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Eleven years, 2000-2010, of monitoring of water resource over the Yangtze middle reaches exploiting ENVISAT, MODIS, Beijing 1 time series conjointly with altimetric data and field measurements

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Dongting and Poyang Lakes can be considered as key elements for flood natural control and reduction as well as major water resources within the Yangtze middle basin. As part of the Wetland Flood DRAGON Project, Poyang and Dongting lakes water extent was monitored with a revisiting period of about ten days over a 11 years period, 2000-2010. For Poyang Lake, ENVISAT ASAR and MERIS data that have been mostly exploited from 2003 to 2010, completed from 2000-2003 by MODIS time series. For the Dongting Lake it is MODIS decade synthesis products that have been exploited. In addition, a large set of 25 Beijing 1 data was exploited, plus seven Landsat data, for validation purposes. During the same data span, water level has been measured using Topex, and/or ENVISAT RA2 and also Jason 2 for Dongting Lake. In parallel, to derive regional meteorological indicators, GPCP and TRMM, times series were exploited for the derivation of monthly average rainfall, residues analysis and global precipitations trends.

At lake's scale, the obtained results allowed the characterization of lakes behaviors and identification of lakes sub divisions behaviors. Even if Dongting and Poyang lakes' mechanism are substantially different, theirs water extent and water level variations show very good concordance. For example 2002 corresponds to the largest flood extents for the analyzed period whereas 2001 year to the lowest extent of inundated waters. The two lakes present a global decrease of the amplitude tendency of minimum and maximum water surfaces and level. Also, both present astonishing low levels and low surfaces of water in summer 2006 associated with a very early draw off. Few reasons could be advanced to explain this event such as 1) deficit of rain fall at sub watershed level, 2) event in the upper stream part, a possible closing of the Three Gorges Dam gates in 2003, in order to infill the reservoir, 3) a more global climate change effect at regional scale. For the 2006 astonishing drop down of on Dongting and Poyang lakes, carried investigation shown that the reasons are neither a local rain deficit, or a change in Three Gorge Dam Management (for which gate were well close in 2006 but very late in fall 2006). The observed smallest water's surface and level for a wet season appeared to be linked with a relatively severe drought within the Upper Stream part of the Yangtze basin. The origin of the drought may be now analyzed in a more global meteorological context, in term of Nino/Nina. In addition at regional scale, over the near ten years of monitoring larger scale, an impressive decreasing tendency of water surfaces and water level is observed in the middle reaches of the Yangtze River linked with a relative constant decreasing of the precipitations over the last decade. This synergistic exploitation of data derived from Earth observation systems and in situ data will provide very valuable information for the water resource management at the scale of the middle Yangtze watershed.