

Research on the Fusion of Time-Series Sentinel-1 Data and Phenological Features for Sugarcane Planting Distribution Extraction

Senzheng Chen¹, Huichun Ye¹, Shanyu Huang², Longlong Zhao³, Chaojia Nie¹, and Weixia Hu⁴

¹Chinese Academy of Sciences Aerospace Information Research Institute

²Ministry of Agriculture and Rural Affairs of the People's Republic of China

³Chinese Academy of Sciences Shenzhen Institutes of Advanced Technology

⁴JiangXi University of Science and Technology School of Science

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Abstract

The extraction of sugarcane planting distribution provides a scientific basis and theoretical support for local sugarcane cultivation management and the prediction of sugarcane yield. Sugarcane predominantly grows in tropical and subtropical regions characterized by cloudy and rainy conditions. Optical satellite remote sensing imagery is greatly affected by cloud and rain interference. In contrast, synthetic aperture radar (SAR) data exhibit strong penetration capabilities, enabling effective imaging in overcast, rainy, and cloudy environments. Focusing on Fusui County, Guangxi Province, China, this research utilizes Sentinel-1 radar data and integrates the phenological features of sugarcane growth. A sugarcane planting distribution extraction model is constructed using a random forest classifier. The results demonstrate that the phenological feature approach based on temporal radar scattering characteristics achieves superior performance in sugarcane identification and extraction. The overall accuracy surpasses 92.18%, with a Kappa coefficient of 0.89. This method exhibits a 4.95% accuracy improvement compared to single-period radar scattering feature methods. Therefore, this radar-based method for extracting sugarcane planting distribution can effectively and accurately extract sugarcane cultivation patterns in regions with complex cloud and rain conditions, such as Guangxi Province. It also serves as a methodological reference for extracting crop planting distributions in cloudy and rainy areas.

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