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Methods in maritime education for analysis of factors influencing shipping and marine environment in the western part of the Black Sea

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Abstract. The marine environment is a complex environment that includes both the water and the area of air moving through the vessel. Depending on its mode of expression, its status parameter value, it produces direct effects, favorable and unfavorable, on navigation. Modern Meteorology and Oceanography operating methods and procedures for obtaining data for education, necessary for determining regularities that lead to phenomena and processes which occur in interdependent layers, in the marine environment and the atmosphere above the ocean (waves, storms, rain, currents, the impact on the safety of life, activities and maritime navigation challenges - in terms of visibility, stability, and immovability of the ship.

Keywords. maritime education, oceanographic and meteorological factors, environment, shipping

1.Introduction

Socio-economic and political conditions at the beginning of the XXI century (the negative influence of the global crisis extended in recent years) have imposed significant challenges on international shipping, amounting to almost 10 billion tons of freight transported, almost four-fifths of global trade. Shipping, thus invariably becomes a significant branch of the global economy bearing primary role both in quantity and quality among all other communication means. Further, the evolution in transport technologies in modern times has adversely affected shipping due to reduced cost of transport on the one hand, and diversification of international trade relations on the other.

Due to these reasons, the global maritime fleet (over 90,000 merchant ships in 2019) has seen unprecedented development, reflected in the increase in total tonnage (1.9 billion dwt in 2019). Along with this evolution, evolved diversification of types of ships and specialization in shipping increased, the tonnage unit and the speed of the march, automation in the functioning and operation of the board and the ship, improved working conditions on board, increased the safety and security of crews, and widening of waterways areas.

Although progress has been rampant in other modes of transport, freight vessels remain the primary means of transport in international trade. The ascendant of these vessels is particularly evident when considering percentage of goods transported through sea and its overall value in global trade.

As an economic activity, maritime transport cannot be limited to improve economic profitability, but requires an objective necessity of development of human society in its geographical, economic, and political stability. No other means of transport can provide cost-effective and massive cargo volume trade that is subject to international economic exchanges.

The Black Sea looks to resemble a deep pool oriented from west to east, which spans the length of six degrees latitude and breadth five degrees longitude, between parallels and meridians 40°055'N and 46°037'N 27°027'E and 41°047 ' E. It is an excellent interconnection linking the Bosphorus, the Mediterranean Sea and Kerch Strait, the Sea of Azov.

Principal phenomena that manifest in the oceans (waves, tides, sea currents, freezing and thawing, and sound propagation) and significant oceanographic parameters variation (salinity, density, temperature) affect directly and indirectly navigation, condition of the ship and cargo and crew wellbeing during the voyage at sea.

Meteorological and oceanographic navigation is the branch of modern maritime navigation using statistical and oceanographic data in real-time to optimize the route and reduce the risks for the ship, crew, and cargo. Education and training should be able to provide potential officers with the highest quality training and the ability to provide multiple employment opportunities. Professional training for shipping and related sectors, but also marine engineering and fishery, should be under review continuously.

The aim must be to ensure that all institutes of higher maritime education graduates to provide training to international standards such as those prescribed in the Standards of Training, Certification, and Supervision "Standards for Training, Certification, and Watchkeeping" (STCW Convention). They pose a range of additional skills, which correspond to the needs of the maritime industry and enable them to enhance their employability and increase their competitiveness. The superiority of the institutes depends on attracting the best young men and women in education and training in the maritime field. In this way the high training quality image of this sector increase. It is essential to ensure proper working conditions and living conditions for seafarers, both men, and women. The objective of any owner should be to have quality ships, led by skilled and well-trained seafarers who work in the best conditions.

Currently planning a voyage at sea cannot be conceived without forecast and oceanographic information available, accurate, and up to date about the sea areas crossed. Numerous studies of sea crossing and ocean show benefits of proper voyage planning with the assistance of oceanographic forecasts, thus it is accurate to say that updated information assists in saving time and fuel, increases the safety of the crew, passengers, and cargo carried.

During the sea voyage weather and oceanographic information fully and promptly provides a basis for modifying the ship's passage to optimize routing in unfavorable weather conditions, which requires good knowledge of the navigator of marine meteorology and oceanography notions.

Equipping ships with modern instruments and apparatus for meteorological and oceanographic observation is essential, systems such as satellite surveillance exist and oceanographic and meteorological information. Appropriate knowledge of marine meteorology and oceanography is now a standard requirement of modern navigation.

In the practice of navigation, it is essential to have a statistical analysis of the sea agitation, expressed numerically wave elements (height, period length, the overall direction of travel), and weather-oceanographic factors that generate them.

During navigation on dangerous waves, the greatest danger is the phenomenon of resonance. Resonance means a coincidence period when the oscillation of the ship coincides

with the apparent wind wave period. Apparent wind wave period depends on the speed of the march and the angle between the path of the ship and wave direction.

