STUDY ON DRIVING FACTORS OF SURFACE THERMAL ENVIRONMENT DISTRIBUTION IN COASTAL AREAS OF EASTERN ZHEJIANG

Bachelor's thesis

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ABSTRACT

Relevance of research. LST is a key variable in high temperature monitoring and climate ecological environment research. It reflects the energy balance of the surface to a large extent. Therefore, it is important to study the factors affecting land surface temperature. The actual measurement of the meteorological station is an accurate and reliable means to obtain the surface temperature data. However, due to the limited number and uneven distribution of meteorological stations, it is not easy to obtain the surface temperature of complex terrain or remote areas. Remote sensing is widely used in the inversion of LST because of its global spatial coverage, high spatial and temporal resolution and long-term availability of data records. This not only helps scientists to monitor and predict climate change more accurately, but also provides an effective tool for resource management. The development of remote sensing technology provides an important way to integrate the information of LST and other environmental factors from different spatial and temporal scales, and to clarify the spatial and temporal pattern of LST and its change mechanism.

Infrared remote sensing is a technical means to collect and record the difference of radiation temperature of ground objects by using the thermal infrared band of spaceborne or airborne sensors. It is widely used in LST inversion, urban heat island effect and other research. In the field of modern remote sensing, there are many kinds of satellite sensors equipped with thermal infrared sensors. Among

them, Landsat 8 inversion results are consistent with MODIS temperature products in terms of overall ground temperature distribution. However, Landsat 8 has higher spatial resolution, which can more carefully identify the LST differences of different land cover types on small-scale plots, and shows more obvious advantages in accurate LST inversion. Compared with MODIS, although it has global coverage and well-calibrated long-term data records, its data contains a large number of missing values caused by various factors such as cloud pollution, non-overlapping satellite orbits and instrument failures.

Some studies have estimated missing values by fitting the empirical relationship between LST and auxiliary data (latitude, longitude, altitude, surface humidity, normalized difference vegetation index, etc.). There are also studies based on data fusion methods, combined with surface temperature data from different satellites or the same satellite at different transit times to simulate surface temperature at a resolution of 30 meters under all-weather conditions. The mechanism of simulation in these studies is affected by the driving factors of surface temperature, so it is necessary to carry out more in-depth research. Most of the previous studies have focused on the differences in local surface temperature in cities, but in some natural areas where towns and villages are sparsely distributed, surface temperature has also undergone dynamic changes that cannot be ignored. Some scholars have discussed the influence of natural factors on surface temperature, such as terrain factors such as altitude, slope and aspect, underlying surface properties such as soil and vegetation conditions, water body, lithology and fault zone, etc., and the distribution of surface thermal environment has a certain correlation with these factors.

In order to discuss the influence of multi-type factors on different land cover types and LST, this paper uses the radiative transfer model method to invert the LST of Landsat 8 OLI/TIRS and Landsat 9 OLI-2/TIRS-2 remote sensing data in the eastern coastal area of Zhejiang Province, and compares it with the ground measured meteorological data of 6 meteorological stations to evaluate the inversion accuracy. The feature types are obtained based on the random forest

classification method, and the geomorphological features are obtained based on the terrain data. **The research object** is the LST in the eastern coastal area of Zhejiang Province. **The subject is** to analyze the correlation characteristics between LST and various environmental factors in combination with the regional LST information. **The purpose of** this study is to seek the driving mechanism of surface thermal environment, to explore the surface influencing factors related to the change of LST, to provide an important scientific basis and data basis for improving the simulation and reconstruction of LST, and to provide a scientific basis and method for analyzing the response of ecosystem to climate change.

To achieve the purpose of the work, the **following tasks** were set:

1.The overall correlation characteristics between LST and various environmental factors are analyzed in combination with the LST information of the partition.

2.The correlation between LST and key topographic factors such as altitude, slope and aspect was analyzed, and the internal mechanism was explored.

3.The influence of the complex combination of surface morphology and underlying surface types on the spatial pattern of surface thermal environment.

4.LST is usually affected by both natural and anthropogenic factors. Therefore, the effects of different factors are considered in the study, which shows the contribution of different factors to the surface temperature and reveals the driving force of the surface temperature change in the coastal areas of eastern Zhejiang.

Research methods. Based on Landsat 8/9 remote sensing data, this study uses the radiative transfer equation method to invert the surface temperature, and uses the random forest classification method to extract different features. Three indexes of NDVI, NVBI and MNDWI, which are closely related to the surface thermal environment, are calculated by using remote sensing images. Because the ocean has a certain influence on the temperature of the coastal area, the mask is removed from the ocean surface during the study. At the same time, the basic terrain elements are extracted from DEM data, and the correlation between NDVI,

NVBI, MNDWI and surface temperature is analyzed. In addition, the study also used DEM to extract the LST in the plain(0-200m) and mountainous areas(more than 200m). The linear model was used to quantitatively evaluate the combined effects of natural and human factors on the LST in the coastal areas of eastern Zhejiang, and to reveal the driving forces affecting the LST changes in the coastal areas of eastern Zhejiang.

Structure of the work. The full text consists of seven parts, namely, abstract, introduction, research area and data, research methods, results and discussions, conclusions and references. The total number of pages is 54, including 17 pictures and 4 tables. The research results are in the submission stage.