



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.



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NUMERICAL INVESTIGATION OF EFFECT OF WAVE PARAMETERS ON SEDIMENT TRANSPORT AT INLETS

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Key words: numerical model, inlet, wave, sediment transport, mike 21

Introduction

Inlets are constructed at a thin zone between land and ocean at rivers mouth. An estuary is a semi enclosed coastal body of water that extends to the effective limit of tidal influence, within which sea water entering from one or more free connections with open sea and sea water diluted with fresh water derived from land. Sediment transport at inlets has a great influences on beach line. Waves, currents and tides are the features that control sediment transport at inlets.

Mike 21 numerical model

In this research, currents and sediment transport patterns at inlets are evaluated with mike 21. Mike 21 is the most famous numerical model between oceanic models. This program that prepared by Denmark DHI water and environment, has a high calculation ability and graphic in modeling of the oceanic features.

The design of model

In the present research to evaluate the effect of wave height and direction on sediment transport and current pattern, a basin is used with 1000m length and 460m width. Entrance mouth is about 60m and barrier islands height are about 10m (figure 1).

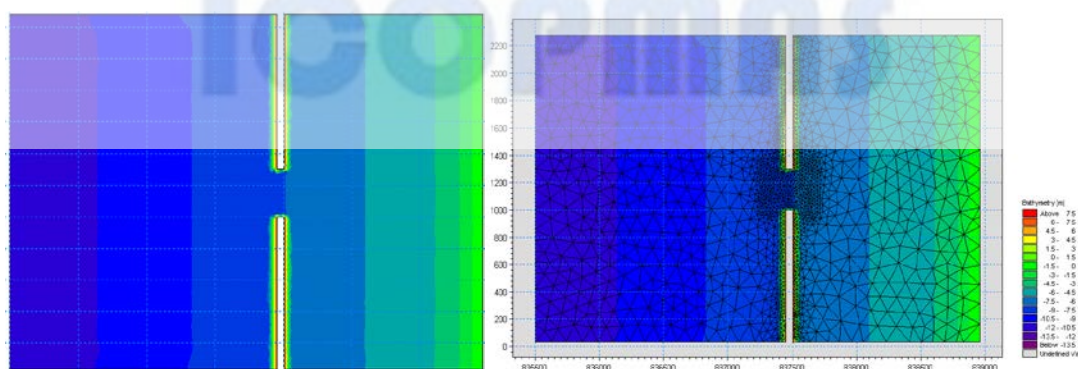


Fig.1)used model with its mesh

To evaluate the effect of wave height on sediment transport and current pattern, wave with 0.75, 1.5 and 2.2 m height and period of 8 seconds are radiated normally to the inlet entrance. To

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evaluate the effect of wave direction, waves with 2.2m height and periods of 8 seconds, with different directions radiated to the inlet entrance (table 1).

Table 1)experiments program to evaluate the effect of wave direction and height on sediment transport and currents pattern.

Modules	Wave height (m)	Wave period(s)	Wave direction	Barrier islands height(m)
HD, ST, SW	0.75	8	normal	10
HD, ST, SW	1.5			
HD, ST, SW	2.2			
HD, ST, SW	2.2	8	normal	10
HD, ST, SW			+45	
HD, ST, SW			-45	

Results

For each items of table 2 the HD, ST and SW modulus of mike 21 is run(figures 2 to 5).



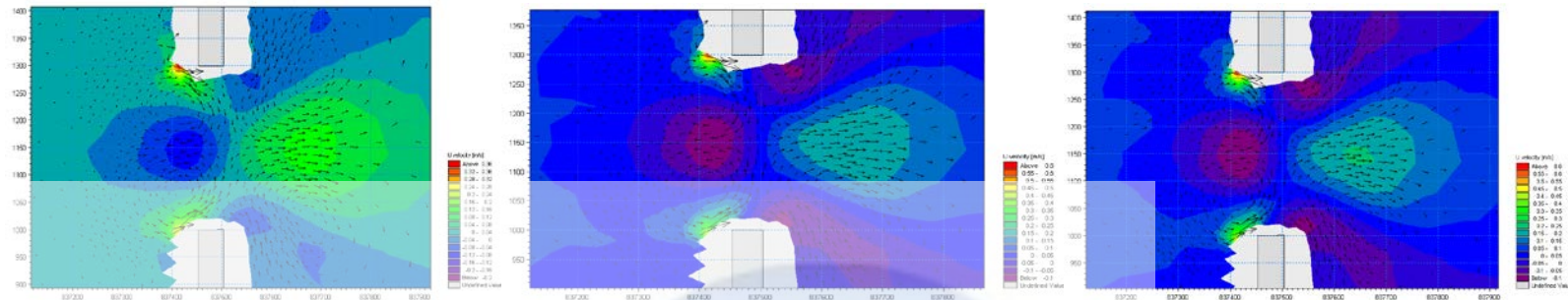


Fig. 2) from right to left, HD module output for heights of 0.75, 1.5 and 2.2m respectively

