



مرکز بررسی و مطالعات دریایی

سازمان بنادر و دریانوردی به عنوان تنها مرجع حاکمیتی کشور در امور بندری، دریایی و کشتی‌رانی بازرگانی به منظور ایفای نقش مرجعیت دانشی خود و در راستای تحقق راهبردهای کلان نقشه جامع علمی کشور مبنی بر "حمایت از توسعه شبکه‌های تحقیقاتی و تسهیل انتقال و انتشار دانش و سامان‌دهی علمی" از طریق "استانداردسازی و اصلاح فرایندهای تولید، ثبت، داوری و سنجش و ایجاد بانک‌های اطلاعاتی یکپارچه برای نشریات، اختراعات و اکتشافات پژوهشگران"، اقدام به ارایه این اثر در سایت SID می‌نماید.



سازمان بنادر و دریانوردی





SURVEY AND ANALYSIS OF WIND PATTERN OVER THE PERSIAN GULF NORTH COAST BASED ON SYSTEMATIC WIND, SEA AND LAND BREEZES

Fereshteh Komijani¹, Ali Nasrollahi², Shahrzad Nahid³, Narges Nazari⁴

Keywords: Persian Gulf, wind pattern, systematic wind, sea breeze, land breeze.

Introduction

One of the most important wave-generation sources is wind that has significant effect on the Persian Gulf water circulation [4]. Also investigation of land and sea breeze's atmospheric circulation is essential for forecasting of oil spill's path from coast toward sea. Hence in this paper as well as investigation of seasonal variation of the Persian Gulf's wind pattern, sea and land breezes, their variations have been surveyed along Persian Gulf north coast. And comparing of sea breeze, land breeze and systematic wind influences on the study area's wind pattern for long temporal period is considered.

Procedure of Research

Synoptic data of wind speed and direction were collected (from beginning to 2007) from 13 climatology stations where located on the Persian Gulf north coast (Fig.1 and table.1). Investigations were done after utilizing some correction on wind speed data, such as Elevation, stability and wind speed variation with fetch corrections. Studying includes: drawing and analyzing of monthly and annually wind roses for each station (Fig. 2,4). The monthly wind roses were classified based on their equality and wind occurrence frequency. Variations of wind speed pattern, were also examined providing monthly wind speed probability tables and corresponding plots for each station (Figs. 3,5).

¹ PhD candidate in physical oceanography, JWERC, fereshtekomijani@gmail.com

² PhD of civil engineering, JWERC, nasrollahi_a@yahoo.com

³ PhD of physical oceanography, Meteorological Research Institute, shahrzad.nahid@gmail.com

⁴ PhD candidate in civil engineering, JWERC, n.nazari8203623@yahoo.com



مرکز بررسی و مطالعات دریایی

سازمان بنادر و دریانوردی به عنوان تنها مرجع حاکمیتی کشور در امور بندری، دریایی و کشتی‌رانی بازرگانی به منظور ایفای نقش مرجعیت دانشی خود و در راستای تحقق راهبردهای کلان نقشه جامع علمی کشور مبنی بر "حمایت از توسعه شبکه‌های تحقیقاتی و تسهیل انتقال و انتشار دانش و سامان‌دهی علمی" از طریق "استانداردسازی و اصلاح فرایندهای تولید، ثبت، داوری و سنجش و ایجاد بانک‌های اطلاعاتی یکپارچه برای نشریات، اختراعات و اکتشافات پژوهشگران"، اقدام به ارایه این اثر در سایت SID می‌نماید.



