



**JTLS**

*Journal of Travel Literature Studies*

*JTLS*, Vol. 1, No. 2, 2026, pp. 100-123.

Print ISSN: 3135-6788; Online ISSN: 3135-6796

Journal homepage: <https://www.tlsjournal.com>

DOI: <https://doi.org/10.64058/jtls260102mmtpc>



---

## Mapping Maritime Travel: Portolan Charts and the Epistemic Shift in Medieval European Geography

**Sai Dong**

**Abstract:** The emergence of portolan charts in the thirteenth-century Mediterranean marked a significant transformation in European cartographic practice. Unlike traditional *mappae mundi*, which organized space through classical and theological frameworks, portolan charts focused on maritime environments shaped by sustained navigation and exchange. Characterized by detailed coastlines, dense coastal toponymy, and networks of rhumb lines, these charts functioned as practical tools shaped by repeated maritime travel. This paper examines the development of portolan charts through their geographical scope and the evolution of hydrographic and toponymic information from the thirteenth to the fourteenth centuries. By tracing how navigational knowledge was accumulated, corrected, and stabilized in use, it argues that portolan charts represent not merely technical innovation but a broader epistemic reorientation in late medieval geography toward an empirically grounded spatial knowledge rooted in travel, movement, and practice.

Received: 11 Jul 2026 / Revised: 02 Aug 2026 / Accepted: 20 Aug 2026 / Published online: 15 Sep 2026 / Print published: 15 Dec 2026.

**Keywords:** portolan chart; maritime travel; medieval cartography; navigation; epistemic change

**Author Biography:** Sai Dong is a lecturer in the School of Foreign Languages and International Communication at Luoyang Institute of Science and Technology. He obtained his PhD from the University of International Business and Economics, with a dissertation on the literary cartography of *The Canterbury Tales*. His research focuses on medieval English literature, literary geography and geocriticism, and travel writing. He has published in peer-reviewed journals including *The Explicator*, *Journal of Central South University*, and *Journal of Henan University*. Email: dongsailing@lit.edu.cn.

### **The Emergence of Portolan Charts in Their Historical Context**

Over centuries of development, European medieval maps presented a diverse array of forms and styles. Modern scholarship in the past century has often classified and discussed them based on shape and function. By form, they are generally categorized as rectangular, circular, oval, or almond-shaped. By function, they are divided into *mappa mundi* (world map), local and regional maps, portolan charts, and celestial maps; it is this functional classification that has received particular scholarly attention (Woodward, 1987, p. 295).<sup>1</sup> Among these, the *mappae mundi* oriented with East at the top was the most common surviving type. From their inception in the sixth and seventh centuries, later draftsmen often relied on historical texts, natural histories, biblical exegesis, and mythological legends, incorporating substantial contemporary geographical information. By the thirteenth century, world maps exhibited a

<sup>1</sup> The term portolan charts is conventionally used in modern scholarship to designate medieval nautical charts. The term itself dates to the late nineteenth century and derives from the Italian portolano, a written manual of sailing directions. This etymology has often been taken to imply that early scholars understood such charts as auxiliary to textual navigational guides rather than as autonomous cartographic instruments. For a standard account, see Campbell (1987, p. 375).

characteristic blend of imagination, historicity, religious symbolism, and encyclopedic detail (Shi & Dong, 2025, p. 80).

However, the thirteenth century witnessed the rise of commercial revival and long-distance sailing in the Mediterranean. It was during this period that a markedly distinct and functionally innovative type of map emerged: the portolan chart. Radically departing from the traditions of *mappae mundi*, these charts eschewed grand historical and mythological narratives, focusing instead on the practical realities of the often-tumultuous seas. Oriented with North at the top, they delineated the coasts of the Mediterranean, Black Sea, and parts of the European Atlantic with remarkable accuracy, labeling them with numerous port names. Devoid of modern latitude and longitude systems, they incorporated intricate networks of rhumb lines, which provided mariners with a reference for determining bearing and plotting courses on unpredictable waters. The emergence of portolan charts thus marked not merely a significant transformation in cartographic practice, but also a broader epistemic reorientation in late medieval geographical knowledge, one that increasingly privileged empirical experience and practical engagement with maritime space. By examining the formal characteristics, origins, and development of portolan charts from the thirteenth to the fourteenth century, this study seeks to illuminate the ways in which European cartography and spatial understanding were reshaped during this period.

This epistemic reorientation was not an abstract intellectual shift but was materially embedded in the formal structure and practical design of portolan charts themselves. Portolan charts were designed on mathematical and geometric principles. Typically drawn on single sheets of parchment, coastlines were outlined in black ink, with numerous port names written perpendicular to the coast on the landward side. Major ports, small islands, and river mouths were marked in red, while reefs were indicated by crosses or dots. Key areas were often covered by one or two tangent wind roses. From the center of these wind roses, like spokes from an axle, radiated 16 or 32 lines intersecting the circumference. From each intersection point, 8 or 16 lines radiated in the opposite direction, creating a dense, crisscrossing web of rhumb lines that

covered the chart comprehensively, providing a full directional reference. In practical use, the accurate coastlines and port information on a portolan chart established a geographical framework. Mariners could select their departure and destination points from the ports listed along the coast (usually in counterclockwise order). They would then identify the rhumb line nearest to the intended course for the most economical and safe route. If a vessel deviated from its planned course due to wind, weather, or human error, the navigator would first estimate the distance and angle of deviation using a compass and sandglass timer. They could then employ the *marteloio* method—a trigonometric system for resolving the nautical triangle—to calculate the corrective course back to their intended route and determine their estimated position. Functionally, therefore, the chart was not merely a coastal record but a dynamic navigational instrument, indispensable for planning voyages.

