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Twelve years of monitoring from space the largest Chinese lakes: gained experience in term of water resource, biodiversity and public health and recommendations in term of EO data resource access.

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Within the framework of the DRAGON program, a relative long term surveillance, 12 years, of the Poyang and Dongting lakes, considered as key elements of the Yangtze watershed in terms of water resource, flood redaction and for biodiversity maintain has been realized. This was done combing altimetry, in situ measurements, SAR and optical time series with a high revisiting frequency of 10 days. One of the major results, is the characterization of the important inter annual, and intra annual variations in term of water height and water extent of both lakes, variations that are linked with rainfall variations at sub basins and Yangtze basin scales. This 12 years period is marked by general non linear tendencies of water resources decreasing even if two major flood events occurred in 2002 and 2010. Drought tendency and drought intensity has been precised. During winter 2011-2012, EO data analysis allowed given the real size of the water surface extent as 720 km2 when Medias were speaking about 200 km2; the driest winter for the latest decade being the 2003-2004 as shown by the time series comparison. These analysis also highlight the very fast change from extreme stage to another as in June 2010 as when the transition from drought to an extreme flood stages occurred in less than 3 weeks. In addition to the water height/surface monitoring, for water resource analysis, same data set were exploited for modeling constraints (ie Donting lake modeling, with CSK, HJ1A/B and ENVSIAT ASAR) and also for water quality motoring (HJ1A/B, Deimos), for the mapping of vegetation units groups (SPOT, Beijing1, ALOS) and vegetation growth have been carried. Downstream exploitations of these keys elements characterizing inland ecosystem will be presented, epidemiology (Schistosiomaisis over Poyang and Dongting lakes based on intermediate host ecosystem monitoring) and biodiversity (Human practices and birds location ...). One other major output corresponds, particularly within the context of lost of Envisat and Sentinels' data availability expected in 2014, to the analysis of a large range of MR and HR optical and SAR data for water bodies monitoring in term of quality, potential and accuracy. Over the years, changes in the type of data used are very indicative of a share of the resource available, and also of technological improvement over the years. It can be noticed since 2008, that, part of HR optical data, Beijing1, DEIMOS, HJ1 A-B has increased significantly. These HR data exploited initially in order to validate the derived results from MR data, in fact allowed insuring the monitoring itself. In regards to the two years gap in term of data resource, some recommendations can be given to insure the monitoring of large water bodies. It is appearing that, for the optical range, HJ1A/B CCD as well as Deimos data could be very valuable EO resource, their swath allowing both a regular revisit and total coverage of these large ecosystems. For the SAR data, it is large swath mode of commercial systems, CSK, TerraSAR X, Radarsat-2 that would be the more convenient, in term of revisit versus coverage. Finally, the obtain results allow to have a good idea of the ways of exploiting the future Sentinels that will be a powerful tool for mapping and monitoring rich complex and sensitive large ecosystems such as the monsoon lakes in China and Asia, but also at a global scale, all large coastal or inland delta all around the world.

Dragon project id

基于12年时间序列地球观测数据监测中国两大淡水湖的水资源、生物多样性和公共健康问题

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在龙计划框架下，将鄱阳湖和洞庭湖作为长江流域的关键研究区域，采用12年的时间序列遥感监测数据，监测水资源、洪涝减灾与生物多样性维护。该研究集成应用重复周期为10天的卫星测高数据、现场同步实测数据、SAR与光学数据。所得到的一个重要结果是，两大湖泊的水位和水体范围均具有大幅度的年内变化和年际变化特征，其变化与湖泊流域以及与之连通的长江流域降水量变化相关。在12年的时间序列上，虽然在2002年和2010年出现了两次大的洪水事件，水量在整个时间序列上仍然表现出递减的非线性趋势，准确反映了干旱趋势和程度的加强。2011-2012年冬季，媒体报道水面面积为200km2时，根据地球观测数据分析获取的实际水面面积为720km2。通过时间序列比较分析发现，最近10年最旱冬季出现在2003 - 2004年。这些分析也给出了2010年6月发生在3周之内由干旱到高洪水位的快速变化。除了水面高度监测，对于水资源分析，相同数据集用于模拟的局限（即：洞庭湖模拟采用CSK、HJ1A/B、ENVISAT ASAR）和水质监测（HJ1A/B、Deimos），植被制图（SPOT、Beijing1、ALOS）以及植被长势监测。这些关键区域下游以陆地生态系统为特征的开发，流行病（鄱阳湖和洞庭湖的血吸虫以生态系统间接监测）和生物多样性（人为活动和候鸟定位。。。）。研究得到的另外一个重要结果是，由于Envisat失效而Sentinels数据2014年才能获取，分析大量MR和HR光学数据与SAR数据用于水体监测的质量、潜力和精度。多年来所采用的可获取的共享数据的类型变化预示着技术在不断进步。值得注意的是，2008年以来，HR光学数据、Beijing1、DEIMOS、HJ1A-B数据已经大量增加。这些HR数据最初发展用于校验MR数据提取结果，实际上用于保障监测本身的正确性。考虑到数据资源两年的缺口，提出一些建议用于保证大面积水体的监测。显然，光学数据HJ1A/B、Deimos可能是非常有价值的地球观测资源，其观测幅宽有利于定常得到这些大型生态系统周期性重复观测和全覆盖的遥感数据。对于SAR数据，考虑其重复观测周期与覆盖范围，商业系统CSK、TerraSAR X、Radarsat 2具有大幅宽模式，更为方便。结果表明，地球观测技术作为高效的制图和监测工具，可用于中国和其他亚洲国家季风区湖泊的复杂而敏感的大型生态系统乃至全球尺度、世界所有大型海岸带或三角洲。