

PAPER • OPEN ACCESS

Collaborative influence of river discharge and marine current on PHC in Jiaozhou Bay

To cite this article: Dongfang Yang *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **218** 012148

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the collection - download the first chapter of every title for free.

Collaborative influence of river discharge and marine current on PHC in Jiaozhou Bay

Dongfang Yang^{1,2,a}, Dong Lin¹, Yuan Zhang¹, Qi Wang¹, Haixia Li¹

¹ Accountancy Shool, Xijing University, Xian 710123, China;

²North China Sea Environmental Monitoring Center, SOA, Qingdao 266033, China;

^adfyang_dfyang@126.com

Abstract. Using investigation data on PHC in May and August 1990, this paper analyzed the collaborative influence of river discharge and marine current on the distributions of PHC in Jiaozhou Bay. Results showed that the PHC contents in May 1990 in surface waters in Jiaozhou Bay were 0.018-0.270 mg L⁻¹, compared to 0.020-0.081 mg L⁻¹ in August 1990. Dagu River and Haibo River were the major PHC sources in May 1990, while Haibo River was the major source in August 1990. In May 1990, there was a “clean path” from the bay center to the bay mouth in where PHC contents were relative low. In August 1990, there was a “polluted region” from the estuary of Haibo River to the center of the bay in where PHC contents were relative high. By means of the collaborative influence of river discharge and marine current there are frozen moments of water exchange.

1. Introduction

Along with the rapid increasing of industry and economic, a large amount of wastes were generated and discharged to the environment [1-2]. Ocean is the sink of pollutants. By means of rainfall-runoff, various pollutants are washed and discharged to marine bays via river discharge [3-6]. Jiaozhou Bay is a semi-closed bay located in south of Shandong Peninsula, eastern China [7]. The major inflow rivers are playing roles of source input paths of pollutants to marine bays [8-9]. Using investigation data on PHC in May and August 1990, this paper analyzed the collaborative influence of river discharge and marine current on the distributions of PHC in Jiaozhou Bay [10-11]. The aim of this paper was to provide scientific basis for pollution control and environment protection.

2. Study area and data source

2.1 Study area. Jiaozhou Bay (120°04'-120°23' E, 35°55'-36°18' N) is located in the south of Shandong Province, eastern China (Fig. 1). It is a semi-closed bay with the total area, average water depth and bay mouth width of 446 km², 7 m and 3 km, respectively. There are more than ten inflow rivers such as Haibo River, Licun River, and Loushan River [12-13].

2.2 Data source. The data was provided by North China Sea Environmental Monitoring Center. The investigations were conducted in May and August 1990, respectively. Surface water samples in 13 sampling sites (i.e., 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 2104, 2105 and 2106) in May and 11 sampling sites (i.e., 52, 53, 54, 55, 57, 58, 59, 60, 61, 2105 and 2106) in August were collected and measured followed by National Specification for Marine Monitoring (Fig. 1) [14].



