



ESA-MOST Dragon Cooperation

中国科技部-欧洲空间局合作“龙计划”

DRAGON 2 FINAL RESULTS AND DRAGON 3 KO SYMPOSIUM

“龙计划”二期总结研讨会暨三期启动会

Land surface biophysical variables and crop
production estimation from remote sensing data
(combination 10196 & 10605)

Prof. Wu Bingfang, Prof. Liang Shunlin
Prof. Lieven Bydekerke, Prof. Jean-Louis Roujean

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- 1 Project's partners and PIs

- Wu Bingfang, Pi of the project, Institute of Remote Sensing Applications, Chinese Academy of Sciences, China
- Liang Shunlin, Pi of the project, College Of Global Change and Earth System Science, Beijing Normal University
- Lieven Bydekerke, Pi of the project, VITO, Belgium
- Jean-Louis Roujean, Pi of the project, Meteo France / CNRS



- 1 Project's partners and member
 - Alfred Stein, ITC, Netherlands
 - Wang Limin, IARRP, Academy of Agricultural Sciences
 - Fan Jinlong, National Satellite Meteorological Centre, CMA
 - Li Qiangzi, IRSA, CAS, China
 - Meng Jihua, IRSA, CAS, China
 - Du Xin, IRSA, CAS, China
 - Jia Kun, BNU, China
 - Yuan Wenping, BNU, China
 - Liu Suhong, BNU, China
 - Zhang Yuzhen, BNU, China
 - Zhang Mingwei, National Satellite Meteorological Centre, CMA
 - Dong Qinghan, VITO
 - ...

- 2 Project's objectives and research content
 - The research objectives is the estimation of land surface biophysical variables and crop production.
 - Land surface biophysical variables estimation includes leaf area index (LAI), fractional vegetation cover (FVC), fraction of photosynthetically active radiation (fPAR) and Gross Primary Production (GPP) in northern China with satellite data.
 - Crop production estimation includes identification of different crop combinations without ground survey using multi-source satellite data, Crop acreage estimation integrating multi-resolution satellite data and Crop yield model using microwave data and crop growth models.
 - The project will provide basic data sets for further environment change study and support government for policy decision.

- 2 Project's objectives and research content
 - Contribution to the Dragon 3 call objectives.
 - The dragon 3 project has the objective of exploitation of products for research and development of applications for EO data analysis.
 - This proposal focus on land surface variables and crop production estimation from satellite remote sensing data that is consistent with the objective of dragon 3 project
 - Under the dragon 3 priority themes of "Climate & Earth system science" and "Land environment". Land surface variables and crop production are necessary for global change research and food security studies.

- 2 Project's objectives and research content
 - Research Content
 - (1) LAI estimation from satellite remote sensing data
 - (2) FVC estimation from satellite remote sensing data
 - (3) fPAR and NPP estimation from satellite remote sensing data
 - (4) High efficiency and accuracy crop identification methods development
 - (5) Crop acreage estimation
 - (6) Crop yield model by assimilating crop models and satellite data
 - There are 3 study area for biophysical variables estimation, and one area need about 30 Sentinel microwave data and 60 optical data.

