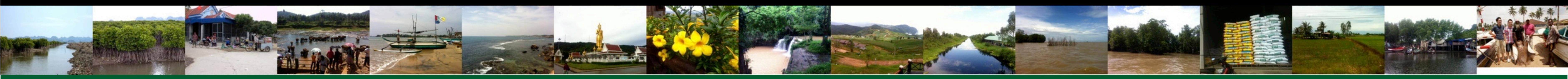

FLOOD EVENT DETECTION BY AMSR-E AND PALSAR ON GLOBAL SCALE

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ABSTRACT: In this paper, we investigated the potential of AMSR-E for flood detection. The daily land surface water coverage (LSWC) database, which was derived from AMSR-E in time series from 2002 to 2011, was built and by analysing LSWC database the anomaly was extracted which showed a good identity with the actual flood events. Finally, PALSAR data (ScanSAR mode) was used to validate several flood events, it is indicated that the availability and importance of LSWC database for flooding detection, moreover, by using PALSAR data (Fine mode) to map water coverage, showed its superiority in the accurate flood evaluation based on a known flood event.

Introduction

Due to the global warming combined with excessive human activities, the flood have been one of the most catastrophic hazard among various natural disasters. It was not only a threat to human life, but also related losses in infrastructure and economy. Therefore, it's necessary to grasp the accurate information and right extent of the flood for the strategy of government and BCP of enterprises. AMSR-E presents a potential for flood monitoring because of the ability of the microwave signal to penetrate through cloud and provide an all-day data and its sensitivity to surface water (Temimi M, et al., 2007). It can fast reveal large-scale flood patterns (Zheng W et al., 2008). PALSAR, which is also an active microwave sensor, has 3 observation modes providing higher range resolution and is suitable to flexibly correspond to wide-ranging natural disasters like flooding.

The objective of this paper is to detect flood event on global scale by analysing LSWC database from 2002 to 2011 derived from AMSR-E and to preliminary investigate the superiority of PALSAR in flood evaluation.

