

# **Synergy of Satellite Imagery and Altimetry for Inland Water Bodies And Wetland Monitoring. Applications to the Analysis of Water Resource Dynamic in Terms of Risk Management, Water Quality, Biodiversity Dynamic Trends and Public Health**

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As a successor of the very fruitful flood Dragon 1-2, facing challenges such as, water resources, environmental preservation, and public health, a new project is set up. Having water monitoring as the corner stone, its goals are: 1- large and small water bodies monitoring, in terms of water extent height, quality, 3- wetland ecosystem understanding, 4- epidemiology, 5- regional interaction and global context. Project presents an extent in term of partnership integrating new members from Europe and China , in terms of geography. it will be focus on the middle and lower Yangtze reaches, as, few hundred millions of inhabitants downstream of 3 gorges dam, depend directly on the services that wetlands provide: regulating services such as flood storage; provisioning services such as fishing. From the largest Poyang and Dongting, it will extent to smaller lakes, downstream in Anhui province but also upstream as Napahai in the 3 valleys region and Rouergai in Qinghai plateau. Seven interconnected WPs can be distinguished: WP1: Water extent monitoring: 1- insure the continuity of the monitoring ongoing since 2000 over Poyang and Dongting lakes, with temporal frequency of ten days based EO multi-mission resource; 2- develop the similar approach for smaller water bodies, exploiting archives and recently launched or new imagery .

WP2: Water height monitoring from space. Insure the continuity of the monitoring of the two largest lakes; Integrate more virtual gauge stations all over the Yangtze course and associated lakes, compared and validated thanks to situ gauge measurements. Particular attention will be paid on new missions, HY2, Altika, Sentinel3.

WP3: Soil erosion and water quality monitoring: Exploiting MERIS, SPOT and Beijing 1 time series, based on inversion models, the water quality of lakes and in the estuary of the Yangtze River will be done. Analysis of the relationship between soil erosion and land use land cover change (LUCC) will be investigated .

WP4: Disaster mapping. NRT actions, core of the former Dragon projects, will allow mapping disaster extent and impact focussed on flood events, landslides associated with monsoon rain and pollution (alga bloom, slick).

WP5: Wetland mapping and biodiversity values analysis will be focused on the interaction between vegetation resources, water cycle analysis and human interactions. High resolution and superspectral imagery will be exploited for mapping the vegetation phenology and quality (in terms of feeding resources for birds). Antropic elements, (dikes, tree planting, fishes farm / traps), will be derived from HR and VHR imagery. Final aim is to model, map and explain the distribution of biodiversity and their associated habitats, explaining spatio-temporal changes in biodiversity caused by biotic and abiotic factors.

WP6: Epidemiology: Yangtze reaches are under the threat of epidemics, associated with the water cycle, Schistosomiasis Japonicum, Avian Influenza, or to more generic environmental parameters, echinococcosis /leichmaniasis. Based on Bayesian approaches, EO derived information can provide elements to understand the spatial relationships among the natural environmental parameters.

WP7 Regional and global interactions. It consists in a better understanding of the monsoon lakes behaviours in a regional and global change context, enhancing potential drought tendency, involving rainfall component multiscale analysis taking in account the influence of management of the 3GD. Within this WP7, the cooperation with others DRAGON3 projects on water resource analysis will be tasked.

All along these WP, an important part is dedicated to the exploitation of multi-mission data, with the processing of SAR and optical imagery obtained by European sensors (ENVISAT, CSK,) TPM, and Chinese missions (Beijing 1, HJ-1AB). Sentinels constellation will be the key data of this project , access to the emergency strip map mode of Sentinel 1 will be requested.

## 基于卫星影像和测高数据的内陆水体和湿地的水质、生物多样性变化趋势和公共卫生的动态监测研究

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在龙计划1期和2期成功实施的基础上，新项目主要针对人面临的水资源、环境保护、公共安全等问题。其研究对象包括：1、水体监测；2、水面高程及水质监测；3、湿地生态系统；4、流行病；5、区域相互作用与全球变化影响。项目组又吸收了一些来自欧方和中方的合作伙伴。研究区主要集中在长江中下游地区，该地区有几亿居民生活在三峡大坝下游。研究对象不仅包括下游的鄱阳湖、洞庭湖这样大的湖泊，也包括位于上游青藏高原的纳帕海和若尔盖等湖泊湿地。项目由七个相互关联的部分(WP)组成：

WP1：水体监测。一方面继续对鄱阳湖、洞庭湖自2000年一直开展的水体变化监测，另一方面进一步采用类似方法对小一些的湖泊水体进行监测；

WP2:卫星测高。项目将继续采用卫星数据和地面测站数据相结合对鄱阳湖、洞庭湖水面高程进行测量，并重点尝试一些新的卫星数据，如HY2、Altika和Sentinel3。

WP3：土壤侵蚀和水质监测。项目将利用MERIS、SPOT和北京1号时间序列数据，基于反演模型，监测湖泊水质和长江河口的水质，同时也将分析水土流失与土地使用/土地覆被(LUCC)变化间的关系。

WP4：灾害制图。近实时灾害监测是上一期龙计划的核心内容，本期项目将继续关注洪水、滑坡以及突发水污染灾害的监测。

WP5：湿地与生物多样性监测。项目将利用高分辨率遥感影像重点分析植被、水循环与人类活动的相互作用，其目标是建立模型、专题制图以及分析引起生物多样性的时空变化的生物因素和非生物因素。

WP6:流行病调查。长江流域部分地区受到一些与水循环相关的流行病威胁，如血吸虫、禽流感，甚至包虫病、利什曼病等。利用对地观测技术获取的信息，基于贝叶斯方法，可以分析流行病空间分布与自然环境参数之间的关系。

WP7：区域相互作用与全球变化影响。在区域与全球变化影响下，季风性湖泊发生干旱的趋势在增加。项目将通过多尺度降雨分析研究三峡工程运行后的影响。该部分将与龙计划三期水资源分析项目开展合作。

项目7个部分都将充分利用SAR和光学影像，包括欧方的卫星数据(ENVISAT, CSK, TPM)，和中方的卫星数据(北京1号, HJ-1A/B)。