Clouds resemble the Milky Way. The only other mention in the catalogue itself comes in the final list of bright stars “in Usum Navigantium”, useful for navigation, where the first in the list is "quaes adjacent Nubeculae minori", close to the Small Cloud. The Clouds also appear as Nubeculae in his Planisphere of 1678.

The second effort was by Nicolas de La Caille who observed at the Cape of Good Hope between August 1751 and July 1752. He published a catalogue of southern nebulae (or, more precisely, of nebulous stars) in 1755, in which the Clouds are not listed, probably because they were too large for his purpose (47 Tuc and 30 Dor are mentioned). In the introduction he says that he observed the brightest regions of the Milky Way several times with a 14-foot (4.25-m) focal length telescope, and compared them to the two Clouds:

“qu’on appelle communément les nuées de Magellan et que les Hollandais et les Danois appellent les nuées du Cap (his underlining). On voit évidemment que ces parties blanches du ciel se ressemblent si parfaitement, qu’on peut croire, sans trop donner aux conjectures, qu’elles sont de même nature,...”

He adds that these Clouds seem to be detached parts of the Milky Way, and that it is not clear that their whiteness would be caused, as is usually believed (sic), by clusters of small stars more tied together than in other parts of the sky, as he could not resolve them with his telescope.

About the names, he also says:

*D’ailleurs, la plupart des Navigateurs appellent nuages du Cap, ce que nous appelons nuées de Magellan, ou le grand & le petit nuage.*

In the celestial map completing his publication (see Figure 5) the two Clouds do indeed appear under the names “le Petit, et le Grand Nuage”. But his words, “que nous appelons nuées de Magellan”, seem to indicate that around that time the association of the Clouds with Magellan was already spreading beyond the nautical community, even if the scientific term was still simply Nubeculae or les Nuages.

When James Dunlop described his observations of the southern sky (Dunlop, 1828) “made at my house” in Paramatta, near the Brisbane Observatory in Australia, he reported that he made: “very correct drawings of the Nebulae major and minor... with an excellent 9-foot reflecting telescope” but there is not a single mention of Magellan. He gives detailed sketches of both nebulae, with the positions of many stars and smaller nebulae within.

When Rümker later published his catalogue (Rümker, 1832) based on observations from the Observatory of Paramatta, Australia, he states that “the Nebulæ major and minor of LaCaille are two fragments of the Via Lactea and distinguish themselves by nothing from any other parts of it requiring, with the exception of two nebulae, no powerfull telescope to be dissolved in well-defined Star’s” — again, no mention of Magellan.

John Herschel (1847), in a section entitled “On the two nebulae or Magellanic Clouds”, talks only about Nubeculae. Only in the accompanying figure, where he gives his visual observations, does he mention, “The two Magellanic Clouds as seen with the naked Eye”. So he uses both the scientific denomination and the more public name, and Herschel seems to have been the first to use the name Magellanic Clouds in scientific publications. Later, in the first edition (1910) of the well-known Norton’s Star Atlas, it is stated that, “the Magellanic Clouds or Nubecula Major and Nubecula Minor appear to the naked eye like detached portions of the Milky Way, and are a marvelous sight in the telescope” as if their names were obvious, but without any further note on Magellan (nor on their nature). So, although no precise date can be given, it seems that by the late 19th century, the term Nubecula was still being used in scientific exchanges, but the term Magellanic Clouds was progressively passing from nautical circles to the public and scientific spheres, finally replacing Nubeculae once scientists abandoned Latin.
To conclude about Magellan, one may turn to words from the introduction to Drake’s famous voyage (Ed. 1628):

Fame and envie are both needlesse to the dead because unknown, sometimes dangerous to the living when too well knowne: reason enough that I rather chuse to say nothing, then too little, in the praise of the deceased Author.

It is more difficult now to observe “at my house”, as Dunlop did, but astronomers travelling to Chile should keep in mind in how hard it was to reach that country in those early days. Today, we do it in 14 hours, instead of 14 months.

Acknowledgements
A longer version of this article is available at arxiv:2009.04973. Many of the texts have not reached us in their original language, but rather in Latin, French (or, later, English) translations. Whenever possible, I have presented text in the original language (except Arabic), to also reflect the diversity of languages in use in the ESQ community. Concerning travel and the discovery of the southern hemisphere, some of the compilations mentioned above — to which the reader may refer for more details — such as de Barros (1552), d’Anghiera/Eden (1516/1555), Ramusio (1550), Herrera (1601) or Fernández de Navarrete (1837), are available online; some travel reports have been translated into English by the Hakluyt Society (which honours the work of Richard Hakluyt himself [1553–1616]). Regarding Magellan’s journey, most available documents have been assembled in the excellent, recent book by de Castro (2010). Many detailed reports of Portuguese travels (by da Mosto, Vespucci, Gama, etc.) have also been published by Éditions Chandeigne (Paris).

This work is of course not the first dealing with the discovery and description of the southern sky. While conducted independently, it has also benefited, in addition to the references and compilations quoted above, from prestigious predecessors. To mention at least the most important ones: the Cosmox from Alexander von Humboldt, the 3rd volume of which appeared in 1851; the report by E. Halley, which appeared in 1679 in Latin in London, and the same year in Paris translated into French; and the reports of La Caille, which appeared in Paris in the Mémoires de l’Académie des Sciences in 1752 (p. 586) and 1755 (p. 194). See also the IAU 190 in 1998 where Paul Hodge dealt with that topic (1999, IAU190, ed. Chun, Y. H. et al., ASPM, 3).