Methodology

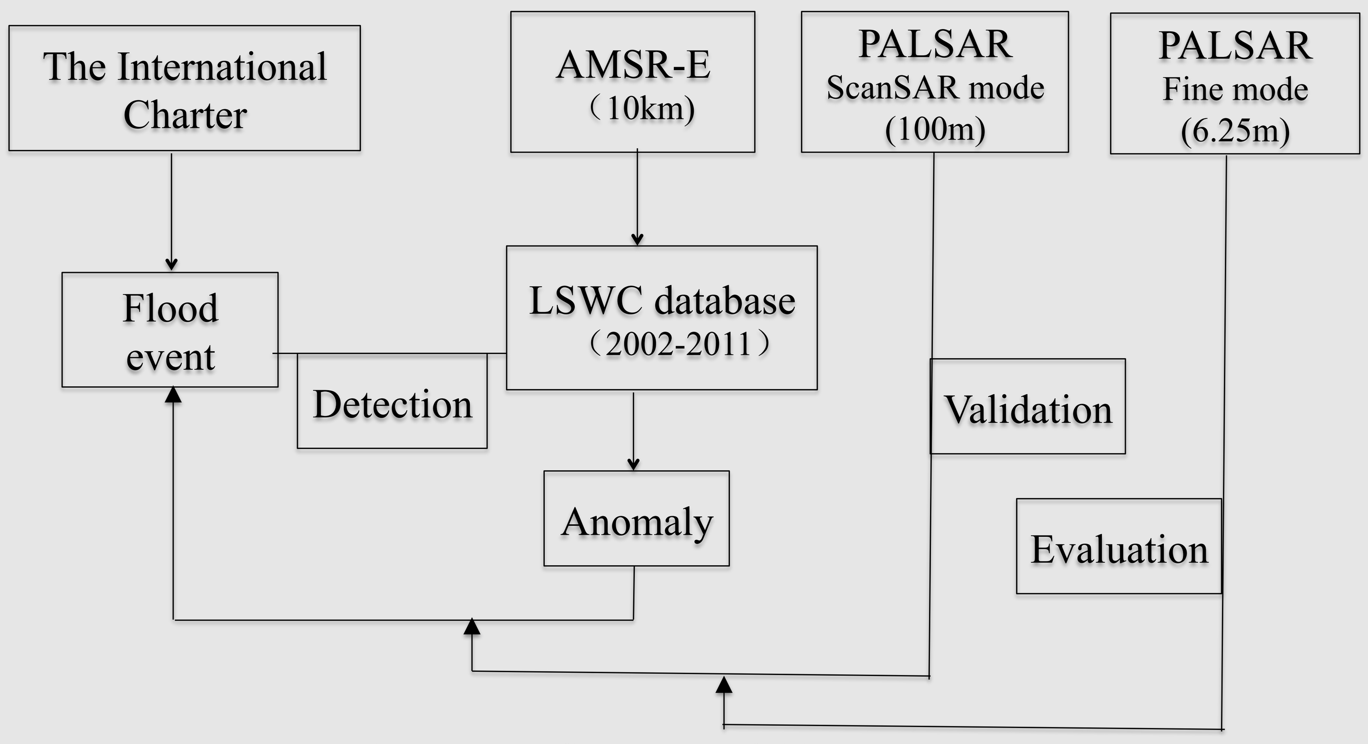


Figure 1. A flowchart of this study

Table 1. Basic information of selected flood events occurred in the worldwide

Country	Location of Event	Date of Charter Activation	Central location Lat.	Central location Lon.
China	Anhui province	2007-7-19	32.5N	115.8E
Vietnam	North and Central provinces	2008-11-5	20.9N	105.8E
Pakistan	North West Pakistan	2010-8-19	28.2N	69.4E
Thailand	Central Thailand	2011-9-30	14.9N	100.3E
Senegal	Senegal	2007-9-18	16.1N	13.8W
Namibian	Northern Namibia	2011-4-5	18.2S	15.7E
Argentina	Santa Fe and Entre Rios provinces	2007-3-30	31.2S	60.6W
Bolivia	Cochabamba, Santa Cruz	2008-2-9	14.6S	65.1W
Colombia	Bolivar province	2011-5-23	8.3N	73.9W
Mexico	Tabasco	2007-11-3	18.1N	92.7W
USA	Iowa	2008-6-13	42.5N	93.2W
Australia	Queensland	2011-1-9	27.3S	151.3E

Results and discussion

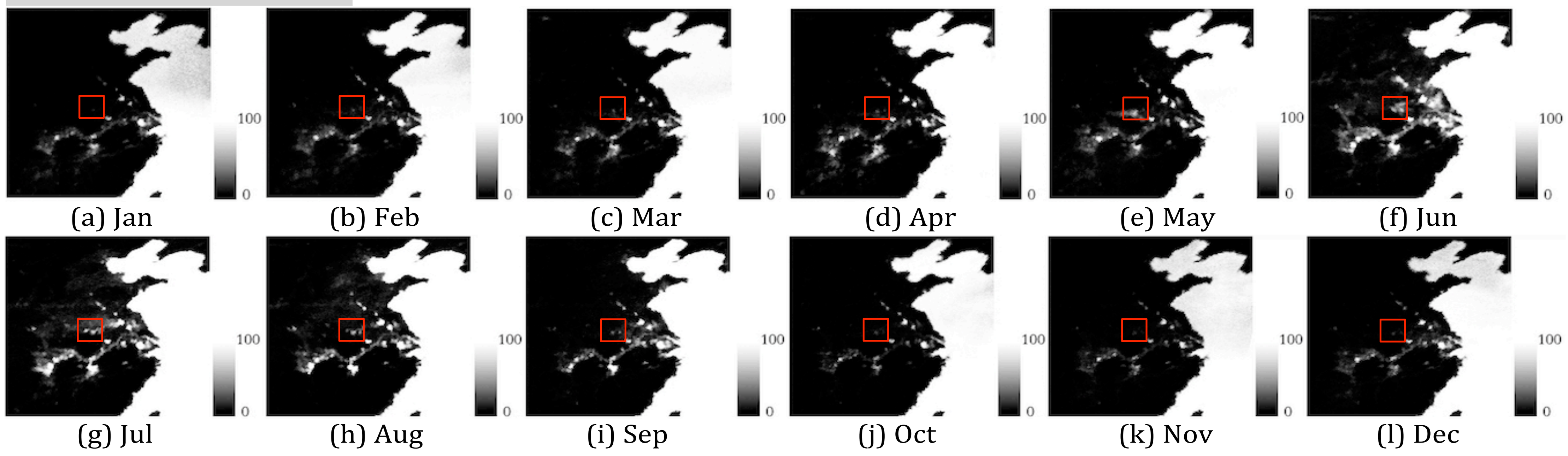


Figure 2: Monthly changes of LSWC in Anhui province in China (32.5N, 115.8E) in 2007. Brighter area indicates high abundance of water coverage at that pixel.

