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## ENVIRONMENTAL ENGINEERING | REVIEW ARTICLE

# Practical aspects of meteorology and oceanography for mariners: A guide for the perplexed

L. C. Araúcha<sup>1\*</sup>, H. O. Duarte<sup>2</sup>, E. L. Droguett<sup>3</sup> and D. R. A. Veleza<sup>4</sup>

**Abstract:** This paper aims to review and summarize the practical aspects of meteorology and oceanography for navigation, highlighting their influence on shiphandling. It is a review for: gathering, in a summarized way, some useful information for mariners, oceanographers, coastal managers, maritime students and maritime engineers; raising important topics for discussion about the theme; and identifying shortcomings that need more research. Aspects of navigation in Brazilian waters, specifically METÁREA V, are introduced as an example, bringing to light, when applicable, the practical aspects for shallow and restricted waters navigation. The parameters analysed were: clouds, rain, smog, fog, breeze, winds, waves, tides, and coastal and tidal currents. The passage of cold fronts can change winds direction. Also, local winds can overlap the effects of breezes, depending on its intensity. Dense fog, that can reduce visibility to less than 100 m, and rain, which according to its intensity, can reduce visibility to less than 500 m, are examples of some parameters that were checked and are able to reduce visibility when navigating. In addition, were reviewed the concepts of occurrence of rain and squall, and of frontal systems and the expected changes in local weather, pressure and air temperature with their approach. The importance of waves, tides and currents is

### ABOUT THE AUTHOR

Leo Costa Araúcha is a recently graduated oceanographer, formed at Federal University of Pernambuco - UFPE, Brazil; Héitor de Oliveira Duarte is an assistant professor at the Mechanical Engineering Department, UFPE, Brazil; Enrique López Droguett is an associated professor at the Mechanical Engineering Department, Universidad de Chile, Chile; Doris Regina Aires Veleza is an assistant professor at the Oceanography Department, UFPE, Brazil. Key research activities of the authors are mainly focused on ocean-atmospheric processes and dynamics, highlighting their influence, in particular, at Tropical Atlantic Ocean. Also, the group is also interested for topics in Risk Analysis and Navigation, especially ecological risk assessment and shallow and restricted water effect on ships manoeuvrability, respectively. This research allowed that the group research activities were brought together, since it involves meteorology, oceanography, risk analysis and shallow and restricted water effects.

### PUBLIC INTEREST STATEMENT

Whether on a private boat, on a tanker, or on a cruise, the weather can become a serious threat when sailing. In addition, the oceanic waves and tides also influence on a ship manoeuvre, especially at shallow waters, when ships movements are restricted. This review article summarizes the main aspects of atmosphere and ocean that affect navigation, focusing at Brazilian waters and highlighting shallow waters navigation features. It contains practical hints and tips to follow when navigating in bad weather, being useful as a guide. The paper assesses weather behaviour at Brazilian coast. Also, it points that is crucial that mariners know what to do when facing adverse atmospheric conditions, in order to avoid maritime accidents, economic loss and human lives. Topics that need more research, particularly the processes already affected by climate change, are also discussed. Notably, new technologies would be important for the development of innovative tools that could allow a safer navigation in bad weather.

# Mariners Guide To Oceanography

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