Their practical utility meant portolan charts were subject to seawater damage and wear from frequent handling. Consequently, compared to the more commonly preserved world maps kept indoors, far fewer have survived. According to Tony Campbell's census, only one chart survives from the thirteenth century, with the number rising to thirty-three for the fourteenth century. Among these, the works of the Genoese craftsman Pietro Vesconte (1270–1344), which include one chart and seven atlases, are particularly notable; and he is recognized as the first medieval mapmaker whose identity is securely established (Campbell, 1986, p. 69). As these charts were used in maritime trade, warfare, and exploration to mitigate risks, identify positions, and plan routes (Kelley, 1995, p. 2), their emergence during this era of unprecedented geographical mobility in the twelfth and thirteenth centuries is unsurprising. However, the reasons for their sudden, high-precision appearance, so distinct from medieval cartographic traditions, remain a subject of ongoing scholarly debate.

### **Competing Explanations for the Origins of Portolan Charts**

The formal sophistication and apparent technical maturity of the earliest surviving portolan charts raise an important historiographical problem. Despite their close

association with late medieval maritime practice, these charts appear suddenly in the historical record with a level of precision that seems disproportionate to the navigational instruments and scientific knowledge conventionally attributed to medieval Europe. This tension between the charts' demonstrably practical function and the apparent absence of clear developmental antecedents has prompted sustained scholarly debate concerning their origins. Accordingly, modern research has sought to explain how portolan charts came into being, advancing competing theories that variously emphasize classical inheritance, medieval innovation, or the cumulative experience of mariners.

One influential line of explanation situates the origins of portolan charts in developments that predate the Middle Ages, emphasizing the limitations of medieval navigational technology. From this perspective, the emergence of charts with such apparent precision is difficult to reconcile with the tools and techniques conventionally available to medieval sailors. On the basis of mathematical modeling, Roel Nicolai has argued that mariners of the Middle Ages would have been unlikely to produce charts of such accuracy through empirical navigation alone. He therefore proposed that portolan charts may ultimately derive from ancient maps or nautical charts transmitted to Italian merchants through contacts with Constantinople, advancing what has come to be known as the Greco-Roman origin theory (Nicolai, 2014, pp. 57–62). According to this view, the extensive cultural exchange, long-distance travel, and administrative surveying practices characteristic of the Greek and Roman worlds provided a more plausible context for the development of such cartographic precision than the politically fragmented landscape of medieval Europe. The prominence of the Mediterranean and Black Sea regions in early portolan charts—areas central to classical maritime activity—is often cited as further support for this interpretation.

However, no classical maps or cartographic models that closely resemble portolan charts are known to have survived into the Middle Ages for medieval cartographers to consult. Neither Ptolemaic maps nor those by Al-Idrisi (1100–1166), despite their deep indebtedness to Roman geographical traditions, bear significant resemblance to

portolan charts. The fundamental cartographic principle of portolan charts, namely, their explicit design for practical navigation by sailors, finds no clear precedent in surviving Greco-Roman cartography. On this basis, a number of scholars have argued for a medieval origin of portolan charts, noting the first documented appearance of portolan charts in late thirteenth-century sources. This medieval-origin position, however, encompasses a range of distinct interpretations. One view suggests that the earliest charts were drawn using geographical information from written *portolani* (sailing directions),<sup>1</sup> such as bearing and distance data between Mediterranean ports found in texts like *Lo compasso* (Nicolai, 2014, p. 120). However, Campbell contends that the distance and directional information in *portolani* was generally less precise than that represented on portolan charts. Furthermore, comparative analysis of toponyms indicates that the earliest surviving medieval portolano, the *Liber*, did not derive exclusively from first-hand sailing experience, but instead appears to have borrowed, at least in part, from earlier charts, a finding that suggests portolan charts may have preceded written sailing directions rather than the reverse (Campbell, 2021).

Another influential interpretation within the medieval-origin framework was advanced by Hermann Wagner, who proposed that portolan charts were assembled from a series of regional maps of the Mediterranean. He suggested that Italian cartographers systematically revised and combined maps of different sea basins to construct a comprehensive chart of the Mediterranean (Wagner, 1895, pp. 65–87). Campbell subsequently refined Wagner's hypothesis by drawing attention to a pronounced bulge between Tunisia and Sicily that effectively divides the Mediterranean into eastern and western basins. According to Campbell, sailors operating within each basin over long periods accumulated experiential knowledge by recording inter-port distances, and as trade expanded during the later Middle Ages, voyages increasingly crossed these basin boundaries. Mariners therefore likely produced regional charts in response to practical navigational needs. Through incremental empirical correction of routes, such charts

<sup>1</sup> Two *portolani* predating the thirteenth century survive: the *Liber de Existencia Riveriarum et Forma Maris Nostri Mediterranei* and *Lo compasso*. These typically contain written records of distances between ports and sailing directions, including information on freshwater sources, landmarks, and hazards.

gradually reduced accumulated errors, and over time, these regional representations were integrated by navigators into a unified chart of the Mediterranean (Campbell, 1987, p. 387).

