Assessment of CHRIS PROBA data for land cover derivation and flood mapping. Application over the Dongting - Poyang lake sectors and to the Songhuajiang River (China)

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Abstract

The goals of the Chris Proba Flood Dragon project are to assess the potential of HR multispectral Chris Proba imagery for wetland and flood mapping in conjunction with MERIS and ASAR data from ENVISAT. Chris Proba data would be used as reference data in order to derive information on land use/land cover. In addition a number of Chris Proba images would be acquired during a flood event and used to validate the information derived from ASAR and medium resolution optical data. Test sites are located within the major wetland areas of China and correspond to flood prone sensitive ecosystems.

1 - General context

Within the framework of the flood Dragon project nr 2551, "Assessment of the synergistic exploitation of ENVISAT ASAR and MERIS data for Plain Flood Rapid Mapping and for Flood Support Risk Management", accepted as part of the ESA Dragon Programme [1], a specific Chris Proba data request have been made.

The goals of the Flood Dragon project are to enhance the ENVISAT objectives of monitoring natural disasters such as floods. ENVISAT ASAR and MERIS's spatial and temporal resolution potential in flood mapping will be explored: ASAR spatial resolutions ranging from Precision to Global modes will be assessed in order to maximize the revisit and coverage, as well as evaluating polarization modes for thematic accuracy. One of the major ultimate goals is to give the guidelines/recommendations for a Near Real Time exploitation of SAR data in flood monitoring. Another aspect of the proposal deals with the exploitation of ENVISAT data as an input to monitoring tools at this at a catchment's scale. This is necessary to improve flood prediction and water resources management.

2 - Test sites

In the framework of the Flood DRAGON project, two major test sites, known as high-risk areas, have been selected in China. The first, the Dongting-Poyang lakes sector, covering 300*600 km^2 and located in Central China, is an important part of the Yangtze watershed.
The Dragon Project's second test site, part of the Songhua Jiang flood zone, a 200*450 Km^2 area located in the Heilongjiang province (NE China, eg. Manchuria) consists of a very flat zone where huge marshlands, internationally renowned for their biodiversity interest, coexist with a wide agricultural plain. Furthmore, this is a very sensitive area from an economic point of view, such as the Daqing oilfield or the city of Harbin.

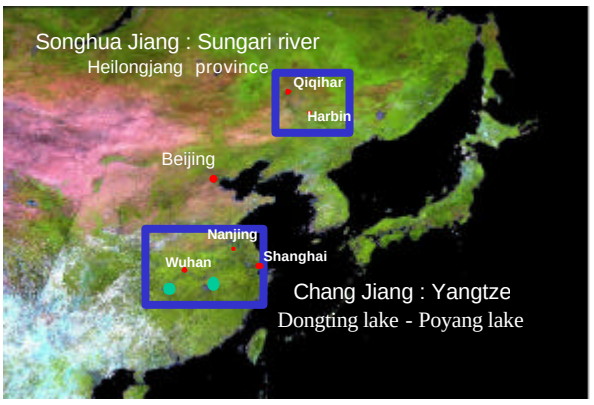

Fig. 1. Flood Dragon test sites: Songhua Jiang and Poyang-Dongting Lakes

Over these test sites, reference data such as ERS, Landsat SPOT data are already collected and integrated

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into database. Three areas, within these large Flood Dragon Chinese test sites, and sensitive in terms of both economic-human impact and their ecosystems, have been selected. Each Chris Proba test site size is equivalent to a mosaic of 4 Chris Proba scenes, 26*26km^2.

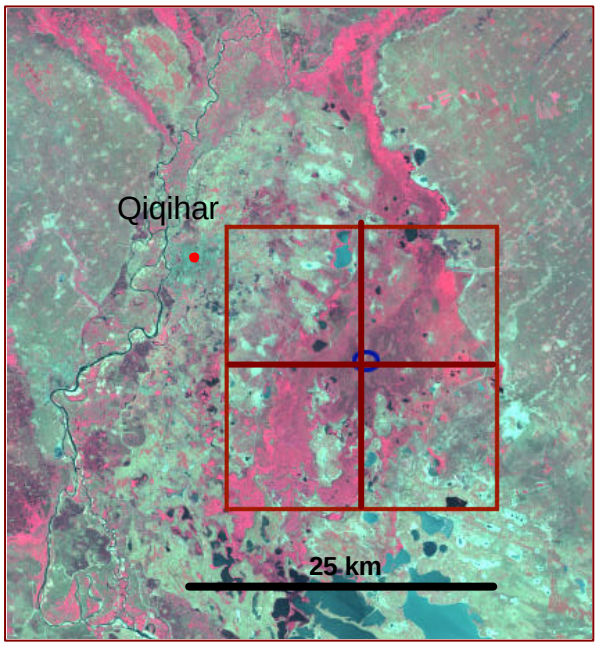

Fig. 2. Location of Chris Proba mosaic over the Zhalong Natural reserve, 124.35E, 47.14N

Firstly, the **ZHALONG** national nature reserve, near Qiqihar in the Heilongjiang Province. The ZHALONG at 210,000ha is the biggest wetland nature reserve in China. This internationally renowned RAMSAR nature reserve is a very sensitive ecosystem, prone to flooding, drought and fire.