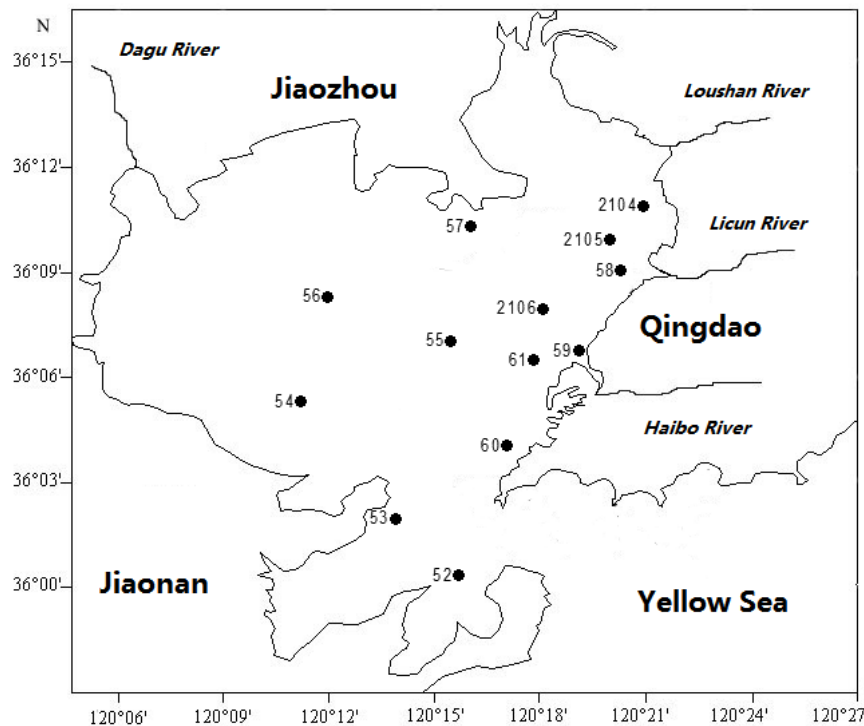


Fig. 1 Geographic location and monitoring sites in Jiaozhou Bay

3. Results and discussion

3.1 Horizontal distributions of PHC in May. The PHC contents in May 1990 in surface waters in Jiaozhou Bay were 0.018-0.270 mg L⁻¹. In May, high value regions of PHC contents were in estuaries of Dagou River and Haibo River, in where the high values of PHC contents were 0.270 mg L⁻¹ and 0.258 mg L⁻¹, respectively. On one hand, PHC contents were decreasing from the northwest of the bay to the bay center. On the other hand, PHC contents were decreasing from the east of the bay to the bay center. These indicated that Dagou River and Haibo River were the major PHC source in May 1990. In according to the investigation time on May 1990, the marine current was the falling tide. The terrigenous pollutants of this bay are mainly sourced from the inflow rivers. In May 1990, the source input of PHC was mainly from Dagou River in the northwest of the bay and Haibo River in the east of the bay. Along with the falling tide, PHC sourced from Dagou River and Haibo River were transporting to the whole bay (Fig. 2). Meanwhile, there was a “clean path” from the bay center to the bay mouth in where PHC contents were relative low (Fig. 2).

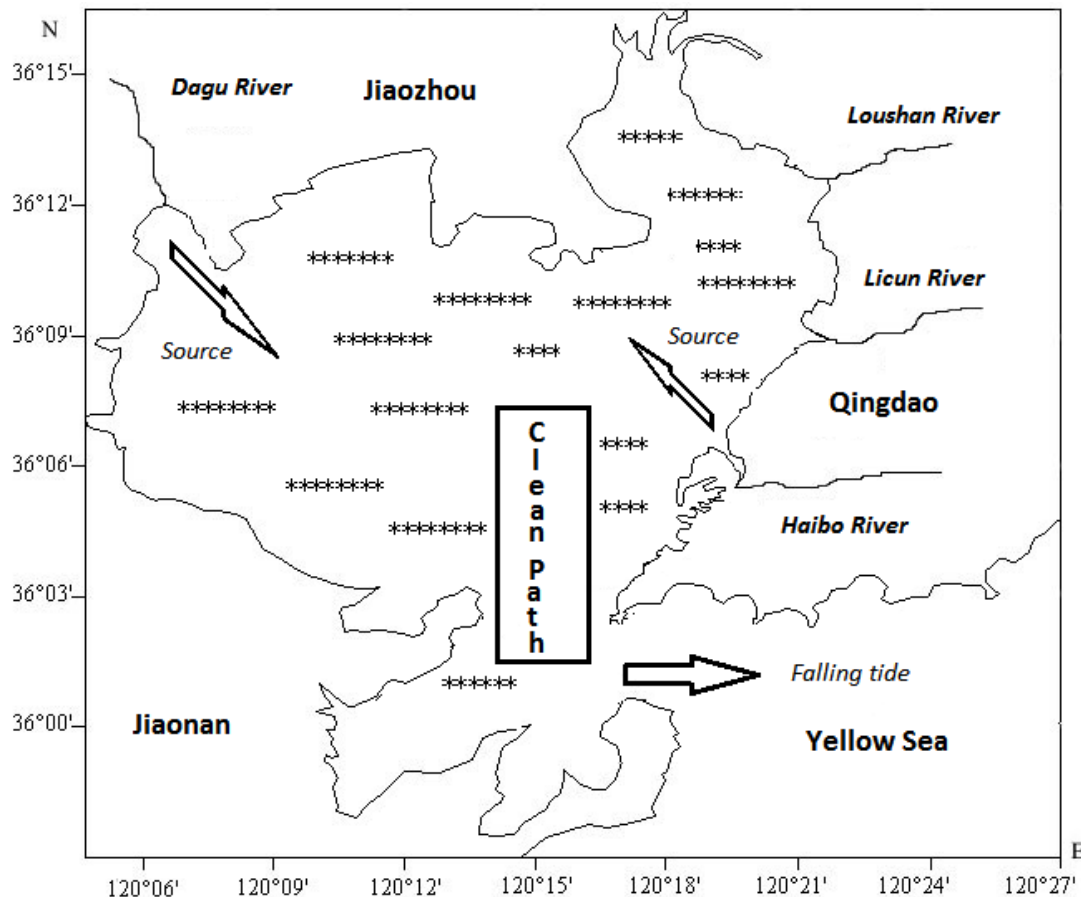


Fig. 2 Block diagram model for the collaborative influence of river discharge and marine current in May 1990