Building on the ideas of Wagner and Campbell, Roel Nicolai further proposed that early Mediterranean charts were composed of six “sub-charts,” each characterized by its own scale and orientation, which were subsequently assembled by cartographers using overlapping coastlines as reference points (Nicolai, 2014, pp. 286–287). Tome Marelić’s cartometric analysis of seven portolan charts from the fourteenth to the sixteenth centuries identified notable variations in scale and accuracy across different regions within individual charts, findings that lend empirical support to Nicolai’s compilation model (Marelić, 2025). Yet despite his endorsement of the composite-chart hypothesis, Marelić ultimately extended his inquiry beyond medieval practice to questions of deeper origin. He observed that the geometric configurations of charted regions closely approximate those generated by Mercator projection, a technique he argues could only have been mastered by classical mathematical geographers and was subsequently lost during the Middle Ages. On this basis, he continued to trace the ultimate source of portolan charts back to antiquity (Marelić, 2025, pp. 608, 611). Nevertheless, the compilation theory itself raises several unresolved problems. The proposed “basins” and “sub-regions,” for instance, do not correspond well to the actual geographical structure of the Mediterranean, nor do the names of such hypothetical regional charts appear in later cartographic traditions. Moreover, medieval sailors were primarily concerned with navigational routes rather than abstract maritime basin divisions unrelated to practical sailing, casting doubt on the extent to which such divisions could have shaped the process of chart production.

Beyond theories that derive portolan charts from written *portolani* or from the compilation of regional maps, other scholars within the medieval-origin camp argue that these charts emerged from the accumulated sailing experience and direct observation of generations of mariners, expanding in scope and increasing in accuracy

as trade routes developed. Campbell is a leading proponent of this interpretation. He argues that:

Before the appearance of the portolan chart an open-sea (pelagic) mariner, from any early period, would have needed a mental map of at least part of the Mediterranean, allied to the ability (prior to the invention of the magnetic needle) to determine direction, by means of a mental wind compass – for which there is indeed documentation. He would not have set out to sea otherwise. The mental maps would have been formed out of an expanding network of individual courses, memorized during a pilot's life. Since many voyages would have involved ports around the sea's periphery those, collectively, could have served to define the Mediterranean's limits. Based on a collaborative pooling of those mental maps it would have been possible to 'download' the whole network as a single graphic design. Once the Mediterranean was visible as a whole, the conflicting estimates of a place's position could be reconciled and omissions rectified. (Campbell, 2021)

On this view, portolan charts originated in the collective navigational memory of Mediterranean sailors, emerging as the product of communal practice and shared experiential knowledge. This raises a further question: how was such a "mental map" first translated into a coherent and reliable graphic representation? Campbell suggests that sailors, once capable of visualizing complex route networks from memory, may have recognized that externalizing these relationships on a physical surface would clarify spatial relations and facilitate the incorporation of new routes. Coastlines could then be sketched by connecting known capes, ports, and landmarks, gradually forming recognizable coastal outlines. Subsequent users needed only to add place names sequentially along these coastlines to generate early chart forms (Campbell, 2021). Campbell's hypothesis remains necessarily conjectural, as there is no direct documentary evidence demonstrating that such a comprehensive Mediterranean "mental map" existed or was systematically employed for navigation. Doubts have also

been raised concerning the capacity of human memory to retain the volume of route information required for chart construction. Nevertheless, the theory is not without historical support. Prior to the widespread use of charts, navigation relied heavily on personal experience and dead reckoning, employing rudimentary instruments such as sandglasses, lead lines, and lodestones. Chaucer's description in the General Prologue of a fourteenth-century sailor who knew "alle the havenes" between Gotland and Finisterre and "every cryke" in Brittany and in Spain without a chart provides indirect testimony to mariners' ability to form intangible mental route maps of familiar seas (Chaucer, 1987, lines 407–409).

By the thirteenth century, moreover, technological developments had begun to make the externalization of such knowledge increasingly feasible. European mariners adopted the magnetic compass for orientation, a device already depicted on the earliest surviving portolan charts. Triangular surveying methods likewise offered a practical structural framework. Although rooted in Greco-Roman antiquity, these methods required neither advanced mathematics nor sophisticated instruments: through experience and observation, sailors could estimate positions by means of intersecting bearings, thereby supplying reasonably accurate geographical information for chart production. Taken together, the combination of medieval navigational tools, accumulated sailing experience, and shared mental route maps makes it plausible that mariners could have produced rudimentary charts, which were subsequently refined and corrected through sustained use.

While each of the above approaches has contributed substantially to our understanding of medieval cartography, they have often treated portolan charts either as technical solutions to navigational problems or as derivative products of earlier scientific traditions. Relatively less attention, however, has been paid to the epistemic conditions under which such charts were produced, used, and invested with authority. Building on this observation, this article adopts a complementary perspective: rather than focusing primarily on where portolan charts originated or how accurate they were, it asks what kinds of geographical knowledge they embodied and authorized. By

situating portolan charts within the broader contexts of mercantile exchange, crusading mobility, and everyday maritime practice, this study argues that they are best understood as material expressions of an epistemic shift in late medieval geography—from authority-based, textually inherited conceptions of space toward empirically grounded, practice-oriented modes of knowing.

### **The Evolution of Hydrographic Information on Portolan Charts**

To move beyond debates over origin and explanation, it is necessary to examine how portolan charts actually developed in use. By tracing changes in coastline representation, toponymic density, and regional coverage over time, the following section shifts the focus from hypothetical origins to the concrete processes through which hydrographic knowledge was accumulated, stabilized, and transmitted in medieval maritime practice. In their earliest surviving forms, portolan charts share several distinctive features in their geographical scope. Rather than presenting an abstract or comprehensive vision of the world, they concentrated on maritime spaces shaped by sustained human movement and exchange. They typically extended eastward to the Black Sea and the eastern Mediterranean and westward to the western Mediterranean and parts of the European Atlantic coast. On the earliest extant example, the *Carta Pisana*, these coastlines are already densely populated with port toponyms, and major coastal cities are highlighted in red. This density of coastal information suggests that by the thirteenth century—or even earlier—maritime routes linking the Black Sea, the Mediterranean, and the Atlantic had become both operationally established and cognitively integrated.