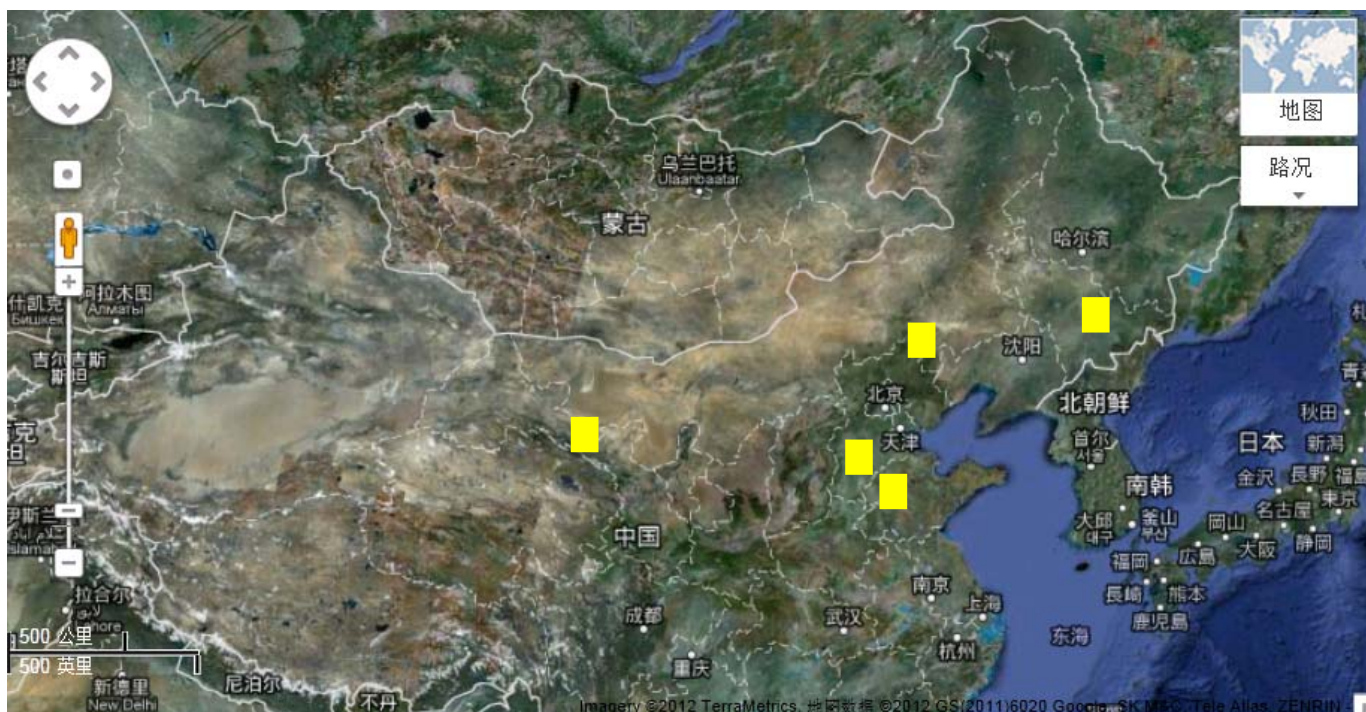
- 3 The ESA, Chinese and TPM data to be investigated
 - Original data plan is focused on ENVISat ASAR/MERIS, change of data source is needed due to satellite failure (historical data is still suitable for methodology research).
 - The sentinel 1 (already in service) and sentinel 2/3 (are planned to be launched in 2013)
 - 30 ERS-1/2 SAR data will be used for model development in the study area.
 - 272 HJ-1 CCD, 54 Beijing-1/2 MSI and 138 HJ-3 SAR images are needed respectively.

- 3 The ESA, Chinese and TPM data to be investigated
 - TerraSAR data, which is used for crop identification experiments based on multi-frequency SAR data; there are 3 study area in the project, for one of them TerraSAR image should be acquired during crop growing season in 2013-2017. Totally, 132 TerraSAR images are needed.
 - Cosmo-skymed data, which is used for crop identification experiments based on multi-frequency SAR data; there are 3 study area in the project, for one of them Cosmo-skymed images should be acquired during crop growing season in 2013-2017.

- 3 The ESA, Chinese and TPM data to be investigated

Satellite/Sensor	Sensor mode (eg IMS)	Number of archive scenes	Number of New acquisitions	Comment
ENVISAT/ASAR	AP	30		
ERS-1/2 / AMI	SAR	30		
ENVISAT/MERIS	RES	30		
Sentinel-1/SAR	Strip Map mode		10	
	Extra-wide Swath Mode		10	20*40m
Sentinel-2/optical			15	10/20/60m resolution, 2013
Sentinel-3/SLSTR			50	1km LST products
Sentinel-3/OLCI			30	300m
HJ-1-A	Hyper-spectrum	3	3	
HJ-1-A	multi-spectrum	70	202	
HJ-1-C	SAR		138	
CBERS	IRMSS	66	198	
Beijing-1/2	multi-spectrum	27	27	

- 4 Detail the in-situ data measurements and requirements
 - Site description-China
 - In China, 5 study area locates in Northern China.



- 4 Detail the in-situ data measurements and requirements
 - Site description-China
 - Three testing areas for the land surface biophysical variables estimation experiment are selected, one is in North China, the second is in Northeast China and the third is in Northwest China.
 - The latitude and longitude of the centre of these study area are
 - 41.5° N and 118.8° E
 - 42.5° N and 127.7° E
 - 38.9° N and 100.4° E.

