Assessment of wind and wave temporal and spatial distributions using long term data in Persian Gulf

Project manager: **Dr. Bahareh Kamranzad**

Abstract

Long-term wind and wave data are valuable resources for research and applied purposes in marine engineering. In this study, temporal-spatial variations of the wind and wave characteristics (wind speed and direction, significant wave height, peak period and wave direction) was investigated using 31 yearly data in the Persian Gulf. Inter-annual variations of the mean wind speed and significant wave height shows a slight increasing in some years, especially in north-western and middle parts of the Persian Gulf. Seasonal variations of the wind and wave characteristics indicates that the highest mean wind speed and significant wave height exist in winter and they decrease in spring and summer and reach the lowest values in autumn. In addition, a reduction of approximately 1% in mean wind speed from winter to autumn has led to a reduction of 25% in corresponding significant wave height. Monthly variations of the mean wind speed and significant wave height illustrate that the variations are affected by dominant Shamal wind in the Persian Gulf. Quantitative assessment of wind and wave characteristics in twenty selected points represents that the winter and summer time Shamal winds influence mostly the middle and north-western parts of the Persian Gulf, respectively. Furthermore, a new zone defining was suggested for the Persian Gulf based on the similarity between the monthly variations of the mean wind speed, significant wave height and peak period. Seasonal and monthly variability indices depict that the variability of significant wave height is higher than the wind speed, while the peak period shows the lowest variability. In addition, the seasonal and monthly sustainability of wind speed and monthly sustainability of significant wave height are higher in eastern part of the Persian Gulf; adjacent to the Strait of Hormuz. Frequency distribution indicates that the highest percentage of occurrence for wind speeds more than 12 m/s exists in a boundary between the north-western and middle parts, while the highest percentage of occurrence for significant wave heights more than 2 m exists in the middle part of the Persian Gulf. In addition, seasonal wind and wave roses display that the wave direction is more stable than the wind direction in various seasons. Besides, the prevailing wave direction is mostly similar to wind direction, except for some points in which, the wave direction shows a difference of a fourth quarter comparing to the wind direction.

Keywords: wind speed, significant wave height, peak period, Persian Gulf, variability index, seasonal and monthly distributions, frequency and directional distributions, temporal-spatial variations.