The most accurately rendered coastlines generally correspond to regions of intensive Genoese and Venetian commercial activity, including the Black Sea and the Mediterranean networks dominated by these city-states, as well as the North African coast with which they maintained frequent trade. By contrast, the North Sea and the Baltic Sea appear somewhat later in portolan charts and are depicted with noticeably lower precision in early examples. Yet from the fourteenth century onward, these northern regions were progressively incorporated, accompanied by continuous revision

of place names and coastal outlines. Even core regions such as the Mediterranean and the Black Sea underwent ongoing correction and refinement. Such patterns indicate that early portolan charts were not static representations but working instruments, repeatedly consulted, amended, and recalibrated in response to contemporary maritime practice. Accordingly, tracing the evolution of hydrographic information—especially changes in coastlines and the expansion of represented regions—provides insight into the ways in which geographical knowledge was generated through trade, crusading activity, and sustained seafaring.

To examine the evolution of hydrographic information, scholars typically begin by establishing approximate dates for surviving charts and arranging them chronologically in order to compare changes across successive periods. This analytical sequencing reveals that the development of portolan geography proceeded in several discernible stages rather than through uniform expansion. The earliest regions to appear were the Mediterranean coast, which linked eastern and western worlds, together with the enclosed waters of the Black Sea; these areas also constitute the most accurate components of early charts. Subsequently, coverage expanded northwestward into the Atlantic and Scandinavia, incorporating the Atlantic coasts of France, the Low Countries, England, and Ireland, as well as the North Sea and the Baltic Sea. These regions are already present in charts produced before the 1330s, though their accuracy improved gradually. A third phase, occurring in the fifteenth century, introduced extensive new information on the Atlantic coast of Africa, largely as a result of Portuguese exploration (Campbell, 2021).

Because the earliest surviving portolan charts already display relatively mature geographical knowledge of the Mediterranean and Black Sea, the present section focuses on regions whose representations were still in the process of formation during the fourteenth century. These include England, the North Sea, the Baltic Sea, the European Atlantic coast, and the North African coast. This period represents the formative phase of portolan chart development and is also one from which comparatively few examples survive. The charts examined here include several

produced by Pietro Vesconte, the late-thirteenth-century *Carta Pisana*, and fourteenth-century works by Marino Sanudo, Johannes de Carignano, Angelino Dulcert, and the Pizzigano brothers.

On the *Carta Pisana*, the British Isles appear as a horizontally oriented rectangular form near the upper-left edge of the chart, with six ports labeled along the southeastern coast, including London. In Pietro Vesconte's chart of 1313, the British Isles are oriented more accurately along a north-south axis, with clearly recognizable features such as the Cornwall peninsula and the bays of South Wales. Southeastern coastal elements, including the Isle of Wight, the Isles of Scilly, the Channel Islands, the Thames estuary, and the Wash, are also distinctly represented. The number of English toponyms increases to thirty-six, and Ireland appears for the first time. In Vesconte's final surviving chart (1327), the Isle of Man and the Bristol Channel are added, English place names exceed sixty, and Irish toponyms number more than forty (Campbell, 1987, p. 407). Ruddock has argued that this English geographical information was unlikely to have been derived from contemporary local maps, but instead reflects the navigational records of Venetian merchant vessels engaged in frequent trade with Flanders and England (Ruddock, 1951, p. 22).

The evolution of place names in the North Sea region north of England followed a similar pattern. In the *Carta Pisana*, eleven place names appear between Denmark and Dieppe. This number increases to sixteen in the early-fourteenth-century *Carta Riccardiana* and reaches approximately forty in Vesconte's later 1325 atlas (Campbell, 2015). While many of these names designate major coastal ports, others refer to important inland cities accessible by river, such as Dordrecht, Cologne, Antwerp, Mechelen, and Ghent—urban centers that functioned as key nodes within maritime trade networks. Cologne provides a representative example: located upstream on the Rhine, it had joined the Hanseatic League by 1260 and is placed conspicuously close to the coast in Angelino Dulcert's chart of 1339. Bruges constituted another crucial North Sea hub, serving as a primary intermediary between Hanseatic cities and Mediterranean markets. Historical records attest to Genoese merchants reaching Bruges

as early as 1277, Venetian Flanders galleys arriving after 1314, and regular Genoese voyages by 1325. Early-fourteenth-century Hanseatic trade regulations required that goods traveling north from the Mediterranean or Iberia pass through Bruges, suggesting that much of the geographical information recorded on portolan charts derived from the experience of southern European mariners (Campbell, 2015). By around 1320, Antwerp began to appear in portolan charts and gradually supplanted Bruges as silting rendered the latter less accessible.

As chart coverage extended to the North Sea, the adjacent Baltic Sea also began to receive cartographic attention. Marino Sanudo's world map from around 1320 was among the first to include the Baltic Sea, though its coastline remains schematic. The island of Gotland is exaggerated in size, with its capital Visby—an important commercial center—prominently emphasized. Johannes de Carignano, writing around 1329, also depicted the Baltic, marking ten settlements, though only Bergen and Tromberg can be identified with certainty today. While Norway is absent from these early representations, Angelino Dalorto's chart of 1330 assigns it considerable prominence, depicting it in the distinctive inverted and slanted "A" shape that would persist in later charts. Dulcert's chart of 1339 further refined and expanded the Baltic region, after which its configuration remained largely stable.

