Research & implement the GIS database of 'water level' for the annual flooding area in Mekong delta - BL/00/05

Project partners:

- SPACEBEL
- DITAGIS

(Geographic) study area: South Vietnam (Mekong Delta)

Project period: 04/2004 - 03/2006

Data used (if satellite data, specify): - water level measurements from gauge stations
- satellite data such as ENVISAT ASAR WS, Landsat7 ETM & SPOT5

Context and objectives

Flooding of the Mekong River and its tributaries are recurrent events and cause each year in varying degrees damage to agricultural production, rural infrastructure and human settlements, which can reach disastrous proportions with serious losses in food production and human lives. The floods occur the monsoon period from August till November. They are caused by the heavy tropical storms and typhoons.

The project aims at promoting the investigation and design of a flooding management system combining an Earth Observation-based layer and a GIS database of the water level for the annual flooding area in Mekong delta, with as finalization developing operational services to the user community.

The objectives are:
- To propose an integrated system allowing the integration of existing water level measurements data, remote sensing and ancillary flooding information in order to provide quick support to the decision makers in Mekong Delta.
- To demonstrate the feasibility of an accurate and quick evaluation system (flooded area) during the flood event.

Methodology

- This algorithm is based on a flood seed image produced by threshold on SAR images analysis. Flood seed is used to characterize statistically and locally the flood area appearance in SAR image. The statistics are used in conjunction with flood seed to detect automatically the flood extend, on a pixel-scale basis. This technique is not applied directly on SAR image, but rather well on difference between a SAR image of reference, and a flood-situation SAR image.
- We assessed the capability of very high spatial resolution images from remote sensing origin to detect and help update the features database over the area of interest (Mekong Delta). Features to be detected were water bodies, such as channels and rivers. An attempt at detecting the dams was done as well.
- Comparison between the results obtained from the remote sensing images analysis and treatments are compared with the existing data. Mismatches and discrepancies are analyzed to deduce their origin. The methodology should be tested on higher spatial and spectral resolution imagery, such as Ikonos-II and Quickbird satellites.

Results

- An automatic flood extraction (geographical extension) method & algorithm has been produced.
- A method to extract semi-automatically features such as water and channels as well as dams from high resolution remote sensing imagery has been done.
- The comparison between the new dataset and existing datasets tends to invalidate the already existing datasets, mainly because of outdated data and georeferencing lack of precision during the mapping itself.
- Comparisons with flood patterns tend to indicate the pattern of channels RS detected is the one sufficient to explain the flood extend.
- Future work on higher resolution images would reinforce the strong point of the technique, as well as it would validate the first results obtained.

Products and services

As such, the results point towards a new way of mapping the Mekong Delta channels and dam network and toward the high potential of spatial imagery to be used in hydrological models (calibration, validation).

Pictures illustrating the project:

FLOOD EXTENSION in Nov. 2003
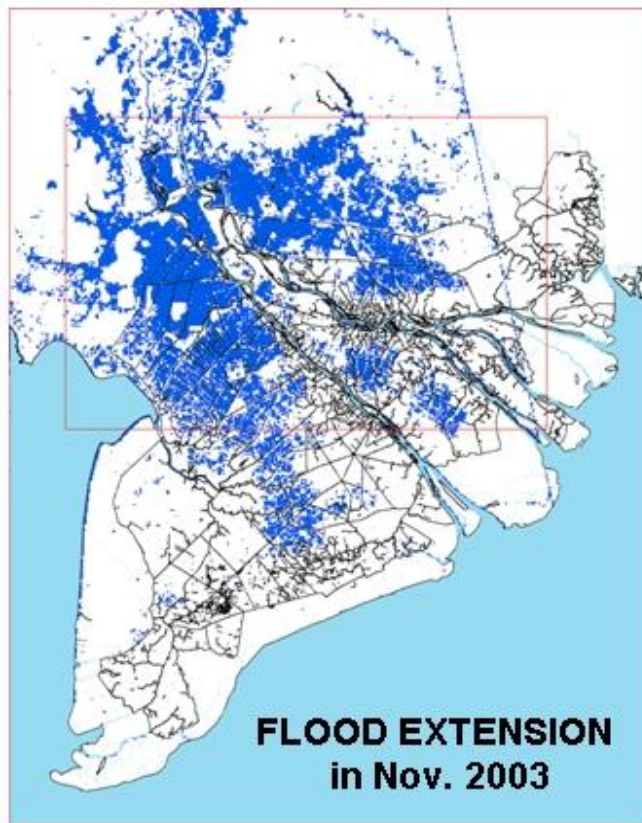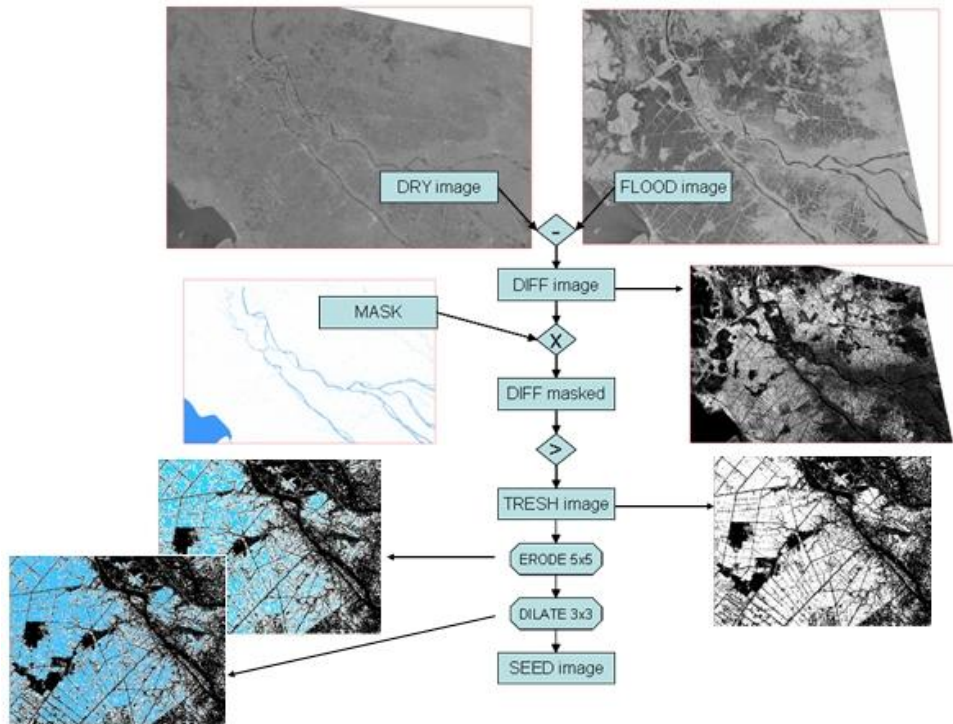
Discipline

Environment/nature conservation
Hydrology & freshwater resources
Natural hazards & disasters

Publications

G. Vandenschrick and F. Lupo, 2006; a (semi) automatic hydrological features extraction from SPOT5 images in the Mekong Delta – to be submitted (?)

F. Lupo & G. Vandenschrick, automatic flood mapping using EOLES technology. Proceeding of the 19th International Conference Informatics for Environmental Protection – EnviroInfo Brno 2005 – Networking Environmental information, ed. J. Hrebicek & J. Racek, Sept. 7-9 Masaryk Universtiy in Brno, Czech Republic.