The behavior of the ship at sea under the action of the wave oscillations are characterized by complex forces, followed by undesirable phenomena caused by the occurrence of accelerations and large inertial forces. Among the critical issues is the need for improved damage stability of cargo ship and aggravated psychophysical effects on the crew because of seasickness. Due to the complexity of the phenomena accompanying the interaction of the hull with the water agitated vessel used in the study oscillations of combined methods of theoretical, experimental and practical, statistical, and probabilistic.

Due to the high engineering knowledge required in shipping, we need to update each year to the development of technology onboard ships. Analysis of oscillations of the vessel in waves relies on the fact that it has, in the space, six degrees of freedom, namely: the feed (the longitudinal movement of the axis G_x); derivatives (G_y lateral displacement of the axis), vertical movement (axis G_z); roll (rotation around axis G_x); pitching (rotation around the axis G_y); pivoting (rotation around the axis G_z). However, for practical interest roll, pitch and vertical movement, pure or combined forms. In their study, it supports two reference systems, namely: a fixed system, with the origin in the plane of the free surface of the water still and the same vertical center of gravity G , a mobile system with the origin at the center of gravity and that moves along with it. Typically, in normal operating conditions, if the advance produces, derivatives, and pivoting, the vessel does not return to its original position. If the vertical movement ship roll and pitch oscillations often run free or maintained.

Fluctuations ship undesirable effect of which reads: boarding water on deck in the bow danger of flooding; the emergence of vertical acceleration at critical points (bridge, engine room, and social spaces); loss of speed, directly dependent on the agitation of the sea; out of the water the propeller blades (propellers) and here Fatigue engine (engine) and worsening main operating conditions of equipment and mechanisms onboard; Water hitting the bottom of the vessel (the effect of slamming, wiping and wetness).

Loss of speed while navigating the waves are caused by increasing drag due to ship oscillations and waves; change the operating mode of the propulsion system in terms of producing strong pitch propeller out part or all of the water; the direct influence of the horizontal movement of the upper layers of participating in the movement of water waves.

In practice, the calculation speed losses can use computer programs, charts (Figure 1), and diagrams on the types of ships, depending on the load, the ship's speed, wave height, and direction.

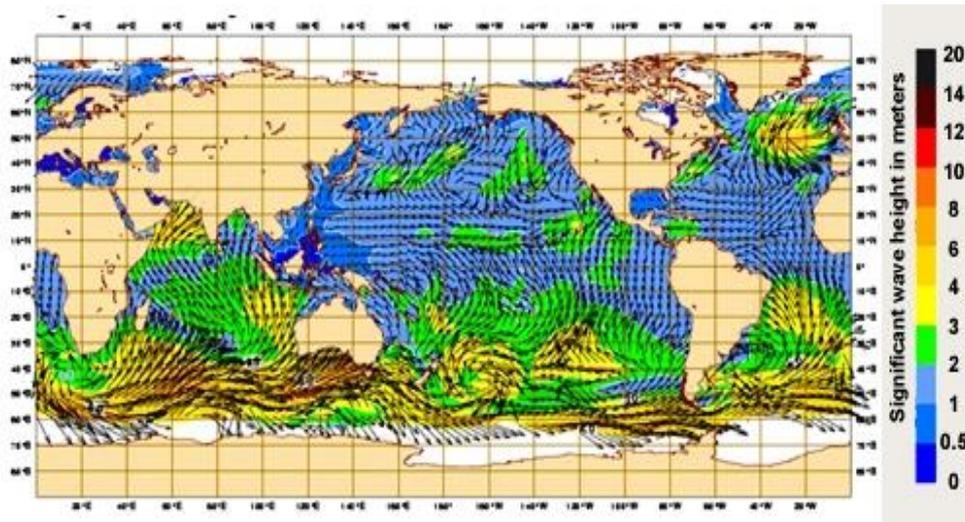


Fig. 1. Analysis of average height and direction of the waves by observation satellites - July 1, 2008

Source:https://www.eumetsat.int/jason/print.htm#page_3.2.0

Navigation in areas with varying currents is a common case of sea transport. In this case of great importance is the knowledge of the influence of the tide, especially in coastal areas, straits, channels, input ports. Education in related subjects to coastal areas, straits, channels, input ports is mandatory.

One problem is that navigation in short currents, wind, whose speed can be determined with a satisfying relationship for the high seas and wind regularly applies for open ocean surfaces for regular winds and constant seawater density.

Conclusion

Classical and modern methods in maritime education are involved in all transport process related to shipping. Due to the high engineering knowledge required in shipping, we need to update each year to the development of technology onboard ships. Education in related subjects to coastal areas, straits, channels, input ports is mandatory.

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