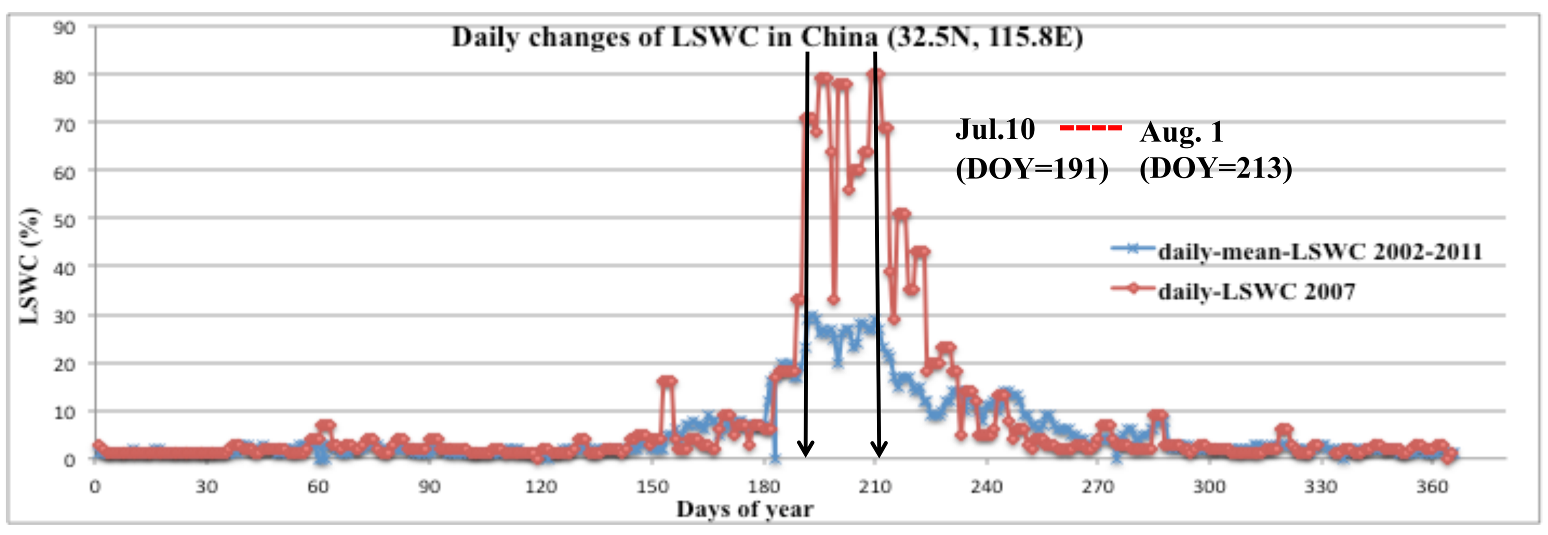
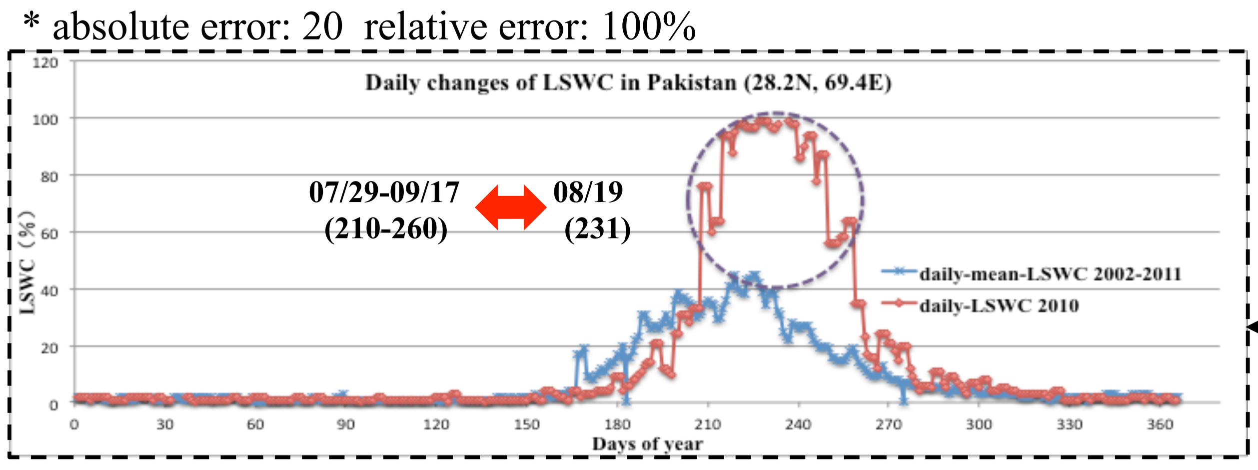