سازمان بنادر و دریانوردی



Table 1) stations characteristics and data recording period in varied stations

station	Station type	longitude	latitude	Station height (m)	recording period
Abadan	Synoptic	48°15'	30°22'	6.6	1961-2007
BandarAbbas	Synoptic	56°22'	27°13'	9.8	1957-2007
Bushehr Port	climatology	50°49'	28°58'	9	1961-2007
lence Port	Synoptic-sea	54°50'	26°32'	22.7	1966-2006
kish Island	Synoptic	53°59'	26°30'	30	1976-2007
Abomosa Island	Synoptic	54°50'	25°50'	6.6	1984-2007
Coastal Bushehr	Synoptic	50°49'	28°54'	8.4	1986-2007
Mahshahr Port	Synoptic	49°9'	30°33'	6.2	1987-2007
Kangan jam	Synoptic	55°22'	27°49'	655	1989-2006
Siri Island	Synoptic-sea	54°29'	25°53'	4.4	1983-2007
Daeir Port	Synoptic	51°56'	27°50'	7	1993-2007
Gheshm Island	Sea	55°55'	26°55'	6	1996-2007
Khark Island	--	50°18'	29°15'	4.3	1984-1991

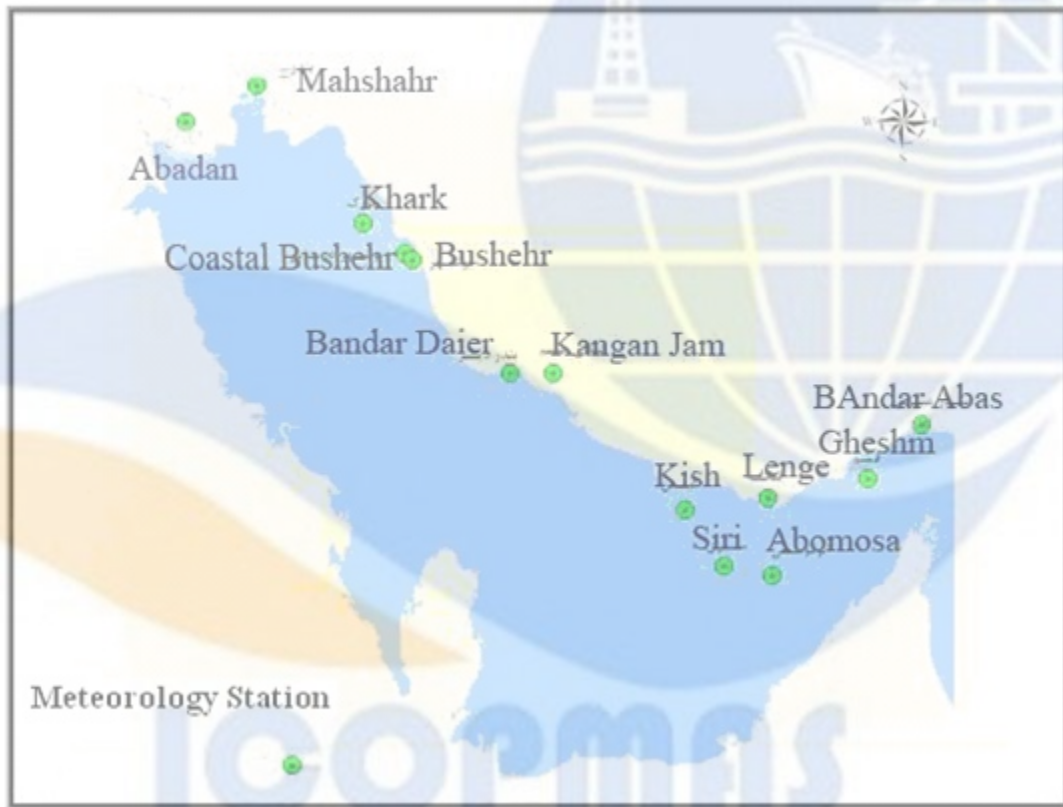


Fig 1) meteorology stations location on the Persian Gulf north coast

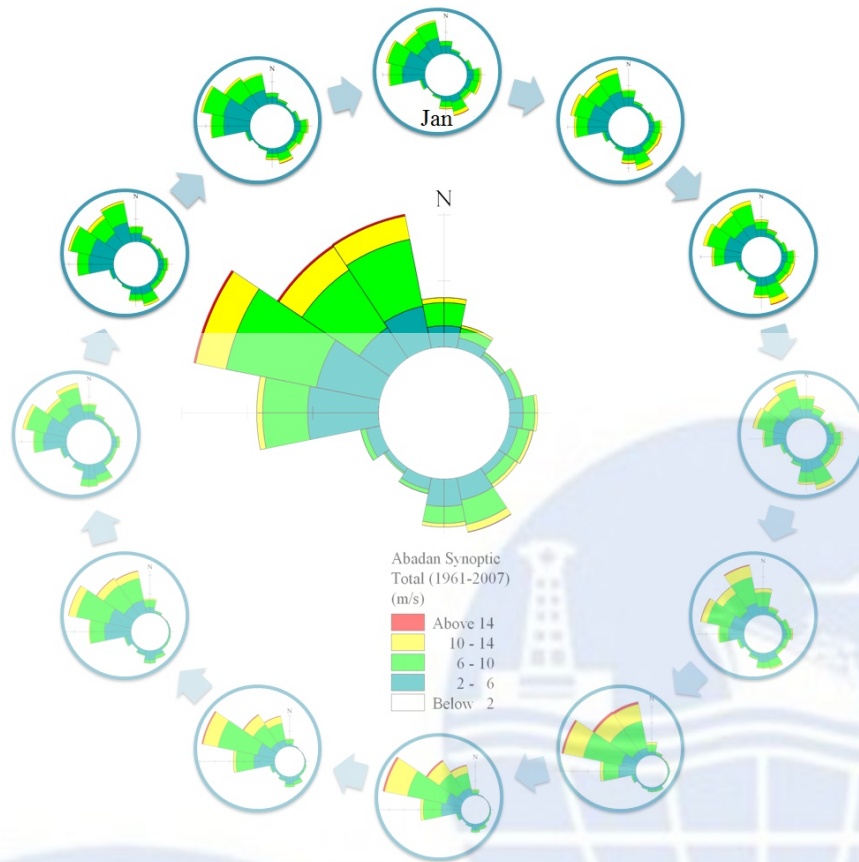


Fig 2) comparing of monthly and total wind roses at Abadan station
 Synoptic Abadan (1961-2007)