3.2 Horizontal distributions of PHC in August. The PHC contents in August 1990 in surface waters in Jiaozhou Bay were 0.020-0.081 mg L⁻¹. In August, high value regions of PHC contents were in estuaries of Haibo River, in where the high value of PHC content was 0.081 mg L⁻¹. PHC contents were decreasing from the east of the bay to the bay center. These indicated that Haibo River was the major PHC source in August 1990. PHC contents in Site 59 and Site 2016 were relative high (0.079-0.081 mg L⁻¹), while in other Sites were relative low (0.020-0.036 mg L⁻¹). In according to the investigation time on August 1990, the marine current was also the falling tide. In August 1990, the source input of PHC was mainly from Haibo River in the east of the bay. Along with the falling tide, PHC sourced from Haibo River were transporting to the bay center and PHC contents were forming a series of semi-circles decreasing along with the flow direction of Haibo River (Fig. 3). Meanwhile, there was a “polluted region” from the estuary of Haibo River to the center of the bay (Fig. 3).

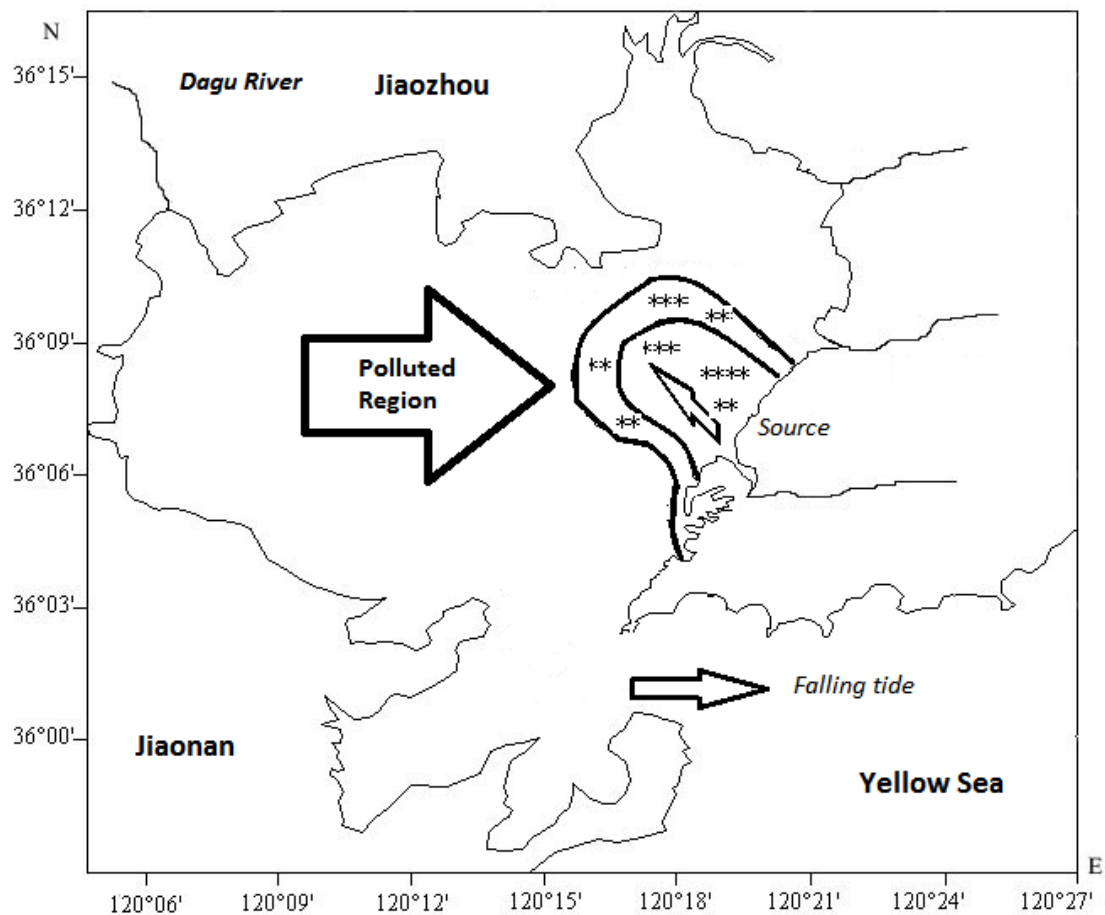


Fig. 3 Block diagram model for the collaborative influence of river discharge and marine current in August 1990

