

Integrated Approach of Remote Sensing and GIS to Monitor the Coastline Changes of the Yellow River Delta

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The coastal zone of the Yellow River Delta (YRD) is a special geological feature, which is generally affected by various natural phenomena. As a result, its spatial position is varied quickly. Nearly 20 years (from 1976 to 1996) of Remote Sensing (RS) images (data) of the YRD are employed for analysing and processing. The YRD coastline changes were studied in a regional scale. The sections of the Hekou, Diaokou, and Yellow River Port were separately analysed, and their coastline changes for nearly 20 years were determined according to the real conditions of coast zone. Siltation of the land is generally a partial phenomenon. It is taking place in the areas occupied successively by the river and sea. But the erosion by oceanic dynamic activity is an extensive process covering large areas, even the areas of siltation. It is under the two dynamic functions of river and sea currents that sand bar and coastline of the whole YRD are affected by such processes as silting, erosion, rising of river bed, and shifting of river channel. The integrated analysis of RS and GIS data revealed the following features of the YRD.

(1) Between 1976 and 1981, the sand bar of the river mouth had the tendency of silting. Between 1981 and 1984, the sand bar extended eastwards with a rate of 5 km/year, and the annual average rate of formation of new land was about 50 km². From 1984 to 1991, the sand bar was stable and the siltation rate was about 2.4 km²/year. Between 1991 and 1996, the sand bar siltation rate increased steadily, and reached an average of 12.1 km²/year. The sand bars had the tendency to expand in a short time interval and then remain stable for a long period. As a result, the main sand bar gradually extended towards the sea.

(2) In the Diaokouhe area, the coastal zone is diminishing. The sand bar had extended from 1975 to 1976. Then, the erosion processes became active. The average erosion rate of the sand bar was about 400 m/year from 1976 to 1984. The highest rate of erosion reached 900 m/year from 1985 to 1996, and the average of that period was 300-400 m/year. The entire area of erosion extended to hundreds of km². The erosion rate was rapid at the beginning, then slowed down, and finally, the area reached to a temporary equilibrium state.

(3) The Yellow River Port area is located near the M2 point, which divides the tidal and non-tidal zones. The coastline has not undergone significant changes between 1985 and 1996.

In this paper, the possible future changes in the YRD coastline are predicted by taking into considerations the combined analysis of RS and GIS data as well as the countermeasures for controlling the YRD.