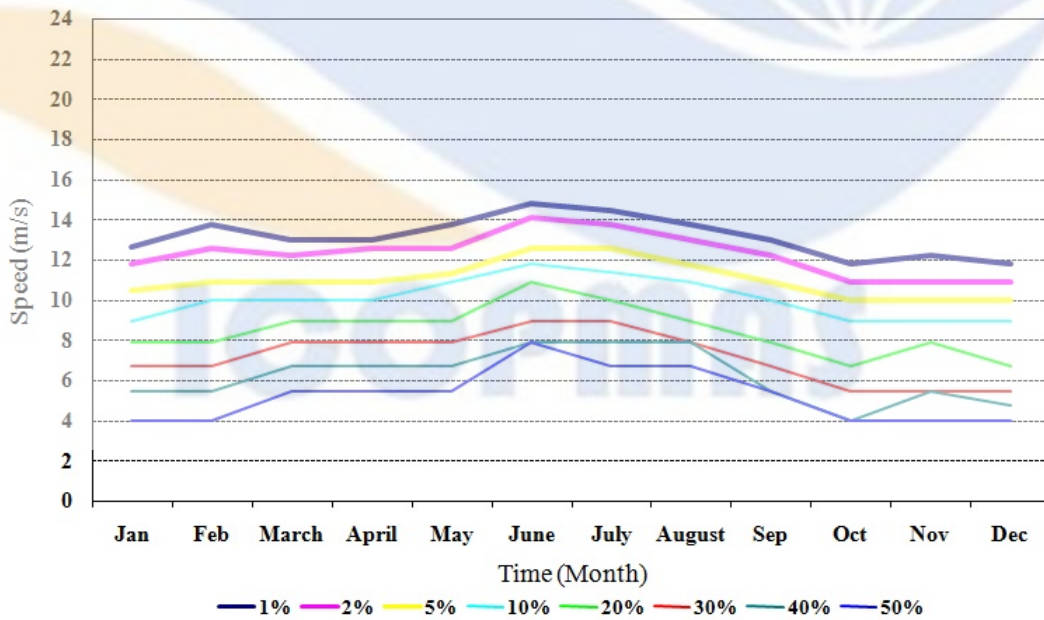


Fig 3) comparing of monthly wind speed probability at Abadan station

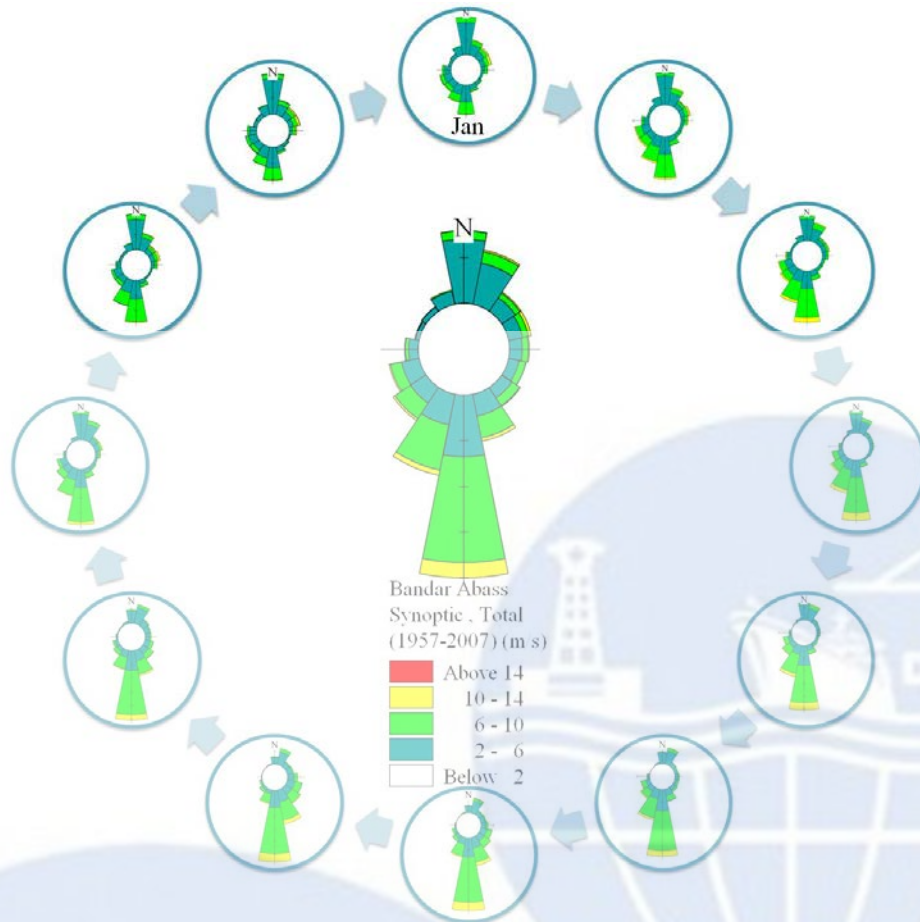


Fig 4) comparing of monthly and total wind roses at Bandar Abbas station

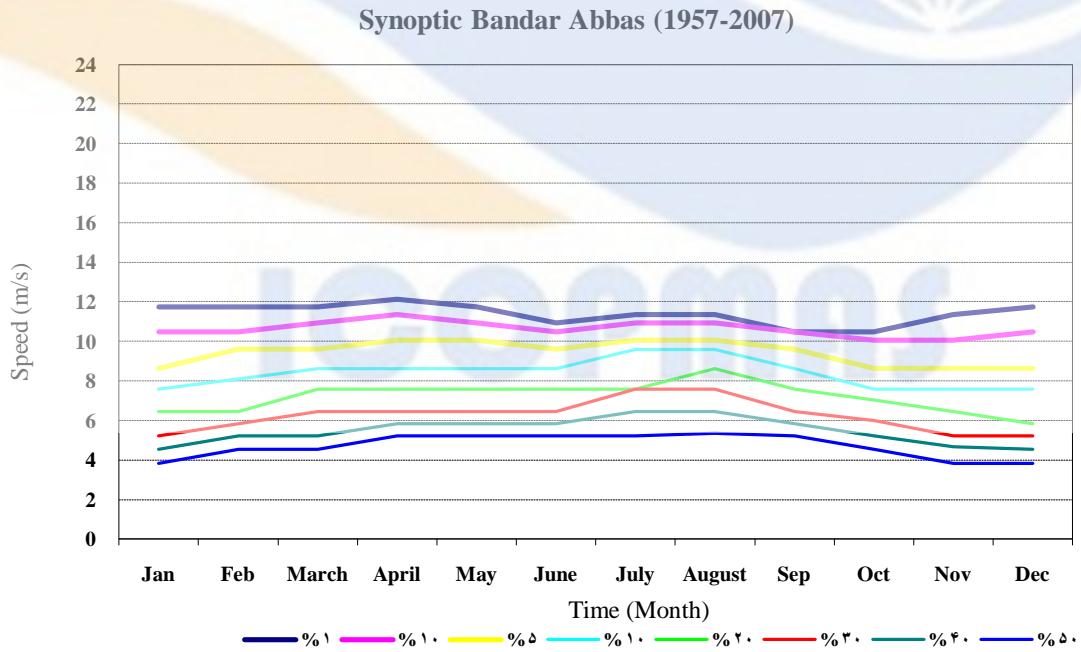


Fig 5) comparing of monthly wind speed probability at Bandar Abbas station