The continental European Atlantic coast opposite England underwent comparatively little modification after Vesconte's chart of 1313. In this map, the coastline extends from Bruges southward along the French Atlantic seaboard to Brittany and Bayonne, then turns westward along the northern coast of Spain to Cape Finisterre before continuing south to Cape St. Vincent and curving around the Strait of Gibraltar into the Mediterranean. This Atlantic coastline, like that of the Mediterranean, represents one of the most accurately rendered regions in medieval portolan charts. Such accuracy, however, was the result of gradual accumulation rather than sudden discovery. In the *Carta Pisana*, the Atlantic outline is barely recognizable. Scholars have suggested that its earliest representations may have drawn on the experiences of crusaders traveling southward by sea, who exchanged oral or written navigational

knowledge with Genoese sailors in the Mediterranean (Kelley, 1979, p. 19). Campbell further argues that Bruges' commercial importance motivated Italian merchants to conduct detailed surveys of the Atlantic coast and that coastal sailing along the European Atlantic seaboard was safer and more routine than open-sea voyages to England or the Baltic. By the 1270s, Genoese trade with Bruges was already flourishing, and the Atlantic coastline had assumed a recognizable form in Vesconte's earliest charts, remaining largely consistent in later works such as the *Carta Riccardiana* and the Carignano chart (Campbell, 2015).

Besides the Atlantic, the North African coast, closely linked through trade with Spain and Italy, was a core component of portolan charts. A distinctive feature of this region is the diversity of its toponymy, which may be broadly classified into three categories: direct transliterations of local (often Arabic) place names; hybrid forms adapted by Christian travelers; and names borrowed directly or indirectly from classical antiquity (Brentjes, 2012, p. 136). The first category predominates and was likely transmitted through practical sources such as sailors' logs, while the third derives mainly from Ptolemaic or other classical geographical traditions preserved in Arabic scholarship. This layered toponymy underscores both the commercial centrality of the North African coast and the multiple channels through which geographical knowledge circulated. Morocco, in particular, occupied a prominent position along Mediterranean trade routes and maintained frequent contact with Europe. The earliest surviving portolano, the *Liber*, records repeated crusader voyages via Morocco between 1147 and 1271. Gautier Dalché's analysis further indicates that crusading fleets resupplied along the Moroccan Atlantic coast during the Third Crusade (Campbell, 2015). Campbell has also suggested that the cartographer of the *Carta Pisana* may have omitted England at the northern edge in order to retain Morocco in the south, given the constraints of parchment size—an omission that itself signals Morocco's perceived importance (Campbell, 2015). Tunisia constituted another key North African region. Ptolemy, himself an Egyptian, had already marked the adjacent Tunisian coast on his world map, though with limited accuracy (Dilke, 1978, p. 155). The earliest historical reference to

a portolan chart reports that King Louis IX of France (1226–1270), during a storm at sea, ordered a chart to be consulted to confirm the route to Tunisia (Freiesleben, 1984, p. 196). Although the chart used on this occasion has not survived, the prominence of “Tunis,” highlighted in red in the *Carta Pisana*, attests to its importance. Located less than 150 kilometers from Sicily, Tunisia served both as a major commercial port and as a crucial gateway for Genoese merchants entering North Africa.

Examining the evolution of hydrographic information in early portolan charts demonstrates that coastlines and place names became increasingly detailed and accurate as trade networks expanded, voyages multiplied, and empirical exploration deepened. Yet it would be misleading to interpret this process as a continuous, linear progression. The representations of England, the North Sea, and the Baltic Sea reached relatively stable forms by the early fourteenth century and remained largely unchanged for generations; even some sixteenth-century charts differ little from their fourteenth-century predecessors. Over time, distinct regional styles also emerged. Italian charts tended to retain a restrained visual language focused on coastal toponymy, while Catalan chart makers increasingly incorporated inland rivers, mountains, cities, and political entities, producing more elaborate compositions. Scholars generally agree that the former preserved greater navigational functionality (He & Han, 2020, p. 80). Charts such as Angelino Dulcert’s of 1339 also expanded Asia toward the Caspian Sea and extended Africa southward beyond the Sahara, anticipating the emergence of “transitional maps” that bridged medieval conventions and Renaissance cartographic models.

Taken together, the gradual consolidation of coastlines and the stabilization of toponyms in portolan charts suggest a pattern of geographical development shaped less by abstract cartographic theory than by sustained, iterative engagement with maritime space. Those regions most frequently traversed—whether for trade, crusading, or diplomatic travel—acquired increasingly dense and stable representations, while less frequented areas remained schematic or marginal. This uneven refinement underscores the practical conditions under which geographical knowledge was accumulated,

transmitted, and corrected. Rather than progressing uniformly, hydrographic information evolved through selective intensification, reflecting the spatial priorities of medieval seafarers. Such patterns indicate that portolan charts were grounded in a mode of knowledge production that privileged repeated experience and functional reliability over inherited authority—a feature that points toward a broader epistemic reorientation in late medieval geography.

### **Portolan Charts and Epistemic Shift**

Surveying the history of European medieval cartography, one quickly recognizes that early maps, such as the *mappae mundi*, were not chiefly concerned with accurate geographical representation. Instead, they functioned as expressions of religious thought and imaginative worldviews, presenting the cartographer's subjective and often impressionistic conception of the world. On such maps, the relative size of geographical regions reflected their perceived spiritual or symbolic significance rather than any actual spatial extent. Consider Isidore of Seville's T-O map, which places Asia in the upper half of the world, with Europe and Africa sharing the lower half. On the thirteenth-century Ebstorf Map (1234–1240), the eastern Mediterranean region in Asia is rendered in rich detail through sacred geography, while Africa, positioned in the lower right quadrant, occupies a comparatively small and sparsely annotated space.

