Land Surface Biophysical Variables and Crop Production Estimation from Remote Sensing Data

European PI(s)
Dr. Lieven BYDEKERKE, lieven.bydekerke@vito.be

Chinese PI(s)
Prof. WU Bingfang, wubf@irsa.ac.cn

On base of summarizing 30 years technical development of crop monitoring with remote sensing, Institute of Remote Sensing Applications, CAS has developed the China CropWatch System in 1998 and kept it into operation ever since. Now, CropWatch provides crop growth monitoring, crop production estimation, grain production estimation and cropping index and crop plantation structure survey service, its monitoring scope covers entire China and 46 major grain-growing countries of the world. The system served more than 20 government bodies and some business companies in China. The team has taken part in technique development of crop growth monitoring, crop acreage estimation, and crop yield prediction, and has organized the running of CropWatch since 2001.

Beijing Normal University, a key university under the guidance of the Ministry of Education, was confirmed as one of the nation's first 10 key universities and entered into the first 211 Project Construction Program and listed among the nation's 985 Project Construction programs. The eam has been conducting a Key Project of the State Program for High-Tech Research and Development (863 Program)--"Generation and Applications of Global Products of Essential Land Variables", which developed new inversion algorithm and production system for the following five land products: Leaf Area Index, Albedo, Emissivity, Downwelling Shortwave Radiation and Photosynthetically Active Radiation. The team has more experience in estimation of land surface variables from satellite remote sensing data.

VITO has engaged in agriculture research for many years. Now, The Agriculture Research group uses corrected images and data sets from the Global Vegetation Research activities to focus on the following research objectives: R&D towards improved agricultural services. Research into, and development of improved methods, applications and services for monitoring agricultural production at the regional and local level in near-real-time, with a focus on crop monitoring, crop area estimation and yield forecasting. Demonstrate the supply of new and improved state-of-the-art agricultural information services based on remote sensing data to selected key-end-users.

Team expertise from Meteo France relies mostly on the BRDF knowledge from which surface albedo determination and other biophysical parameters retrieval will follow in a consistent manner. We consider the widespread approach based on the use of kernel-driven BRDF models(Roujean et al. for MSG and Li-Sparse/Ross-HotSpot for MODIS) to mimic reflectance values observed. The method was shown efficient to yield a global mapping of LAI, clumping index, FVCand fPAR (Roujean and Lacaze, 2000). In particular, method for FVC and fPAR (Roujeanet al., 1995) are now implemented operationally in the frame of the MSG/SEVIRI programme. Scientific experience of the team was built though participation in international field campaigns (HAPEX-Sahel en 1992, BOREAS en 1994). The team gained expertise in acquisition and analysis of PAR reflectance and LAI measurements, also in modelling the mechanisms of radiative transfer within vegetation canopies. The team was involved in various European programmes (CYCLOPES, GEOLAND) and is a key entity of the on-going Land SAF project (landsaf.meteo.pt).

陆表生理参量与作物产量遥感估算研究

欧方项目负责人：Lieven BYDEKERKE，lieven.bydekerke@vito.be；

中方项目负责人：吴炳方，wubf@irsa.ac.cn；

中国科学院遥感应用研究所总结近30年的农情遥感监测技术于1998年开发了"全球农情遥感速报系统"(CropWatch)，并保持运行至今。目前，CropWatch对外提供作物长势监测、作物产量估算、粮食产量估算、复种指数监测以及作物种植结构调查等服务，监测范围覆盖了我国及全球其他46个粮食主产国。该系统服务于20多个中国政府部门及一些商业公司用户。研究团队自2001年起一直从事长势监测、种植面积估算与单产预测技术研究，并负责CropWatch系统的运行服务。

北京师范大学是教育部属重点大学，为国家首批重点建设的十所大学之一，首批列入"211工程"建设计划和"985工程"建设计划。研究团队目前正在承担国家863计划重点项目"全球陆表特征参量产品生成与应用研究"，发展了以下五种陆表参数产品的新反演算法与产品生产系统：叶面积指数（Leaf Area Index，LAI）、地表反照率（Albedo）、地表发射率（Emissivity）、下行短波辐射（Downwelling Shortwave Radiation）和光合有效辐射（Photosynthetically Active Radiation，PAR）等，在利用卫星遥感数据反演陆表参量方面具有丰富的研究经验。

弗拉芒技术研究院（VITO）在农业遥感监测研究领域具有较长的研究历史，其农业研究团队利用"全球植被研究行动（Global Vegetation Research Activities）"的校正影像与数据集，重点开展以下几个领域的研究：先进的农业服务技术研发；区域和局部范围内，在近实时的作物监测、种植面积估算与单产预测方面研究和发展农业产品监测的改进技术、应用和服务；基于遥感数据向终端用户提供最新最完善的农业信息服务。

法国气象局（Meteo France）研究团队主要集中在利用BRDF知识，采用统一的技术手段获取地表反射率和反演其他陆表生理参数。该团队利用广泛应用的核驱动BRDF模型(Roujean et al. for MSG and Li-Sparse/Ross-HotSpot for MODIS)来模拟观测到的反射率值，并被证明能够有效地进行全球尺度的叶面积指数（LAI）、聚集指数（Clumping index）、植被覆盖度（FVC）和光合有效辐射(fPAR)制图。并且，植被覆盖度与光合有效辐射的制图方法已经被MSG/SEVIRI计划采纳和业务化运行（Roujean et al., 1995）。研究团队通过参与各类国际观测计划(HAPEX-Sahel en 1992, BOREAS en 1994)具有丰富的科研经历，而且在光合有效辐射（PAR）和叶面积指数（LAI）的观测、分析，以及植被冠层内辐射传输机理建模方面具有丰富的经验累积。研究团队还参与了多个欧洲科研计划(CYCLOPES，GEOLAND)，并且是目前在研项目Land SAF（landsaf meteo.pt）的核心成员。