For sea and land breezes Analyzing, after determining, January, February, July and October as winter, spring, summer and autumn season's representative, respectively, monthly day-wind rose at 15 o'clock (maximum intensity of sea breeze [1]) and monthly night-wind rose at 03 o'clock (maximum intensity of land breeze [1]) were plotted for mentioned months at Abadan (Figs. 6,7), Coastal Bushehr, Daeir, Lenge and BandarAbbas (Figs. 8,9) stations, then compared them with corresponding monthly wind rose for all stations.

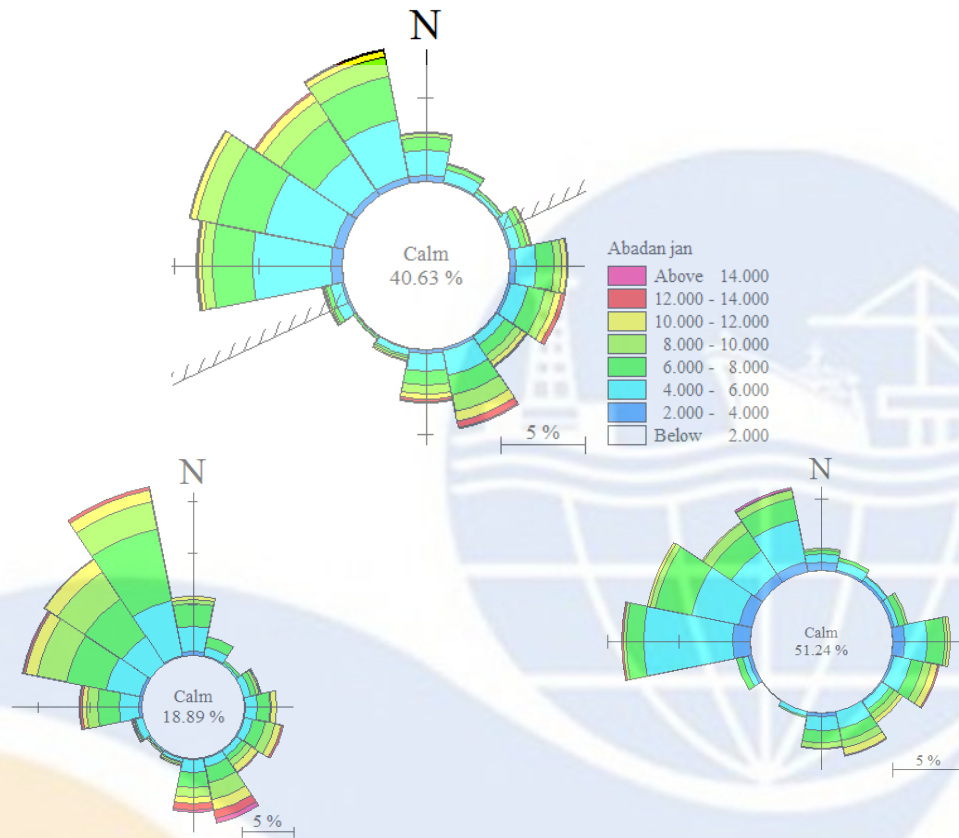
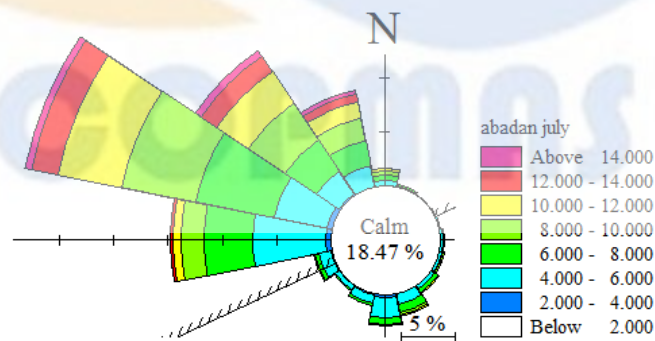