It is a pleasure to thank Hakim Atek and Carlos Carvalho (APF, Rodolfo Barba (Univ. La Serena), Beatriz Barbuy (Univ. São Paulo), Muriel Dennefeld (Science Po Paris), Carl Ehrig-Eggert (Univ. Frankfurt), Emilie Kaffan (Paris Obs.), Somaya Saad and Ahmed Shokry (Cairo Observatory), Mira Veron (OHP), Hans Zinnecker (ESO-Chile) and Louise Devoy and Scarlet Shokry (Cairo Observatory), Mira Veron (OHP), Hans Zinnecker (ESO-Chile) and Louise Devoy and Scarlet Shokry (Cairo Observatory) for useful exchanges and copies of some documents.

References
Alfonso, G. 2006, Scientific American Brasil, 14, 46 d’Anghiera, P. M., De rebus oceanis et Orbe Novo Decades, 1–3 Dec. 1516, Alcalá de Henares; and 1–8 Dec. 1530 Bensaloue, J. 1912, L’Astronomie Nautique au Portugal à l’Epoque des Grandes Découvertes, (Bern: Max Drechsel) de Barros, J., da Asia... dos feitos que os Portugueses fizeram no descobrimentos e conquista dos mares e terras do Oriente,... Décadas 1–4, Lisbon, 1552–1615. Modern edition 1945, (Lisbon: Agência Geral das Colônias) de Castro, X. 2010, Le voyage de Magellan, (Paris: Éditions Chandeigne) Dekker, E. 1987, Annals of Science, 44, 439 Dorn, B. 1829, Trans. R. Asia Soc. Gr. Br. & Ir., Vol. 2, No. 1, 371 Drake, Sir F. 1627, The World encompassed, (London: Nicholas Bournen); reprinted 1854 (London: Hakluyt Society) Dunlop, J. 1826, Philos. Trans. Royal Soc., 118, 113 Ferrand, G. 1928, Introduction à l’Astronomie Nautique Arabe (Paris: Librairie Orientaliste Paul Geuthner)

Hakkuyt, R. 1589, The Principal Navigations, Voiges and Discoveries of the English Nation (etc.), (London: George Bishop & Ralph Newbomie) de Herrera, A. 1601, Historia General de los Hechos de los Castellanos en las Islas i Tierra Firme del Mar Océano (4 Vols.), (Madrid: Juan Flamenco & Juan de la Cuesta) Herschel, Sir John 1847, Results of Astronomical Observation made... at the Cape of Good Hope, (London: Smith, Elder & Co.) de Houtman, F. 1603, Spraek ende woord-boeck in de Maleysche ende Madagaskarsche Talen, (Amsterdam: Jan Evertsz), Star catalogue transl. into French by Marre, A. 1881, Bull. Sci. Math. et Astron., 5, no. 1, 336 Houzeau, J. C. 1885, Ciel et Terre, Vol. 1, second series, 481 Ideler, L. 1809, Untersuchungen über den Ursprung und die Bedeutung der Sternnamen, (Berlin: J. F. Weiss) van der Kroft, P. 1998, Globi Neerlandici, (Utrecht: HES publishers) Levathes, L. 1994, When China Ruled the Seas, (New York: Simon & Schuster) Markham, C. 1911, Early Spanish Voyages to the Strait of Magellan, (London: Hakluyt Society) Fernández de Navarrete, M. 1837, Colección de los viajes y descubrimientos que hicieron por mar los españoles desde fines del siglo XV, Vol. 4, (Madrid: Imprensa Real) Nuttall, Z. 1914, New light on Drake/A Collection of Documents relating to his Voyage of Circumnavigation/1577–1580, (London: Hakluyt Society) Pozo Menares, G. & Canio Lliuquiqui, M. 2014, Wennumapu: Astronomia Mapuche, (Santiago: Ocho Libros) Ramusio, G. B. 1550, Navigazioni e Viaggi, (Venice: Lucantionario Giunti) Rümker, C. 1832, Preliminary catalogue of fixed stars intended for a Prospectus of a Catalogue of the Stars of the Southern Hemisphere included within the Tropic of Capricorn now reducing from the observations made in the Observatory at Paramatta by Charles Rümker, (Hamburg: Perthes & Besser) al-Sufi, A.-al-R. 964, Suwar al-Kawakib, Description des étoiles fixes, trans. by Schellmer, H. C. 1874, (St. Petersburg), reprinted 1886, (Frankfurt/Main: Universität)

Torres de Mendoza, X. 1879, Annuario Hidrografico della Maris di Chile, 5. 450 Transylvanus, M. 1523, De moluccis insulis, (Köln, Paris, Rome) Vespucci, A. 1504, Mundus Novus: Firenze, Paris, Augsburg, etc... also in 1507, Paesi novamente retravati, (Venezia), and in Ramusio, G. B. 1550

Notes
a The oldest surviving manual for navigation, the Portuguese Regimento do Estriboalo, which probably dates from 1509, sits not in Évora, but in Munich (ex Royal Library), see Seitenheiten aus Süddeutschen Bibliotheken (Freys, E. 1912, (München), and Bensaloue, J. 1912).

b d’Anghiera, P. M., De rebus oceanis et Orbe Novo Decades has been reprinted and translated many times, including The Decades of the Newe Worlde or West India, translated into Englishse by R. Eden (1555, London: Rychard Layne); a French translation by P. Gaffarel (1907, Paris), and an English translation by F. MacNutt (1912, London).