- 4 Detail the in-situ data measurements and requirements
 - Site description-China
 - Two study areas especially for crop production estimation experiment are selected in the North China Plain
 - The latitude and longitude:
 - 36.90° N and 116.55° E
 - 37.72° N and 115.72° E
 - Maize, cotton, groundnut, soybean and vegetables are inter-planted, and the fields are divided into very small parcels and belonging to various farmers in large plain area.
 - Normally, maize and soybean are planted from May 20 to June 20, and cotton planted in the second 10-day of April. Groundnut is mainly planted in May. And vegetables are planted nearly every month for different varieties.

- 4 Detail the in-situ data measurements and requirements
 - Site description-Europe
 - An experimental area locates in the junction area between Belgium and France was selected for crop production estimation.



- 4 Detail the in-situ data measurements and requirements
 - Site description-Europe
 - The latitude and longitude of the centre of this study area is 49.75° N and 3.75° E.
 - Typical field size ranges from 1 to 30 ha.
 - The main crops in this region are winter wheat and winter barley, grown from October/November until the end of July and maize and sugar beets, sown in May and harvested in September/October.
 - The climatic zone is temperate. The soil texture is loam. The landscape topology is flatlands and hills. Soil drainage class is moderately well-drained. Irrigation infrastructure is not very common..

- 4 Detail the in-situ data measurements and requirements
 - In-situ data measurements
 - In these study areas, we will carry out field observation by the aid of professional workers.
 - Field observation will be conducted to serve the method development for land surface biophysical variables estimation, crop identification, crop acreage estimation and crop yield estimation.
 - LAI, fraction of coverage, fPAR, crop phenological stage, crop height, crop biomass, and yield will be observed. At the same time, we will survey crop plantation to draw crop distribution maps of every season.
 - Field measurement in China will be implemented in 2013-2014 crop/growing season

- 5 The project schedule and planning
 - 2012.6-2013.3 data collection
 - 2013.4-2015.3 field observation, data acquiring, data analysis, land surface variables estimation model developed, model validation and land surface variables mapping; optical and SAR data analysis and crop discrimination features identification according to different crop combinations, crop identification practices, and crop yield modelling; crop identification practices and crop acreage estimation, crop yield model calibration; Sentinel data analysis and methods improving; Lidar data analysis and methods improving.
 - 2015.4 the preliminary result reporting
 - 2015.5-2016.4 results publication and preparation for final report
 - 2016.5-2016.6 the final reporting.

- 6 Training of young scientists
 - Mr. Zhang Miao will graduate with a Ph. D by exploring one of the major research themes in the project.
 - Mr. Roel Van Hoolst graduated this year with a master degree in bio-engineering is exploiting the possibility of a PhD thesis in the domain.
 - Zhang Huanxue and You Xingzhi will get their master degree from Chinese Academy of Sciences by exploring researching themes of the project.

- 6 Training of young scientists
 - Academic exchange
 - 1-2 stuff/students from IRSA to VITO (1-3 months)
 - 1-2 stuff/students from VITO to IRSA (1-2 months)
 - 2-3 stuff/students from BNU to Meteo France (2-3 weeks)
 - 1-2 stuff/students from Meteo France to BNU (1-2 weeks)

• 7 Expected results-I

- Estimation of land surface biophysical variables:
 - LAI, FVC, fPAR and GPP estimation models and validation report.
 - LAI, FVC and fPAR maps in northern China.
 - GPP estimation in northern China.
- Estimation of crop production:
 - Independent crop identification and crop acreage estimation method, the accuracy is no less than 90%.
 - Crop yield models assimilated microwave radar and crop models.
 - Six conference or journal papers about crop identification and yield estimation using Sino-European satellite data.
- The preliminary and final reports on this research.

• 7 Expected results-II

– Joint Research Publications:

- 2 papers from joint research between IRSA and VITO
 - On crop acreage estimation
 - On crop yield estimation
- 2 papers from joint research between BNU and Meteo France
 - On vegetation LAI estimation
 - On vegetation FPAR/NPP estimation

– Joint research application:

- JSTP
- GOESS/GEOGLAM

Thank you!

谢谢!