Fig 6) January wind rose (up) as well as night-wind rose (down and right hand) and day-wind rose (down and left hand) for Abadan station



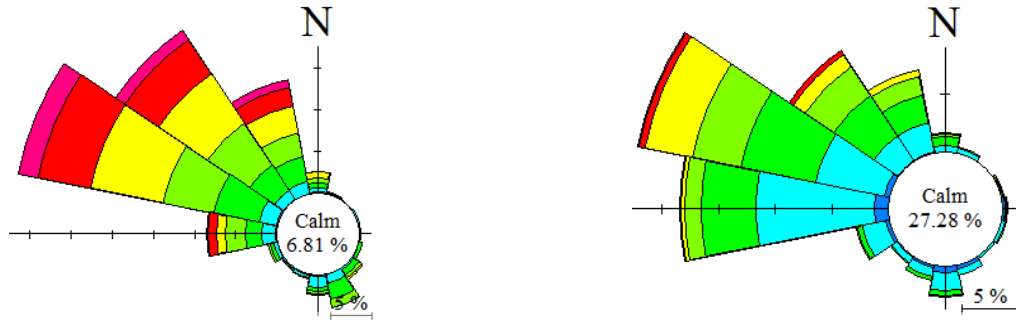


Fig 7) July wind rose (up) as well as night-wind rose (down and right hand) and day-wind rose (down and left hand) for Abadan station

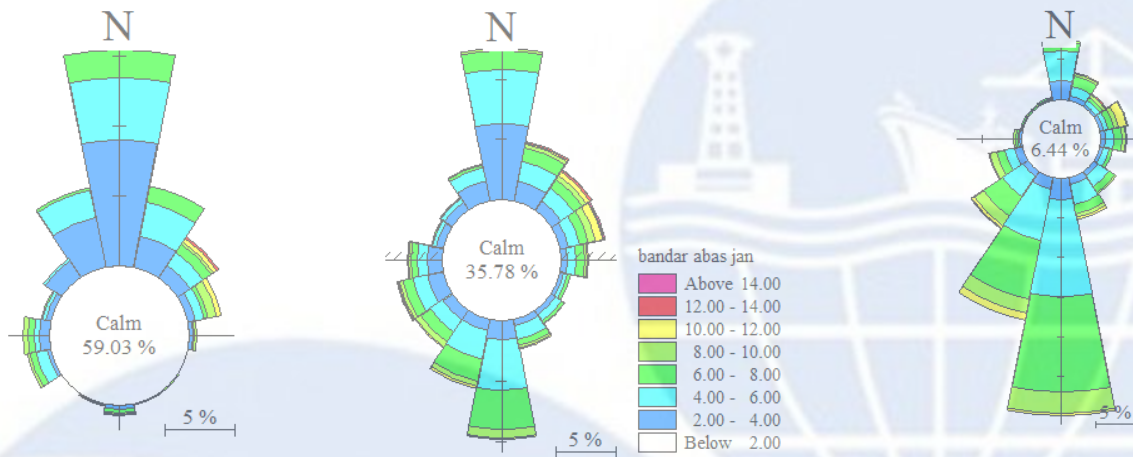


Fig 8) January wind rose (middle) as well as day-wind rose (right hand) and night-wind rose (left hand) for Bandar Abbas station