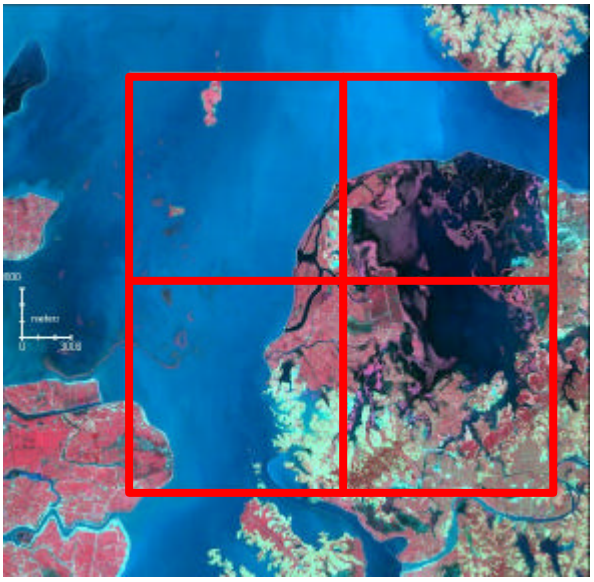

Fig. 3. Location of the Chris Proba mosaic over the Kangshan test site, 116.5E, 28.85N, Poyang lake

The second Chris Proba test site is in the **KANGSHAN** area, Jiangxi Province, a flooded area near Poyang Lake the biggest freshwater lake in China, covering 391,400ha. Kangshan area is an important wetland reserve zone and also a key area for flood control, acting as storage area. The last Flood Dragon test site is in the **XIHU** area, Hunan Province, near the Dongting Lake; one of the biggest freshwater lakes in China covering 274,000 ha. The Xihu area is an important wetland reserve zone, a rare transient birds habitat, and plays an important role in floodwater storage and control, ecosystem balance and socio-economically.

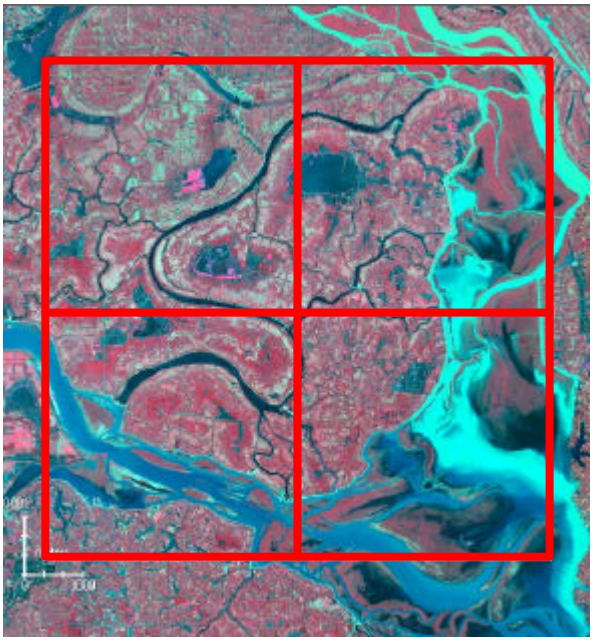

Fig. 4. Location of the Chris Proba mosaic over the Xihu test site, Wuhan province, 112.13E, 29N

3 - Chris Proba data acquisition plan

CHRIS Proba data would be used as reference data and to derive information on land cover. Over each test site the acquisition of a 4-image mosaic will be required. One site will be covered each year, the Zhalong in 2004, the Kangshan in 2005 and Xihu in 2006. The format of the required data is full spatial resolution, the 18 wavelengths with Land configuration and a near nadir acquisition angle.

Moreover, whenever a major event will occur over the next three years affecting the test sites, a fast programming would be carried out in order to get the Chris Proba data as crisis data.

The High resolution Land configuration is requested, as the goals are to derive land cover information as well as to extract water bodies. During this project it will not be possible to explore BRDF capabilities in land use recognition and extraction nor the suspended component in floodwaters.

4 - Chris Proba data exploitation plan

Within the framework of the Flood Dragon project Chris Proba data will have been use in order to:

- Generate a land cover map
- Generate reference background imagery for crisis products (i.e. it is difficult to access topographic maps or aerial photographs in China, so HR data are a good substitute)
- Use as reference to be compared with crisis data in order to differentiate between flooded areas and permanent water bodies. In these wet landscapes, using only a crisis image it can be very difficult to distinguish these types of water. So a reference is needed and it is easier to use the same type of data as both reference and crisis data.

The second point concerns the access to crisis data; i.e. the flooding period usually lasts from May to September. For us the Chris Proba data exploitation goals are the following:

- Use Chris Proba data to calibrate/validate the MERIS results
- Use Chris Proba as a "HR crisis reference data" in order to calibrate the results obtained from the multi-resolution SAR data
- Carry out an assessment of the Chris Proba data for flood mapping in a R&D context. Presently, only a few Chris Proba data exploitation tests have been performed, and this always in a rush during International Charter “Space and Major Disasters” actions [2, 3].

5 - Conclusion

This Chris Proba project will provide information on the use of multi-spectral high-resolution data for flood mapping as well as calibrating results obtained from similar sensors of lower resolution and ASAR data.

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