In the late Middle Ages, cartographers increasingly sought to represent the world in ways that aligned more closely with lived spatial experience, drawing on mathematical proportion, direct observation, and accumulated travel knowledge. The portolan chart represents a paradigmatic expression of this emerging approach, one shaped less by abstract cosmological frameworks than by the demands of sustained long-distance movement across maritime space. Its close connection to long-range crusading voyages is especially notable. The earliest historical reference involves Louis IX consulting a chart en route to Tunisia in 1270, while the earliest surviving chart, the *Carta Pisana*, dates from the late thirteenth century (Freiesleben, 1984, p. 196). This connection may extend back a century earlier: the portolano *Liber de existencia riveriarum*, a key source for chart toponymy, records coastal places referenced in accounts of crusades from the Second (1147) to the Ninth (1271). Approximately three-

quarters of these place names appear on the earliest charts by Pietro Vesconte, whose works—owing to both their early date and high degree of cartographic consolidation—constitute a corpus of so-called “Foundation Names” (Campbell, 2015). Such patterns suggest that crusading itineraries provided not merely anecdotal references but a structurally significant geographical substrate for later chart-making.

The close relationship between crusading activity and the development of portolan charts likely stemmed from the specific navigational demands posed by extended open-sea voyages. Unlike routine medieval commercial travel, crusading expeditions often followed longer routes through unfamiliar waters and involved more complex navigational conditions. Contemporary accounts of naval engagements repeatedly emphasize the importance of fleet maneuvering and positional awareness (Rose, 2013, p. 121). In such contexts, a ship’s heading and location became matters of strategic consequence. These conditions created an acute need for practical spatial tools capable of reliably representing coastlines and bearings. Used alongside instruments such as sandglasses, magnetic compasses, and dividers, portolan charts enabled navigators to estimate position, correct course, and identify potential harbors, functions essential for prolonged maritime operations. It is therefore unsurprising that some scholars have suggested that naval commanders themselves contributed to chart development. Charles de la Roncière, for example, proposed that the Genoese admiral Benedetto Zaccaria, who commanded Byzantine, Catalan, and French fleets, may have undertaken coastal surveying during his campaigns, thereby supplying information later incorporated into charts (Crone, 1978, pp. 36–37).

Beginning in the late eleventh century, the Crusades also facilitated the transmission of scientific and technical knowledge from the Islamic world to Latin Europe. Ptolemaic astronomy, preserved and expanded by Arabic scholars, re-entered Western intellectual circulation, along with advanced works on astronomy, astrology, and celestial projection techniques. These developments contributed to a broader transformation in the epistemic resources available to European scholars and practitioners, including cartographers. Some researchers have therefore suggested that the production of portolan charts may have been indirectly influenced by such projection techniques. Fuat Sezgin, analyzing early chart data, proposed that portolan

charts may have been constructed using stereographic projection—a method known since the Abbasid caliphate of al-Ma'mun (813–833)<sup>1</sup> and commonly employed in medieval astrolabes. He further argued that by the thirteenth century, Arabic astronomical geodesy, refined by scholars such as al-Biruni (973–1050) and Abu Ali al-Hasan al-Marrakushi, had achieved considerable accuracy in determining geographical coordinates. According to this hypothesis, chart makers could have established a coordinate framework through projection and subsequently integrated sailors' route-based data, processed through trilateration, to fix port positions and connect them into coastlines (Nicolai, 2014, pp. 394–395). Supporting this possibility, J. K. Wright demonstrated that employing fifty-eight geographical coordinates from the Marseilles Tables could generate remarkably accurate outlines of Arabia and the Mediterranean (Wright, 1923, p. 87). While such arguments remain speculative, they underscore the extent to which portolan charts were situated at the intersection of practical navigation and broader traditions of scientific knowledge transmission.

The empirical orientation embodied in portolan charts finds a clear resonance in contemporaneous literary production. As Allison DeWitt has demonstrated, Dante's precise and technically informed depictions of navigation—most notably in the episode of Ulysses' voyage—draw upon contemporary maritime practices and instruments rather than relying solely on symbolic or classical paradigms (DeWitt, 2019, pp. 127–128). Read in this light, the *Commedia* and early portolan charts may be understood as parallel articulations of a culture increasingly invested in empirically grounded spatial knowledge, in which literary imagination and cartographic practice alike were shaped by shared mercantile circuits and emerging epistemic habits. A similar convergence may be observed in Chaucer's work. As a customs official who traveled extensively and was familiar with Italian cultural and administrative contexts through diplomatic missions, Chaucer consistently integrates detailed maritime references into his poetry. Alfred Hiatt has observed that in *The Man of Law's Tale*, Chaucer's account of Custance's voyage from Syria to Northumbria and subsequently back to Rome deploys a set of specialized nautical toponyms—"See of Grece," "Strayte of Marrok," "Jubaltare," and "Septe"—which correspond closely to locations frequently inscribed

<sup>1</sup> Al-Ma'mun, the seventh Abbasid Caliph, was a patron of science and translation whose reign saw significant advances in astronomy and geography.

on medieval portolan charts (Hiatt, 2011, pp. 155–156). Such usage suggests not merely incidental borrowing, but a sustained engagement with chart-based spatial knowledge and the epistemologies it encodes.

The epistemological orientation embodied in portolan charts did not remain confined to nautical mapping but gradually reshaped world maps, giving rise to hybrid or “transitional” cartographic forms. The earliest known world map to incorporate portolan features emerged from a collaboration between the Venetian merchant and crusade advocate Marino Sanudo and a Genoese cartographer (Harte, 2008, p. 14). Created in the aftermath of the fall of Acre in 1291, Sanudo’s *Liber secretorum fidelium crucis* included several maps intended to persuade the Avignon papacy to support renewed crusading efforts. The accompanying world map retained the eastward orientation and tripartite division of Asia, Europe, and Africa characteristic of *mappae mundi*, yet it also introduced a network of rhumb lines and rendered the Mediterranean and Black Sea coastlines with portolan-like accuracy. Africa extended southward in an arc suggesting the Gulf of Guinea, the Indian Ocean opened eastward, and significantly, the Caspian Sea was depicted as an inland body of water rather than a northern gulf. Biblical, classical, and contemporary geographical elements coexisted, but Paradise was omitted and the Holy Land was not visually exaggerated. The result was not a simple juxtaposition of old and new forms, but a reconfiguration of world geography under the influence of empirically validated maritime space.