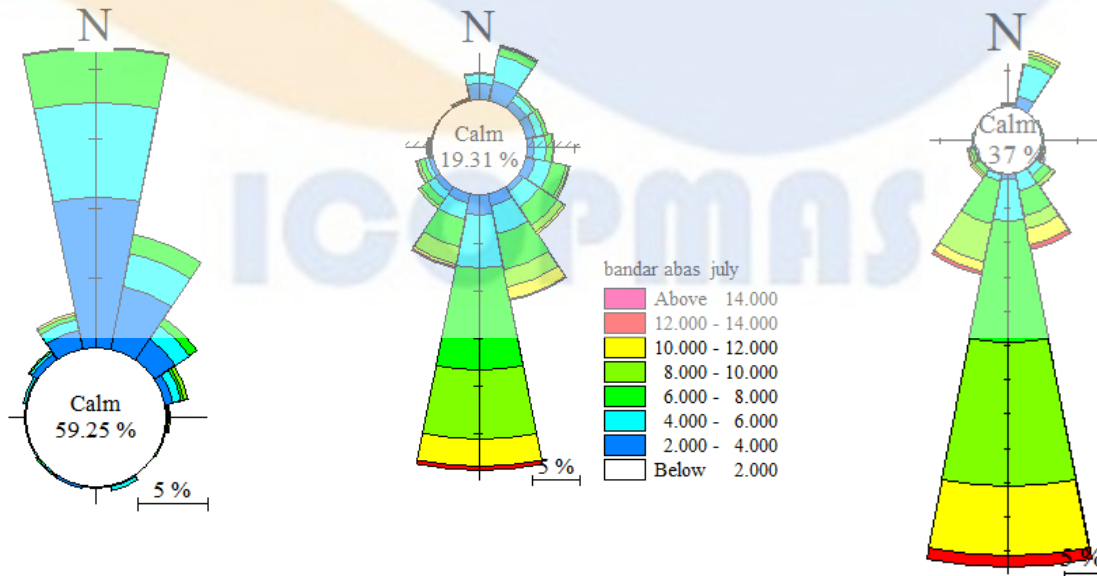


Fig 9) July wind rose (middle) as well as day-wind rose (right hand) and night-wind rose (left hand) for Bandar Abbas station

Conclusion

Analysis indicate that friction stress between wind and land causes that dominate wind direction for Persian Gulf near coast stations, is along the coast line [2,3] that seasonal variations and Zagros Mountains along have effect on it. But for station in the middle of sea (such as Abomosa) that land doesn't have influence, dominate wind direction is independent of season and coast line and is westerly always.

During summer, one mesoscale low-pressure system can generate systematic winds with northeast to south direction over the east of Persian Gulf; therefore frequency and power of south wind increase from east toward west of Persian Gulf. While generally, wind intensity decrease from west toward east of Persian Gulf.

With advancing from west toward east of study area, enhancing of friction between wind and near coast mountain's hillsides makes systematic winds Weak. But since mountain in the east part of Persian Gulf are closer to coast than west of it (especially from Daeir toward BandarAbbas (Fig. 10)), amplification effect of mountains hillside's steepness intensify land and sea breezes in the east of Persian Gulf. In the other hand sea breeze during day and land breeze during night govern east of Persian Gulf's wind pattern; in contrast systematic wind has this role in the west part of study area. Also sea breeze is stronger in summer than other seasons and is stronger than land breeze on the Persian Gulf.

