

Analysis of superposition effect of land subsidence and sea level rise in Tianjin coastal area and its emerging risks

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Abstract

Tianjin, as a major coastal city in China, many economic construction planning parks and engineering construction projects have relied on the special advantages of it. The relative sea level has brought huge hidden danger to the economic and social development of Tianjin. And, land subsidence is the most important factor that influences relative sea level rise. Research analyzed Radarsat-2(2012-2016) and Sentinel-1(2016-2018) through PS-InSAR. And the results indicated that the subsidence rate of the southern plain of Tianjin slowed down as a whole, however, the annual average maximum subsidence rate was still more than 100mm/a. In addition, Wuqing and Jinghai sedimentary areas as well as several subsidence centers have been formed, and the settlement scope tends to expand to the east coast. By establishing a regular grid of land subsidence and groundwater to construct a geo-weighted regression model (GWR), it is found that Wuqing sedimentary area as a whole is positively correlated with TCA. While for Jinghai sedimentary area, there is a spatial difference in terms of TCA and SCA. According to the relative sea level change, it can be predicted that the natural coastline of Tianjin will recede by about 28 km² in 5 years and 87 km² in 20 years. Based on the above research results, this paper integrates land subsidence, groundwater, land classification status and other related factors, and uses machine learning method (XGBoost) to evaluate Tianjin's urban safety as well as analyze high-risk areas and main contributing factors. From the perspective of earth system science, this paper analyzes the potential risks of seawater inundation and urban security caused by the superposition of sea level rise and coastal plain land subsidence, so as to improve the ability of coastal areas to resist disasters.

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