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小麦倒伏的雷达极化特征及其遥感监测

Radar polarimetric response features and remote sensing monitoring of wheat lodging

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中文摘要：

研究探索了雷达遥感大面积监测小麦倒伏状况的潜力。利用覆盖整个小麦生育期的5景时间序列Radarsat-2全极化影像数据，对比分析了倒伏小麦与正常小麦在不同时间、不同极化的雷达后向散射动态响应规律，发现雷达极化特征对小麦倒伏十分敏感，基于此提出利用雷达极化指数监测小麦倒伏的方法。并利用内蒙古额尔古纳市上力农场春小麦抽穗灌浆期的实地调查数据，对提出方法进行验证，结果表明该方法能有效辨识和监测小麦倒伏。为大面积监测小麦倒伏提供了一种简单、快速、有效的段。

英文摘要：

Abstract: Wheat lodging is one of the most popular agriculture disaster. It has a great influence on the yield formation of wheat and causes huge loss every year. However, available means for monitoring crop lodging in large area is very limited. The potential capability of radar remote sensing for monitoring wheat lodging was explored in this study. the backscattering coefficient of wheat field parcels were extracted at different polarization mode, radar backscattering behavior of typical lodging wheat parcels and the one of typ normal wheat parcels was dynamically compared at different growth stages and at different polarization mode, based on 5 multi-temporal Radarsat-2 images that covered an entire wheat growth cycle from sowing to near harvest. Results showed that there were distinct differences between lodging and normal wheat parcels in all polarization channels. Wher compared to normal wheat, the backscattering coefficient at HH (H, horizontal polarization) polarization decreased remarkably, while the one at VV (V, vertical polarization) polariza increased and the one at HV polarization increased slightly for lodging wheat. It was also found that polarimetric feature from synthetic aperture radar (SAR) data was very sensiti wheat lodging and the sensibility was caused by unique structural characteristics of wheat vegetation and inherent polarization characteristics of SAR observation. Then a metho based on radar polarimetric index, which took the full advantage of this sensibility, was put forward to monitoring wheat lodging. And the method was validated by in-situ data collected in 28 wheat parcels in Shangkuli Farmland in Inner Mongolia, China, at heading and filling stages of spring wheat. The result revealed that the polarimetric index, especia based on the ratio of dual-polarization backscattering coefficient (HH/VV and HH/HV), had excellent performance for distinguishing lodging from normal wheat parcels: all the 11 lodging wheat parcels with different severity were detected successfully from 28 parcels. In addition, the results were compared with the ones by single polarization channel data. showed that the polarimetric index method had good anti-inference ability such as resisting influence of wheat growth difference, and can better reflect the intrinsic feature of lodg It should be mentioned that the monitoring result may be influenced by harvest situation and vegetation water content etc. Moreover, while optical remote sensing relied on its spectral features to monitor crop lodging, radar remote sensing utilized polarimetric features to monitor crop lodging since SAR observation had advantage in reflecting the structu variation of lodging. Therefore, radar remote sensing have great potential for crop lodging monitoring, and the study presented a simple and effective method for monitoring whea lodging in large area.

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