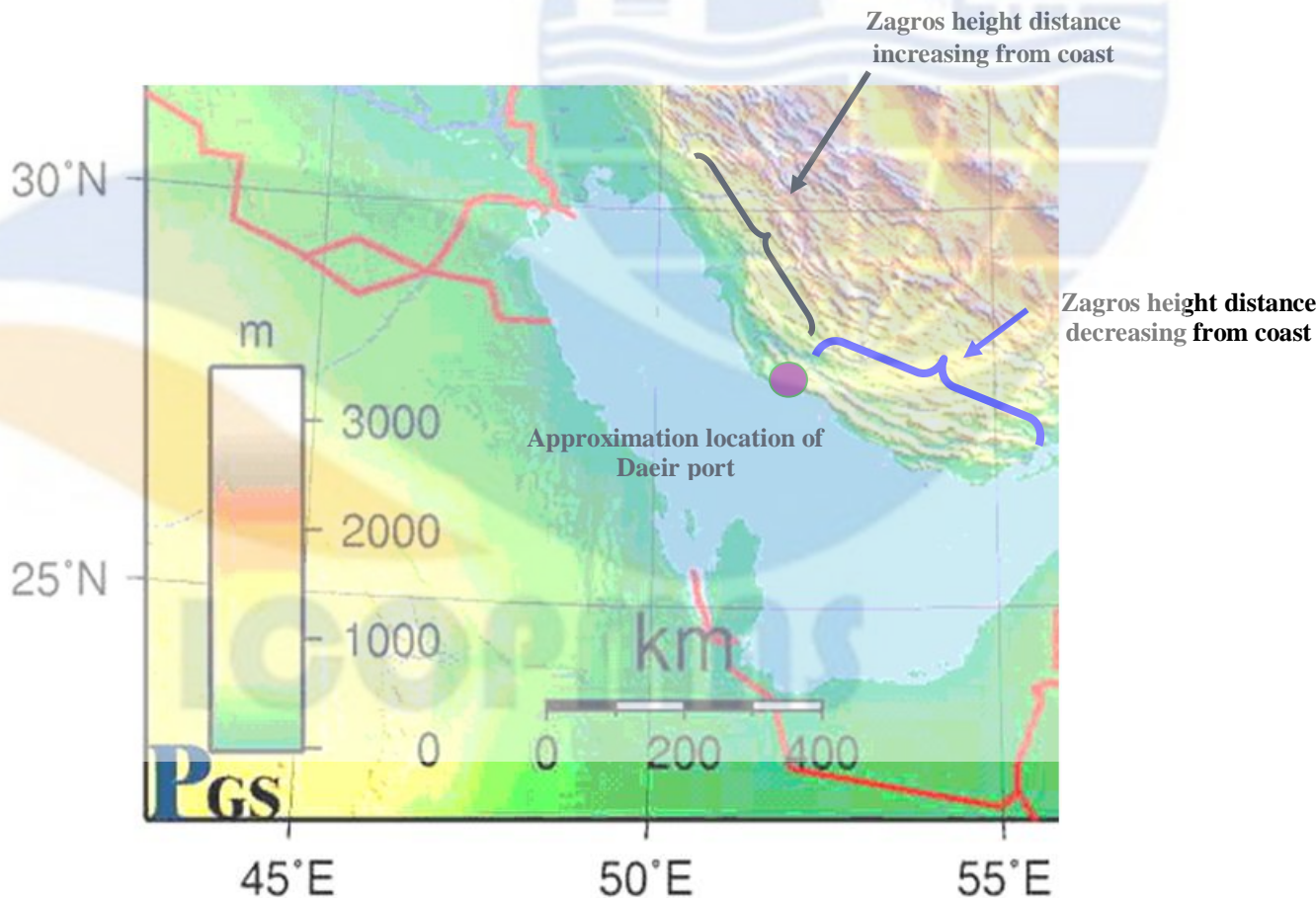


Fig 10) Zagros mountain location into Persian Gulf coast

References

- [1]-Ahrens, C. D. (2009), Meteorology Today, An Introduction to Weather, Climate, and the Environment . Ninth edition, Brooks/Cole.
- [2]- IMCOS. (1974), Hand Book of Weather In The Gulf, 1974 Marine Ltd., London.

[3]-IMCOS. (1941), Persian Gulf And Gulf Of Oman. Marine Ltd., London.

[4]-Reynolds, R. M. (1993), Physical oceanography of the Gulf, Strait of Hormuz, and the Gulf of Oman – Results from the Mt Mitchell expedition, Mar. Pollution Bull., 27, 35–59.

