利用多源卫星数据提取农田农事作业信息支持可持续农业管理

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摘要：中国高分卫星系列和欧洲哨兵卫星系列的发展为开展农业监测提供了丰富的数据源。利用多源时间序列卫星数据，将增加对农业生产耕、种、管、收全流程遥感监测的有效频次，从而可为农业生产管理和农业可持续发展提供及时的、更多的决策支撑信息。在中欧"龙计划"的支持下，本项目在中国选择了 2 类典型研究区，一类是农田地块大，发展现代化农业，与欧洲的农业生产规模相当且具有可比性，另一类是典型的中国北方农业，地块狭小，发展传统农业，开展农业遥感监测具有更大挑战性。这些研究区的作物类型包括小麦、玉米、大豆、水稻和蔬菜，代表北方平原区的灌溉农业和雨养农业。本项目在黑龙江建三江平原针对水稻田春季泡田整地、夏季水旱作物分布、秋季秋收秋翻等农事作业提出了一套基于遥感图像的农事信息提取技术，自 2021 年以来实现了 1200 多万亩农田的农事作业信息遥感及时监测，为整个农场的管理决策提供了科学信息。同时，本项目在山西晋中国家农业高新区，针对秋季秸秆覆盖、冬季农田冬灌农事作业，对上述基于遥感图像的农事信息提取技术进行了迁移改造和应用，取得了很好的应用效果。通过本项目的中外联合研究，推动了中欧年青科技工作者的积极参与和互访交流，在卫星数据处理方法、参数提取算法、遥感分类方法等方面进行了深入交流和互鉴。本项目的成果丰富了农业监测的理论框架和遥感应用技术领域。

关键词：农事作业、农业监测、高分、哨兵、龙计划

Retrieving the cropping practices information with time series of multiple source satellite data in support of sustainable agricultural management

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Abstract: The sentinel satellite series in Europe and the GF satellite series in China are providing the data options for agricultural monitoring as well as enhancing the capability of agricultural monitoring in general. With the time series of multiple source satellite data, it may increase the frequences of validly monitoring the cropping management practices along plough, sow, management and harvest during the whole crop growth cycle and thus it may provide timely and more information in support of the decision making for agricultural production management and sustainable development. Under the support of the Dragon program, two types of study areas were selected in this project. The first one is with big fields and good at the development of modern agriculture that is comparable with the European agricultural farms. Another one is the typic northern Chine fields with the conventional agricultural development that is challenging for the agricultural monitoring with remote sensing data. The crop types in the study areas are winter wheat, corn, soybean, rice, and vegetable, representing the irrigation agriculture and rain fed agriculture in northern China. This project has developed a suite of technology of retrieving the cropping practices on the satellite images and applied for the identification of rice field preparation readiness in spring, dryland and paddy field crop mapping in summer, harvest and plough progress in fall in the northeast China plain. Since 2021, a farm with a little bit less one million hectare crop land has been timely monitored with satellite images and the retrieved information has been used for the farm management decision making. At the same time, another study was carried out in the Jinzhong basin of Shanxi province in north China that is a national high tech agricultural development zone. The straw mulching in fall and the winter irrigation were identified on the satellite imges with adapted abovementioned method. With the heavy involvement of young scientists from Europe and China in this project, the satellite data finely processing, information retrieval algorithm and remote sense classification methods have been exchanged between European team and Chinese team. The finding from this project is expected to bring a step forward to support agricultural monitoring at fine scale and consolidate the theory framework of agricultural monitoring as well as enlarge the areas of remote sensing technology applications.

Keywords: Cropping Practices; Agricultural Monitoring; GF; Sentinel; Dragon Programme