The pinnacle of transitional mapping is Abraham Cresques’ Catalan Atlas, widely regarded as the most accomplished work of the fourteenth-century Majorcan school. The atlas consists of six parchment sheets arranged into twelve folios and, when fully unfolded, measures approximately 65×300 cm. The first two folios assemble medieval European astrological and astronomical knowledge relevant to navigation, including charts, numerical tables, and explanatory texts addressing celestial phenomena, geography, and technical procedures. Such compilations were a common feature of late medieval navigational atlases and manuals, reflecting the range of intellectual and technical resources considered relevant to maritime practice. In this context, the opening folios functioned as a compendium of reference knowledge, framing the spatial representations that followed rather than serving as independent cosmological diagrams.

The final four folios depict a vast spatial expanse extending from the Atlantic to the Pacific and southward to the Indian Ocean, employing gold and silver leaf to render the topography and coastlines of Eurasia and Africa. Specifically, folios 3–4 present the Mediterranean and Black Sea with coastlines that closely follow portolan conventions in scale and orientation, densely annotated with over a thousand port and cape names, and equipped with wind roses and rhumb lines. Folios 5–6 mark the atlas's expansion into a world map, portraying Asia and Africa with increasingly elaborate visual decoration. While certain classical and biblical motifs remain, such as Alexander the Great in Northeast Asia and the Israelites' crossing of the Red Sea, these elements no longer determine the organization of spatial representation. Instead, even within the interiors of Africa and Asia, contemporary place names predominate.

Particularly striking is the attention given to trans-Saharan routes, where salt-mining centers such as Taghaza and Tacost, together with established caravan paths, are clearly marked. The Red Sea, rendered with unusual prominence, appears as a major corridor linking the Indian Ocean to the Mediterranean world. European interest in African gold is visually articulated through the figure of Mansa Musa of Mali, depicted holding a large gold nugget near Timbuktu and accompanied by a legend emphasizing his wealth. The ill-fated voyage of Jacme Ferrer in 1346 to the "Rio de Oro," undertaken in pursuit of gold and from which he never returned, is commemorated by a ship placed along the West African coast, simultaneously marking a historical episode and gesturing toward further exploration. In contrast to traditional *mappae mundi*, which often filled Africa with classical nomenclature or monstrous races, the Catalan Atlas presents the continent primarily as a space structured by routes, resources, and zones of exchange, foregrounding its economic and connective dimensions rather than allegorical meaning.

Asia likewise acquires a recognizable cartographic outline for the first time. The Caspian Sea is depicted with a coherent and enclosed coastline, while Mongol territories extend from east of the Caspian to the Yellow Sea, with the capital Cambaluc (Beijing) of "Catayo" prominently identified. Cartographic historian Gerald Crone argued that much of the atlas's Asian material derived from contemporary travel accounts, including *The Travels of Marco Polo*, *The Travels of Sir John Mandeville*, and *The Travels of Odoric of Pordenone*. Legendary elements, such as desert spirits or

descriptions of Kublai Khan, were often incorporated directly from these narratives (Crone, 1978, p. 41). Larner identified at least twenty-nine Chinese place names traceable to Marco Polo, including Quanzhou, Hangzhou, Guangzhou, the Zhoushan Islands, and Hainan, with nearly all information concerning the Tartars drawn from this source (Larner, 2001, p. 93). India appears for the first time as a clearly defined peninsula, marked by the “Kingdom of Christians” on the east coast and Colombo, as well as ports such as Quilon, Cambay, Baroche, and Gogo on the west coast. Crone suggested that these details may have originated from the missionary Jordan Catala’s *Mirabilia descripta*, completed before 1340 (Crone, 1978, p. 47).

Thus, the Catalan Atlas draws extensively on contemporaneous portolan charts for the Mediterranean, Black Sea, and European coastlines, while simultaneously incorporating thirteenth and fourteenth century travel literature to construct a travel-informed and experience-based representation of Asia. Its principal innovation lies not in the rejection of inherited traditions, but in the systematic integration of a wide range of contemporary geographical sources into a reconfigured world image. Adhering to a practice-informed cartographic logic rooted in portolan traditions, the atlas omits many allegorical narratives and leaves polar regions deliberately blank, rather than filling them with monstrous races. In doing so, it demonstrates the transformative impact of the cartographic principles and practice-validated spatial knowledge first articulated in portolan charts.

## **Conclusion**

Examining portolan charts from the fourteenth century and earlier reveals that they were not static artifacts but dynamic and practice-oriented instruments, continually reshaped by expanding trade routes, crusading expeditions to the eastern Mediterranean, and diverse regional cartographic traditions. Each correction to a coastline and each addition or removal of a place name registers the material traces of medieval sailors’ and merchants’ engagement with maritime space. In this sense, the development of portolan charts constitutes a microhistory of medieval European maritime expansion and spatial learning. The significance of portolan charts within the history of cartography therefore extends well beyond their immediate utility as navigational aids.

They embody a fundamental epistemic transformation: a shift from an interpretive geography grounded in classical authority and theological symbolism toward an empirical geography based on observation, repeated experience, and calculation. While traditional *mappae mundi* articulated a cosmos ordered by spiritual meaning, portolan charts began to delineate a world that could be measured, traversed, and practically known. By enabling trans-regional navigation and challenging inherited spatial hierarchies, they gradually destabilized established conceptual boundaries and fostered new ways of organizing geographic knowledge. This reorientation laid an essential intellectual foundation for the cartography of the Renaissance and the subsequent Age of Discovery.