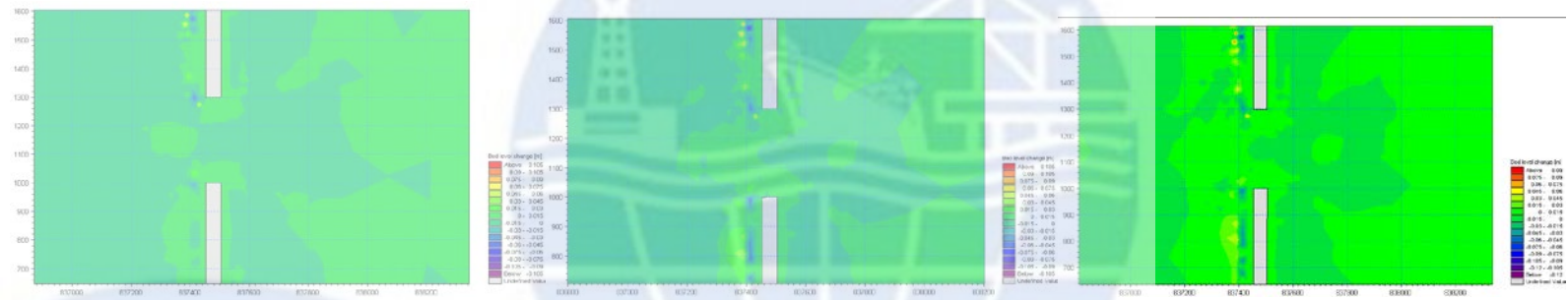


Fig. 3) from right to left, ST module output for heights of 0.75, 1.5 and 2.2m respectively

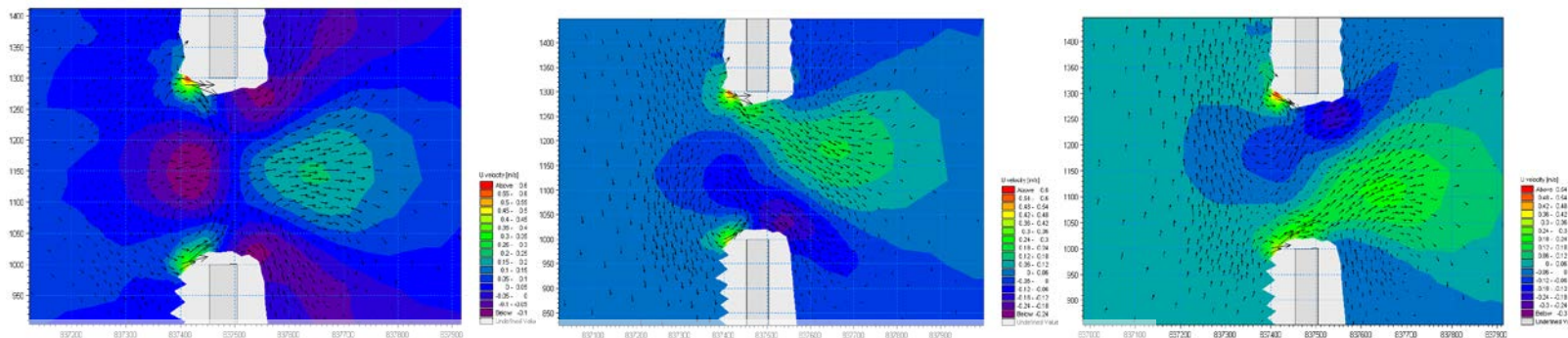


Fig. 4)from right to left, HD module output for three directions(normal, +45 and -45) respectively

