stellations be transported towards the south the state of matters would be reversed, and the sea would invade the emerged land.[1]

An anonymous writer explains the saltness of the sea as resulting from the action of its waters on the land of the coasts, from which they dissolve the saline and bitter parts.[2] Vincent de Beauvais caught a glimpse of the cause of atmospheric precipitation. He knew that the sea constantly lost water by evaporation, and that this was brought back to it again by springs and rivers.[3] Side by side with these correct ideas, many false ones are encountered bearing on meteorological questions, and fanciful interpretations are given regarding the cause of the tides. In general, the schoolmen do not offer any truths in addition to what was known to the ancients.

The ancients, who made so many excellent circumnavigations of the Mediterranean, never constructed general or coast charts of that well-known sea. The marine charts of the Middle Ages therefore demonstrate an immense progress in knowledge with regard to the morphology of the seas. The compass charts, or portulani, a name applied both to the charts and the accompanying sailing directions, made their appearance in Italy in the thirteenth century, and, for the most part, were intended for the navigation of the Mediterranean. Probably the most ancient is that of Petro Vesconti of Genoa, and bears the date 1311.[4] The development of commerce in the Mediterranean after the Crusades, and the knowledge of the compass which permitted voyages on the high seas, rendered the aid of these charts much more necessary than when ships followed courses from island to island, and from cape to cape. It was soon after this that marine maps came into use. These starred charts of the Italians and Catalonians, as well as previous productions of the kind, have no true parallels or meridians. They were traced by the aid of the compass, and were constructed without graduation. They present, however, especially in those parts much frequented by pilots, a remarkable fidelity in the contours and distances, and a surprising exactness in the general forms. The Black Sea, for example, differs but little from its representation on charts of the present day.[5] The charts of this sea used by sailors before the hydrographic exploration of Gauttier at the commencement of this century fell far below the Italian charts of the thirteenth century in exactness. The Mediterranean was represented more accurately on the portulani of the Italians than by Mercator. Several of these charts were designed in the Italian ports, some in the island of Majorca. They not only embraced the Mediterranean and the adjacent internal seas, but

Compass Charts or Portulani.

[1] Peschel, *op. cit.*, p. 222.

[2] Vincentius Bellovacensis, Speculum Naturale, lib. v. cap. 9.

[3] Spec. Nat., lib. v. cap. 8.

[4] It is believed, says Vivien de St. Martin (*op. cit.*, p. 294), that a Venetian chart of the Black Sea, preserved at Venice in the library of St. Mark, dates from the commencement of the thirteenth century. It is known that the Black Sea was, in a way, a Venetian sea from 1204 to 1259; but he adds that the first dated chart, and consequently unequivocally authentic, is the portulano of the Genoese cartographer Petro Vesconti.

[5] See in Peschel (*op. cit.*, p. 217) for a representation of the Black Sea after a manuscript chart belonging to the library of Munich, dated the beginning of the fifteenth century.