**Funding:** This research is funded by the National Social Science Fund of China (No. 23BWW032).

**Conflicts of Interest:** The author declares no conflict of interest.

**ORCID:**

Sai Dong <sup>ID</sup> <https://orcid.org/0000-0002-0721-260X>

**References**

- Brentjes, S. (2012). Medieval portolan charts as documents of shared cultural spaces. In R. Abdellatif, Y. Benhima, D. König, & E. Ruchaud (Eds.), *Acteurs des transferts culturels en Méditerranée médiévale* (pp. 135–146). Oldenbourg Verlag. <https://doi.org/10.1524/9783486989342.135>
- Campbell, T. (1986). Census of pre-sixteenth-century portolan charts. *Imago Mundi*, 38(1), 67–94. <https://doi.org/10.1080/03085698608592606>
- Campbell, T. (1987). Portolan charts from the late thirteenth century to 1500. In J. B. Harley & D. Woodward (Eds.), *The history of cartography: Cartography in prehistoric, ancient and medieval Europe and the Mediterranean* (Vol. 1, pp. 371–463). University of Chicago Press.
- Campbell, T. (2015). *A detailed reassessment of the Carte Pisane: A late and inferior*

*copy, or the lone survivor from the portolan charts' formative period.*

<http://www.maphistory.info/CartePisaneTEXT.html>

Campbell, T. (2021). *Mediterranean portolan charts: Their origin in the mental maps of medieval sailors, their function and their early development.*

<http://www.maphistory.info/PortolanOriginsTEXT.html>

Chaucer, G. (1987). *The Riverside Chaucer* (L. D. Benson, Ed.). Houghton Mifflin.

Crone, G. R. (1978). *Maps and their makers: An introduction to the history of cartography.* Dawson.

DeWitt, A. M. (2019). *Visualizing Dante's world: Geography, history and material culture* [Doctoral dissertation, Columbia University]. Academic Commons.

<https://doi.org/10.7916/d8-8m4c-3680>

Dilke, O. A. W. (1978). Mapping of the North African coast in classical antiquity. In *Proceedings of the Second International Congress of Studies on Cultures of the Western Mediterranean* (pp. 154–160). Association Internationale d'Étude des Civilisations Méditerranéennes.

Freiesleben, H.-C. (1984). The origin of portolan charts. *Journal of Navigation*, 37(2), 194–199. <https://doi.org/10.1017/S0373463300023341>

Harley, J. B., & Woodward, D. (Eds.). (1987). *The history of cartography: Cartography in prehistoric, ancient and medieval Europe and the Mediterranean* (Vol. 1). University of Chicago Press.

Harte, J. (2008). How one fourteenth-century Venetian remembered the Crusades: The maps and memories of Marino Sanuto. *Penn History Review*, 15(2), 9–17.

He, G., & Han, Z. (2020). Research on portolan charts and analysis of existing problems. *Journal of Tsinghua University (Philosophy and Social Sciences)*, 35(2), 76–89. <https://doi.org/10.13613/j.cnki.qhdz.002927>

Hiatt, A. (2011). 'From Hulle to Cartage': Maps, England, and the sea. In S. Sobecki (Ed.), *The sea and Englishness in the Middle Ages: Maritime narratives, identity and culture* (pp. 133–158). Boydell & Brewer. <https://doi.org/10.1017/9781846157844.007>

Kelley, J., Jr. (1979). Non-Mediterranean influences that shaped the Atlantic in the early portolan charts. *Imago Mundi*, 31(1), 18–35.

<https://doi.org/10.1080/03085697908592481>

- Kelley, J., Jr. (1995). Perspectives on the origins and uses of the portolan charts. *Cartographica: The International Journal for Geographic Information and Geovisualization*, 32(3), 1–16. <https://doi.org/10.3138/Q636-7034-W336-4328>
- Larner, J. (2001). *Marco Polo and the discovery of the world*. Yale University Press.
- Marelić, T. (2025). Copying-lineages of portolan chart metrics and implications of their pre-medieval origin. *International Journal of Cartography*, 11(4), 595–620. <https://doi.org/10.1080/23729333.2024.2349974>
- Nicolai, R. (2014). *A critical review of the hypothesis of a medieval origin for portolan charts* [Doctoral dissertation, Utrecht University]. Utrecht University Research Portal. <https://research-portal.uu.nl/en/publications/a-critical-review-of-the-hypothesis-of-a-medieval-origin-for-port>
- Rose, S. (2013). *England's medieval navy, 1066–1509: Ships, men and warfare*. Seaforth Publishing.
- Ruddock, A. (1951). *Italian merchants and shipping in Southampton, 1270–1600*. Basil Blackwell.
- Shi, X., & Dong, S. (2025). European medieval maps and Chaucer's journey of erudition: Focusing on *The Canterbury Tales* and *The Parliament of Fowls*. *Journal of Henan University (Social Sciences)*, (1), 79–86, 154–155. <https://doi.org/10.15991/j.cnki.411028.2025.01.011>
- Wagner, H. (1895). Das Rätsel der Kompaßkarten im Lichte der Gesamtentwicklung der Seekarten. In G. Kollm (Ed.), *Verhandlungen des elften Deutschen Geographentages zu Bremen* (pp. 65–87). Dietrich Reimer.
- Woodward, D. (1987). Medieval mappaemundi. In J. B. Harley & D. Woodward (Eds.), *The history of cartography: Cartography in prehistoric, ancient and medieval Europe and the Mediterranean* (Vol. 1, pp. 286–370). University of Chicago Press.
- Wright, J. K. (1923). Notes on the knowledge of latitudes and longitudes in the Middle Ages. *Isis*, 5(1), 75–98.