3.3 Collaborative influence of river discharge and marine current on PHC in May. By means of the river discharge, PHC was discharging to the bay continuously. Meanwhile, by means of water exchange, PHC contents were changing along with the geographical location continuously. During the falling tide seawater is moving from the bay to the open waters via the bay mouth, while during the flood tide seawater is moving from the open waters to the bay via the bay mouth. By this way, PHC contents in this bay were changing continuously. In May 1990, there was a “clean path” from the bay center to the bay mouth in where PHC contents were relative low (Fig. 2). In August 1990, PHC contents were forming a series of semi-circles decreasing along with the flow direction of Haibo River and there was a “polluted region” from the estuary of Haibo River to the center of the bay (Fig. 3). This indicated that there are frozen moments of water exchange.

4. Conclusion

Dagu River and Haibo River were the major PHC sources in May 1990, while Haibo River was the major source in August 1990. Along with the falling tide, PHC sourced from Dagu River and Haibo River were transporting to the whole bay, and there was a “clean path” from the bay center to the bay mouth in where PHC contents were relative low. In August 1990, the source input of PHC was mainly from Haibo River in the east of the bay. Along with the falling tide, PHC sourced from Haibo River were transporting to the bay center and PHC contents were forming a series of semi-circles decreasing along with the flow direction of Haibo River and there was a “polluted region” from the estuary of Haibo River to the center of the bay. In general, there are frozen moments of water exchange.

Acknowledgement

This research was sponsored by Doctoral Degree Construction Library of Guizhou Nationalities University, Research Projects of Guizhou Nationalities University ([2014]02), Research Projects of Guizhou Province Ministry of Education (KY [2014] 266), Research Projects of Guizhou Province Ministry of Science and Technology (LH [2014] 7376).

References

- [1] Yang DF, Zhang YC, Zou J, et al.: Open Journal of Marine Science, vol. 2 (2011), p. 108-112
- [2] Yang DF, Sun PY, Chen C, et al.: Coastal Engineering, Vol. 32 (2013), p. 60- 72. (in Chinese)
- [3] Yang DF, Sun PY, Ju L, et al.: Applied Mechanics and Materials, Vol.644-650(2014), p. 5312-5315.
- [4] Yang DF, Sun PY, Ju L, et al.: Proceedings of the 2015 international symposium on computers and informatics, vol, (2015), p. 2647-2654.
- [5] Yang DF, Wang FY, Zhu SX, et al.: Proceedings of the 2015 international symposium on computers and informatics, Vol. (2015), p. 2661-2666.
- [6] Yang DF, Sun PY, Ju L, et al.: Proceedings of the 2015 international symposium on computers and informatics, Vol. (2015), p. 2675-2680.
- [7] Yang DF, Zhu SX, Wang FY, et al.: 4th International Conference on Energy and Environmental Protection, Vol. (2015), p. 3784-3788.
- [8] Yang DF, Wang FY, Zhu SX, et al.: Advances in Engineering Research, Vol. (2015), p. 431-434.
- [9] Yang DF, Wang FY, Zhu SX, et al.: Meterological and Environmental Research, Vol. (2015), p. 31-34.
- [10] Yang DF, Zhu SX, Wang FY, et al.: Advances in Engineering Research, Vol. (2016), p. 1351-1355.
- [11] Yang DF, Wang FY, Zhu SX, et al.: Meterological and Environmental Research, Vol. (2016), p. 44-47.
- [12] Yang DF, Chen Y, Gao ZH, et al.: Chinese Journal of Oceanology and Limnology, Vol. 23(2005), p. 72-90.
- [13] Yang DF, Wang F, Gao ZH, et al. Marine Science, Vol. 28 (2004), p. 71-74. (in Chinese)
- [14] China's State Oceanic Administration: The specification for marine monitoring (Ocean Press, Beijiing 1991), p.1-300. (in Chinese)