Using Remote Sensing Dynamic Monitoring and Analysis of Coastal zone changes Supported by GIS Technology

——Taking the Coastal Zone of Longkou City As an Example

Abstract

Coastal zone, located in the connection belt of sea and land, has become a key field of human competition and exploration owing to its abundant natural resources and advantageous geographical location. However, affected by the strong interaction between ocean and continent, it has the most complicated natural environment and the most fragile ecology. In recent years, with the rapid development of economy, the resources and environment of coastal zone have been greatly damaged due to the unreasonable utility of land resource. So the study of dynamic monitoring coastal zone changes has became a hot topic of Global Changes. Nowadays, as the rapid development of science and technology, remote sensing and geography information system have offered the main data sources and technological means for studying global changes, and it is also an important advanced way to studying coastal zone changes. Taking Longkou coastal zone as a case, the paper, on the basis of RS and GIS technology, extracted the thematic information of the coastal zone, then analyzed the changes from space and time and expatiated on driving factors on the changes in detail, supported by national natural science fund "The function of land, sea and environment impact and ecological effect of human activity" and the subject of "The renewal database of land use of Longkou city ". The major contents and research results are as following:

1. The need of information for the research was obtained based on remote-sensing image processing to enhance thematic information of the coastal zone. It was difficult especially to been drew out directly for the low tide line because of being submerged by sea long time. So the study based on the water depth remote sensing theory carried on the statistical correlation analysis on the single band or multi-band combination

data and created the RS-fathoming model, then inversed the fathoming model to drew out the low tide line according as the synchronous tide data. It is obvious that this new method to obtain seawater information quickly and efficiently. So it is value for the study of dynamic monitoring coastal zone changes using remote-sensing technology.

2. The land information of the coastal zone was extracted by computational auto-classification. Compared with the conventional Maximum Likelihood Classifier in the process of which only the spectral information of objects is used, the Artificial Neural Network (ANN) has been developed and applied to remote sensing data classification problem, which can overcome the limitation stated above. It can make classification by integrating RS data (spectral values, texture) with the geographic data (DEM, slope etc.) resulting from GIS. In the paper, the need of land cover classification was made though BP Neural Network classifier, a sort of ANN be widely used for classification of remote image data nowadays, integrating spectral values with texture data and the distance from coastline. The analysis result shows that this method can improve the classification accuracy greatly.

3. Geographic Information Tupu was created to study the Longkou coastal zone changes that included the advance and retreat of coast and the features of land-use in both spatial and temporal from1984 to 2004. The result showed that the coastal zone of Longkou city is an active area with changes obviously during the course of study. There were notable difference of advance and retreat in each coast section from different years. The general trend was moving to land obviously in the north coast, pushing to sea in the coast between Longkou Pot and Jimu Island, and keeping steady relatively in the west coast in addition to having a little advance latter. The changing extent was more remarkable in the 1990s especially in 1992 to 1998, and the coast trended to be steady after 2000. The land use also changed greatly in the coastal zone during 1984 – 2004. There was a great decrease in sand land and cultivated land and a remarkable increase in water area, garden land and build-up land. The speed of the land use change in the region was up to 1.53% per year, and the sand land and water area changes had the highest speed in all land-use type. As to the spatial change, 55.65% of the land use in the region was under the changing progress, major type of

which were cultivated land turned to garden land, and cultivated land and garden land turned to build-up land. But the active land-use conversion was the sand land turning to other land-use type in the region less than 500 meters distance from the coastline.

4. Based on the macroscopic analysis of the driving mechanism of the coastal zone changes, it is clear that the changes of coatal zone were caused by both natural and human factors. However, for Longkou coatal zone, human activity was the main factor, and the natural drove the changes more by giving a feedback to the human activity. Canonical Correlation Analysis was applied to identify the human driving factors quantitatively, and it was concluded that human activities drove the changes of land use by the economic development, agriculture structure change, marine culture, and exploration on sand and coal resources. Nature gave a feedback to the human activity by means of hydrodynamic condition change at coastwise, seawater intrusion and mining subsidence.

Key words: coastal zone; remote-sensing image; water depth remote sensing; BP Neural Network; Geographic Information Tupu; driving force

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