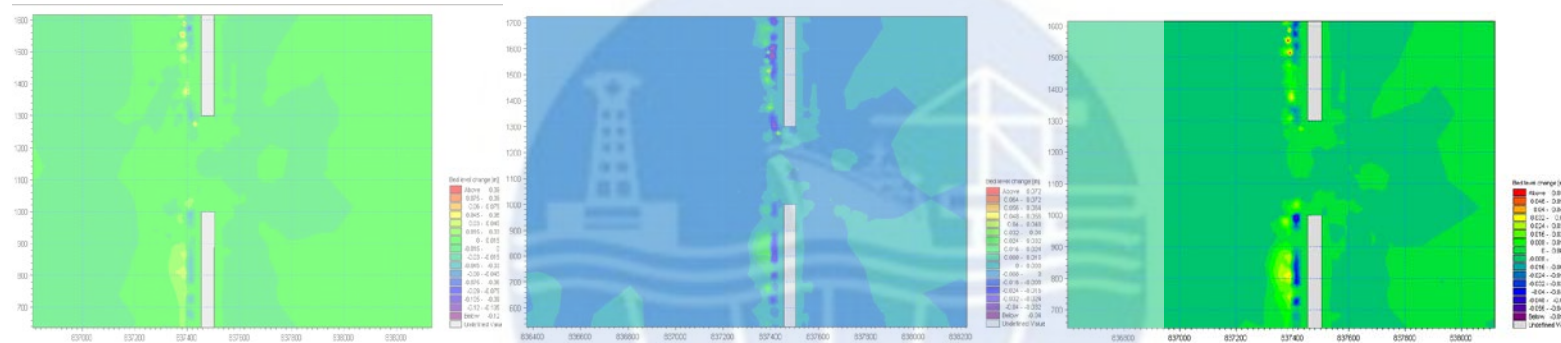


Fig. 5)from right to left, ST module output for three directions(normal, +45 and -45) respectively

Conclusion

The general current pattern in our model is shown in the figure 6.

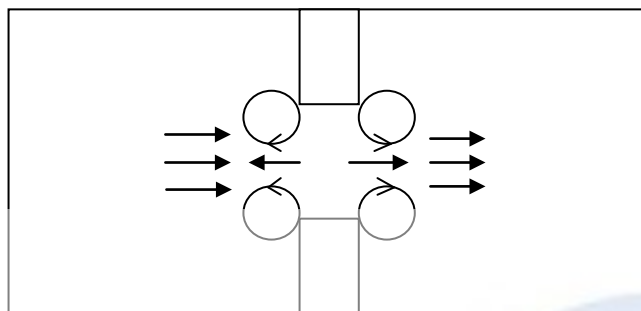


Fig. 6)general current patterns at inlet entrance

According to this figure due to wave radiation to the inlet entrance, two vortices appeared before and after the entrance. These vortices trap sands at the inlet entrance and cause decomposition of sands at the inlets (figure7). Then these sands will be transport before and after the inlet entrance by currents at the inlet. So in this way ebb and flood shoals are created.

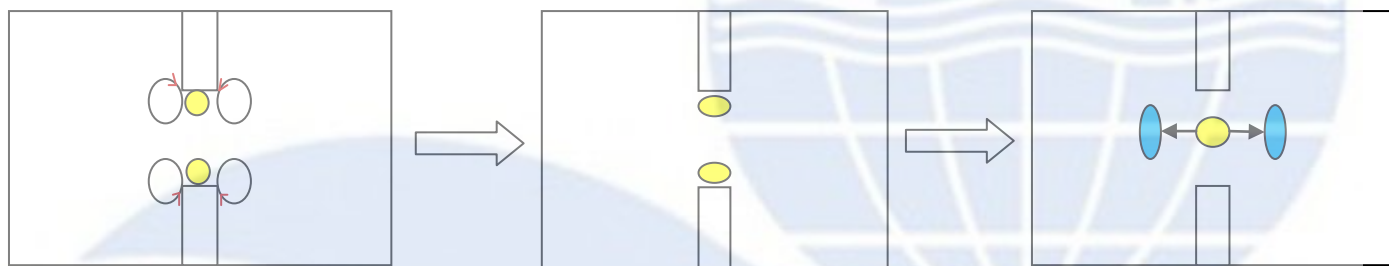


Fig. 7)general sediment transport pattern at the inlet

If wave height increases, the current velocity and the bed level change will increase too. Due to wave direction changes, the sediment transport and current pattern will change too. In normal condition both ebb and flood shoals are created but in angular directions just flood shoal is created.

References

- [1]-Hsiang Wang, Lin Lihwa, Gang Miao, 1992: Sebastian inlet physical model studies final report-movable bed model, Sebastian inlet, Florida.
- [2]-Qingquan Liu, 2006: Laboratory study on sediment diffusion and deposition into blind channels, Institute of Mechanics, Chinese Academy of Sciences.
- [3]-Sungwon Shin and Cox Daniel, 2006: Laboratory observations of inner surf and swash-zone hydrodynamics on a steep slope, O. H. Hinsdale Wave Research Laboratory, Oregon State University, Corvallis, OR 97331-2302, USA.
- [4]-ghazi, 1386: evaluation of currents pattern at inlets protected with jetties, master of science, azad university.
- [5]-karamy khaniki Ali, Tehrani chaichy, 1384: evaluation of sediment transport at hendigan estuary, Iran army, Tehran.
- [6]-daghigh, 1387: evaluation of wave height at kiashahr port by mike 21, master of science, azad university.