

# 乌兰布和沙漠风沙入黄段植被覆盖动态变化特征及驱动力

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**摘要:** 乌兰布和沙漠东靠黄河、西与内蒙古狼山和巴音乌拉山相连, 该地区降水稀少, 土壤粗化, 是我国北方沙尘暴频发的主要源区之一。黄河流域是我国生态安全的重要屏障, 长期以来乌兰布和沙漠的风沙运动对黄河有着严重的影响, 大量泥沙入黄, 导致黄河灾害频发, 严重威胁了该区域的生态安全, 乌兰布和沙漠风沙入黄段的生态环境保护和修复工作刻不容缓。沙漠地区植被对保持水土、防风固沙和改善生态质量具有关键作用, 近年来多项重大生态工程、防沙治沙工作和自然因素变化的强烈作用下, 乌兰布和沙漠风沙入黄段的植被状况出现显著变化。基于此, 本文以 2001—2021 年 Landsat 影像为基础数据, 结合归一化植被指数 (NDVI) 和像元二分模型估算植被覆盖度, 探究乌兰布和沙漠风沙入黄段植被覆盖度时空变化趋势及驱动力, 以期为乌兰布和沙漠风沙入黄段植被恢复和未来生态建设重点区域的选择提供理论依据。结果表明: (1) 在时间变化上, 2001—2021 年乌兰布和沙漠风沙入黄段植被覆盖度整体呈波动上升的趋势, 植被恢复状况良好, 平均植被覆盖度由 0.294 增加至 0.526, 其中 2007—2017 年改善程度最大。在植被覆盖面积变化上, 较低植被覆盖区域和低植被覆盖区的面积由 15.3% 和 60% 减少到 3.8% 和 17.4%, 而较高植被覆盖区域和高植被覆盖区域的面积由 6.5% 和 8.8% 增长到 20.8% 和 13.9%。(2) 在空间变化上, 2001—2021 年乌兰布和沙漠风沙入黄段不同等级植被覆盖度间的转移较为频繁, 其中低植被覆盖度和较低植被覆盖度大面积转出为中等植被覆盖度和较高植被覆盖度, 其转出面积分别为 102.00km<sup>2</sup> 和 128.82km<sup>2</sup>。除此之外, 研究区内有 42.1% 的区域呈现显著增加趋势, 4.90% 的区域趋向于显著减少, 多分布于近乌海段, 该段仍以流沙和低植被覆盖为主, 植被退化显著, 风沙活动频繁, 是未来生态修复中重点关注区域。(3) 乌兰布和沙漠风沙入黄段植被覆盖度空间分异主要与土地利用类型变化、气候因子和人类活动有关; 各驱动因子之间的交互作用以双因子增强为主, 其中土地利用类型、年平均气温和年平均降水与其他因子之间的交互作用最显著。由此可见, 良好的气候条件和适当的人为干扰能够促进植被生长, 改变植被分布。

**关键词:** 植被覆盖度; 时空变化; 驱动因子; 乌兰布和沙漠

## Dynamic change characteristics and driving forces of vegetation cover in Ulan Buhe Desert along the Yellow River

**Abstract:** Based on the Landsat imagery data from 2001 to 2021, the NDVI and the image dichotomous model were used to estimate vegetation cover and explore the spatial and temporal trends and driving forces of vegetation cover in Ulan Buhe Desert along the Yellow River, in the hope of providing a theoretical basis for the restoration of vegetation in Ulan Buhe Desert along the Yellow River and the selection of key areas for future ecological construction. The results show that: (1) the overall vegetation cover in the study area showed a fluctuating upward trend, and the vegetation restoration status was good. The average vegetation cover increasing from 0.294 to 0.526, and the increase was most obvious from 2007 to 2017. (2) From 2001 to 2021, the transfer of vegetation cover between different levels in Ulan Buhe Desert along the Yellow River is more frequent, in which low vegetation cover and lower vegetation cover were transferred out to medium vegetation cover and higher vegetation cover in

a large area of 102.00 km<sup>2</sup> and 128.82 km<sup>2</sup>, respectively. In addition, 42.1% of the area in the study area tends to increase significantly, mainly in the near Dengkou section, and 4.90% of the area tends to decrease significantly, mostly in the near Wuhai section, which should be the key area of concern in future ecological restoration. (3) The spatial variability of vegetation cover in this area is mainly driven by human activities, land use type changes and climate factors, and the interaction between the driving factors is mainly enhanced by two factors, among which, the key interaction factors with the highest degree of influence are land use type and annual average temperature (0.435).

**Keyword:** Vegetation coverage; temporal and spatial variation; driving factor; Ulan Buhe Desert