

## 近35a西藏那曲地区湖泊动态遥感与气候因素关联度分析

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## Correlation Degree Analysis of Meteorological Elements and Dynamic Remote Sensing of Alpine Lakes in Naqu Region of Tibet in the Past 35 Years

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摘要

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摘要 利用1976、1990、2000和2010年4期遥感影像对西藏那曲地区面积大于1 km<sup>2</sup>湖泊的动态变化进行信息提取,并结合1966—2010年研究区9个站点的气象数据,探讨其对气候变化的响应。结果表明,2010年那曲地区大于1 km<sup>2</sup>湖泊的总面积为16 841.93 km<sup>2</sup>,湖泊总数为469。近35 a那曲地区大于1 km<sup>2</sup>湖泊面积共增加3 505.12 km<sup>2</sup>,增幅为26.28%,其中以2000—2010年增长速度最快,达18.18%;近35 a湖泊数量增加96,增幅为25.73%,其中以1990—2000年增幅最大,达13.38%。色林错面积从1976年的1 648.61 km<sup>2</sup>增加到2010年的2 332.55 km<sup>2</sup>,超过纳木错成为西藏第一大咸水湖。1966年以来,那曲地区年平均温度、年平均最高温度、年平均最低温度、年平均相对湿度和年平均降水量总体呈上升趋势,年平均蒸发量呈下降趋势,气候朝暖湿方向发展,其中温度变化最明显,线性气温倾向率为0.51℃·(10 a)<sup>-1</sup>。湖泊动态变化与气象因子的灰色关联分析表明,气温升高引起冰雪融水增加、降水量增加、相对湿度增加和蒸发量减少,是近35 a来那曲地区湖泊面积和数量不断增加的主要原因。气象要素与湖泊面积间的回归方程表明,两者具有显著线性相关关系。

关键词: 西藏 那曲地区 湖泊动态 气候变化响应

Abstract: Out of the 1976,1990,2000 and 2010 remote sensing images of Naqu region of Tibet,information was extracted about dynamic variations of alpine lakes bigger than one square kilometer in water surface,therein.And correlation analysis was done of the information with the meteorological data from 1966 to 2010 available from the nine meteorological stations in the region to explore responses of the dynamics of the lakes to changes in the climate.Results show that there were a total of 469 lakes(bigger than 1 km<sup>2</sup> in water surface),amounting to 16 841.93 km<sup>2</sup> in total area in 2010.In the past 35 years,the lakes increased by 3 505.12 km<sup>2</sup> or 26.28% in total area(especially in the period of 2000-2010 by 18.18%) and by 96 or 25.73% in number of lake(especially in the period of 1990-2000 by 13.38%).The area of Lake Selin Co increased from 1 648.61 km<sup>2</sup> in 1976 to 2 332.55 km<sup>2</sup> in 2010,an increase rate of 41.49%,and exceeded Lake Nam Co in area,becoming the largest saline lake in Tibet.In the past 45 years,Naqu region witnessed a general rising trend in annual mean air temperature,annual mean highest air temperature,annual mean lowest air temperature,annual mean precipitation and annual mean relative humidity,but a reverse trend in annual mean evaporation,suggesting that the climate in that region is changing towards warm and wet,and the change in temperature is the most remarkable,increasing by 2.27 °C from 1966 to 2010.The climate tendency rate reached 0.51 °C·(10 a)<sup>-1</sup>.The gray correlation degree analysis of dynamic changes in lakes with the meteorological factors shows that the the increase in ice-snow melt-water triggered by the rise of the air temperature,the increase in precipitation,the increase in relative humidity and the decrease in evaporation were the main causes of the increase in lake area and number of lakes in Naqu of Tibet over the past 35 years.Regression of the meteorological elements with changes in lake area shows they are linearly related.

Keywords: Tibet Naqu region dynamics of the lake response to climate change

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