利用地球观测卫星大数据监测作物生长支持农业管理

范锦龙 [1], Pierre Defourny[2]

1:北京师范大学,中国; 2: Universite Catholique de Louvain, Belgium

摘要：最近 10 年，欧洲和中国 10-30 米空间分辨率的光学多光谱、高光谱以及雷达数据越来越丰富，为遥感领域的学者探测综合利用这些卫星数据的优势在各种尺度上开展作物监测的技术创造了条件。这些卫星数据有助于实现互补，融合这些多样化的卫星数据可以改进作物生长信息提取的精度，从空间范围和质量上提升农业监测的能力。然而，中国和海外的农业生产均是多样化的，既存在大地块单一作物种植的模式，也存在小地块多作物条带种植的模式，开展作物监测需要考虑这种场景。中欧多光谱卫星系列、高光谱卫星进行农作物分类存在什么差异，特别区分相近作物？中欧多光谱卫星系列、高光谱卫星数据建立的农作物分类模型跨年应用是否可行？本项目将回答这两个科学问题，为此设置了 5 个研究区，其中 4 个在中国，1 个在欧洲，代表主要的农业种植系统，包括中国的冬小麦、玉米、水稻、甘蔗和欧洲的冬麦、土豆和玉米。这些研究区也代表平原区和山区的农业种植系统，灌溉的和雨养农业种植系统、北方的和南方的农业种植系统。项目的地面样本收集技术将按照 JECAM 原则开展。来自欧洲的哨兵 1/2 号、EnMap 和中国的高分 1/6，欧比特以及北京师范大学卫星数据将用于本项目的研究。作物分类算法用于评估单一卫星数据或多源卫星数据提取作物类型的精度，包括多光谱、高光谱和 SAR，但重点是高光谱。通过本项目的研究，特别是调动中欧青年科学家的参与，卫星数据精细化处理方法和农业信息提取算法将得到充分交流和应用。本项目的目标是在更精细的尺度上促进农业监测技术的发展，同时本项目的中欧合作将对地球观测组织的 GEOGLAM 计划的实施做出贡献。

关键词：作物长势、农业监测、农业管理、地球大数据、龙计划

Monitoring Crop Growth with Big Earth Observation Satellite Data in Support of Agricultural Management

Jinlong Fan[1], Pierre Defourny[2]

1: Beijing Normal University, People's Republic of China; 2: Universite Catholique de Louvain, Belgium

Abstract: In recent years, 10 to 30 meter resolution optical multispectral and hyperspectral satellites data and SAR data from Europe and China became available and is encouraging the Remote sensing community to explore the new technology to harness all advantages of all these satellites to achieve best crop monitoring at various scale. The capability of agricultural monitoring in general is being enhanced and improved with these diverse satellite data in term of the monitoring spatial extent and the quality of the retrieved crop growth information. However, the agricultural cultivation is diverse in China and the rest of the world. There are existing large fields with mono crop and small fields with multiple strips of various crop types. It has to take this situation into account when the crop monitoring is being conducted. What are the performance differences between multispectral time series or hyperspectral imagery from both side for crop type mapping, in particular between similar crop types? What is the transferability from one year to another for crop type classification models based on multispectral time series on one hand, and hyperspectral data on the other hand? In this project, 5 study sites, 4 from China and 1 from Belgium, are selected representing the major cropping systems, including winter wheat, maize, rice, sugarcane in China and winter cereals, potato, sprint cereals and maize in Europe. These sites also will be representing the agricultural systems in the flat area or in hilly area, irrigated or rainfed, in the North and the South. The field campaigns will be organized and the data collection will be following the JECAM guideline. The Sentinal1/2, EnMAP, from Europe and GF1/6, Obita and BNUE from China as well as other satellite data will be mainly investigated to support this study. The crop classification algorithm will be evaluated with various satellite data, like optical, SAR and hyperspectral data, either alone or combination to make best crop type maps, but in particular with a focus on hyperspectral data. Through this joint project and the heavy involvement of young scientists from Europe and China, the satellite data finely processing and information retrieval algorithm will be exchanged and the objective of this project will be fulfilled as the task team brings a step forward to support agricultural monitoring at fine scale. The collaboration will also make great technological contributions to GEO Global Agricultural Monitoring Imitative, GEOGLAM.

Keywords: Crop Growth; Agricultural Monitoring; Agricultural Management; Big Earth Observations; Dragon Programme