Time Series of Multisource Hydrological Data Products: merging ESA and China Level 1 Data

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The Global Earth Observation System of Systems (GEOSS) is being translated into practices and infrastructure (GEO Work Plan 2012 2015) and the concept of virtual constellation is being articulated in technical terms. The observation systems currently in space and expected to be launched in the next few years add up to a very rich source of measurements characterized by families of broadly similar satellite sensor systems. This is particularly true for multi-spectral imaging radiometers currently operated by several Countries. Optical observations of the land surface are seriously hindered by clouds, but this constraint may be alleviated by merging spectro-radiometric data collected by multiple satellite sensor systems.

We have developed a procedure to merge diverse spectro-radiometric data into a single database, conceived to create pseudo-images and then retrieve land surface data products with generic algorithms, i.e. independent of the spectral configuration and spatial sampling of a specific sensor system. This work is being completed as part of the FP7 CEOP-AEGIS project (see below for further details).

A suite of data sets has been generated under the CEOP AEGIS project and used as either forcing or validation of a large hydrological modelling system implemented and applied to describe the water balance and river flow in an area of 2.4 106 km2 including the Qinghai Tibet Plateau in China and the upper catchments of the major rivers of Eastern and Southern Asia, all receiving water from the Plateau.

The overall objective of our Dragon-3 investigation is to generate hydrological data products by merging broadly similar radiometric data collected by satellite systems operated by ESA and the China National Space Administration. The specific sensors we intend to combine are detailed in the proposal. This effort will broaden the scope of work done so far both in terms of geographical and temporal coverage and of the performance of our generic algorithms.

To support monitoring of the terrestrial water cycle, a suite of land surface biophysical variables, such as Land Surface Temperature, Leaf Area Index, Fractional Vegetation Cover, Fraction of Absorbed Photosynthetic Radiation, Albedo, Evapotranspiration, Soil Moisture, Snow Cover, Snow Water Equivalent and so on, must be generated using largely automated procedures with multi-source remotely sensed data.

Our project plans to design and develop a software system, named Multi-Source Remote Sensing Production System (MSRSPS), to realize the functions for batch production of land surface variables. The system is composed of three sub-systems including multi-source remote sensing data pre-processing sub-system (M-RSPPS), land surface variables batch production sub-system (LSV-BPS), and data and task management sub-system (D&T-MSS). With the support of MSRSPS, we will provide the research team with land surface variables products for the period 2011 2014 in the designated research area. The products are further validated using the integrated satellite-airborne-ground experiments and the wireless sensor network observations considering the multi-scale spatio-temporal heterogeneity.

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融合欧空局和中国卫星遥感数据生产用于水文研究的多源遥感时间序列产品

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当前，全球综合地球观测系统（GEOSS）已通过写入国际地球观测组织（GEO）的2012至2015工作计划而进入实施阶段，并且虚拟星座的概念也越来越多出现在各种技术术语中。目前在轨运行以及未来几年计划发射的具有相似设置的传感器可以提供丰富的对地观测数据，特别是目前多个国家在轨运行的多光谱成像系统。云严重阻碍了光学传感器对陆表的观测，通过融合多源遥感系统所获取的多光谱数据，可以减小云的这种影响。

我们FP7 CEOP-AEGIS项目的支持下发展了一种方法：通过把多种传感器获取的光谱数据融合进一个数据库，形成 "伪图像（pseudo-image）"，然后采用通用的算法进行陆表参数的反演，该方法具有独立于传感器的光谱设置及空间采样方式的特点。在CEOP AEGIS项目中，我们已经生产了一系列用于驱动或验证一个大型水文模拟系统的数据集。该水文模型可用于模拟包含中国的青藏高原及以其为源头的亚洲东部及南部的主要河流区域共24106平方公里区域的水文平衡和河流流量。

在"龙计划"三期的框架下，我们这个项目的总体目标是通过融合欧空局和中国现有传感器所获取的多源相似遥感数据进行水文研究所需产品的生产。用于生成融合产品的传感器描述详见项目建议书。这项研究将在目前已有成果的基础上，拓展我们通用算法的时空实用性和性能。

陆地水循环模拟所需的一系列遥感参数，如陆表温度、叶面积指数、植被覆盖度、光学有效吸收辐射、反照率、蒸散发、土壤湿度、雪覆盖度、雪水当量等，需要基于多源遥感数据进行自动化生产。我们这个项目将设计和发展一个名为"多源遥感产品系统(MSRSPS)"的软件系统来实现陆表参数的批量生产。这个系统由三个模块组成，分别为多源遥感数据预处理模块(M-RSPPS)，地表参数批处理模块(LSV-BPS)、以及数据和任务管理模块(D&T-MSS)。

采用多源遥感产品系统(MSRSPS)，我们计划在本研究团队内部提供2011年至2014年研究区域的陆表参数产品。产品验证将通过考虑地表多尺度时空异质性而设计的星机地综合实验，及无线传感器网络所获取的数据来进行。

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