Figure 3: Daily changes of LSWC in China (32.5N, 115.8E) in 2007

Table 2. Comparison of the period of real flood events and anomaly extracted from AMSR-E

Country	Date of International Charter Activation	Anomaly extracted by AMSR-E
China	2007/07/19	07/10-07/17,07/19-08/1
Pakistan	2010/08/19	07/29-09/17
Vietnam	2008/11/5	03/30,07/1,10/26-11/5
Thailand	2011/09/30	05/17-06/4,09/17-09/30
Mexico	2007/11/3	01/24,10/27-12/6
USA	2008/06/13	06/5-06/13
Australia	2011/01/9	01/6-01/14,03/18-03/21
Namibia	2011/04/5	03/20-05/1
Senegal	2007/09/18	08/31-09/23
Bolivia	2008/02/9	02/8-05/3
Argentina	2007/03/30	03/28-03/31
Colombia	2011/05/23	03/29-03/31,04/14-07/5,07/26-07/28

* absolute error: 20 relative error: 100%



The anomalies which extracted from AMSR-E by debugging in Matlab basically coincided with the actual period of flooding according to International Charter.

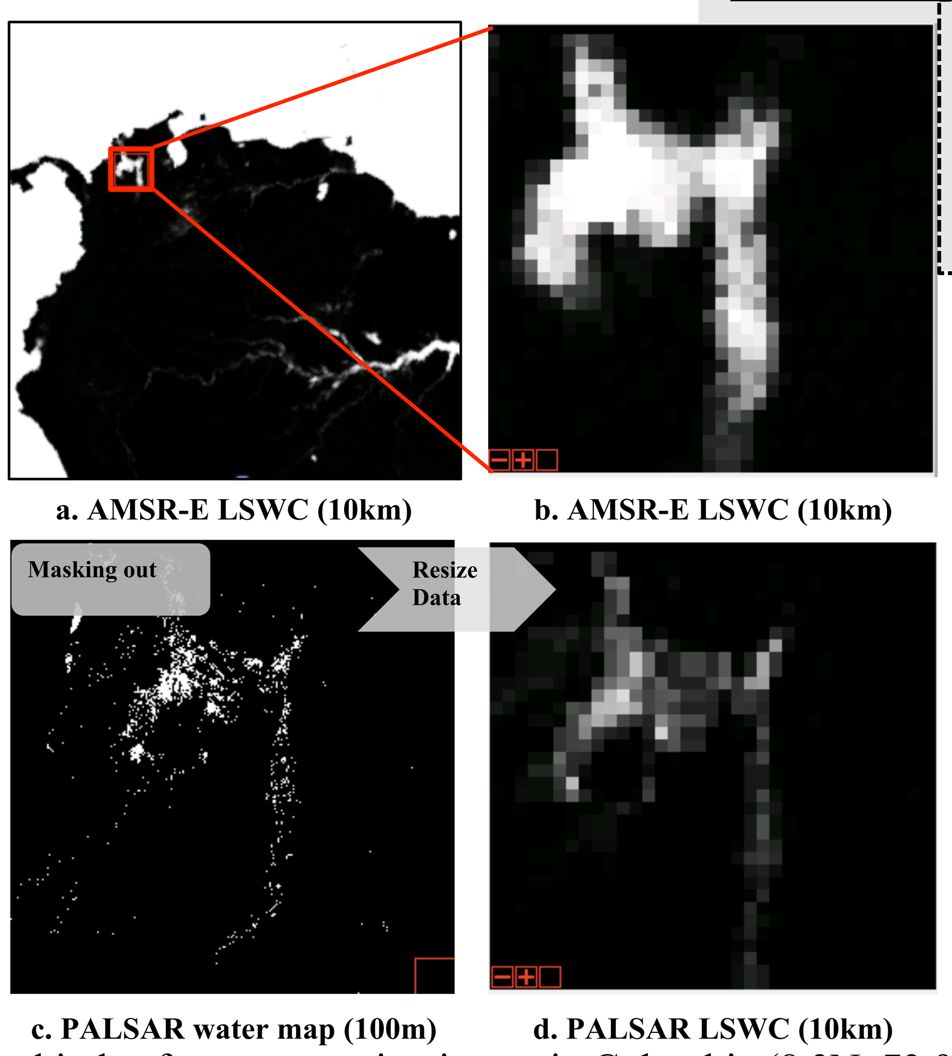


Figure 4: Two kinds of remote sensing image in Colombia (8.3N, 73.9W)

ALOS PALSAR level-1.5 product can be converted to NRCS by the following formula:

$$NRCS = 10 \times \log_{10}(DN^2) + CF$$

where: DN: digital number of the amplitude image, CF: scaling factor

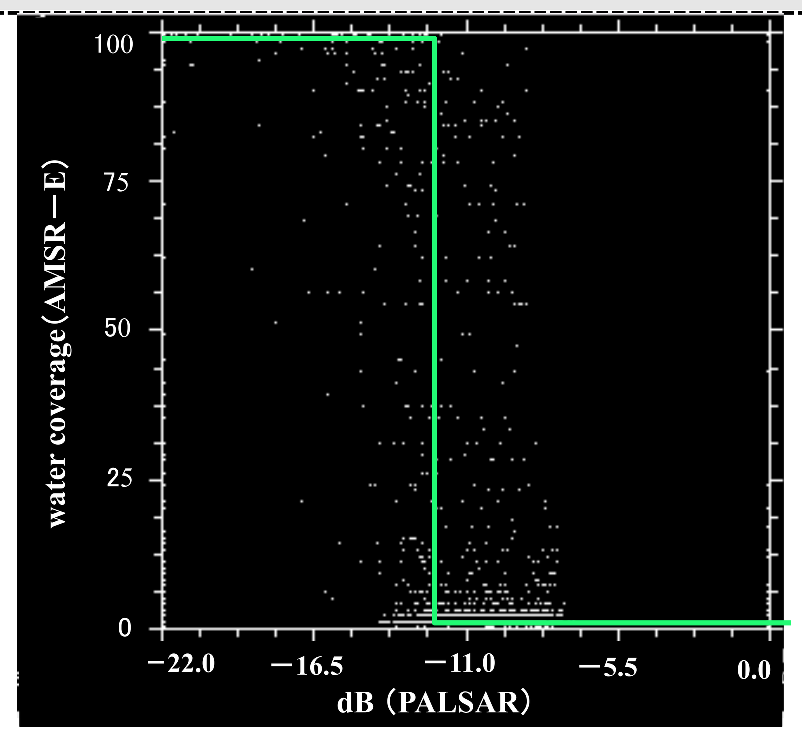
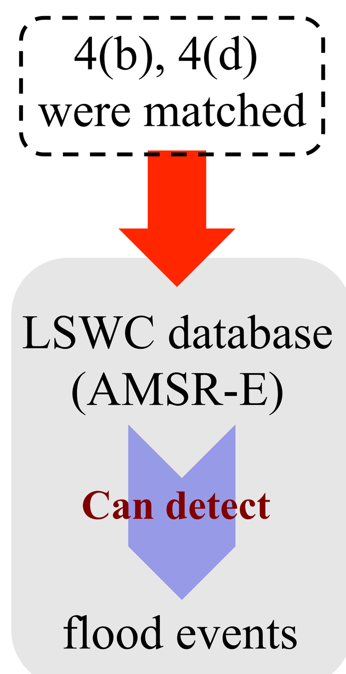


Figure 5: Scatter plot between dB and WC (Colombia)



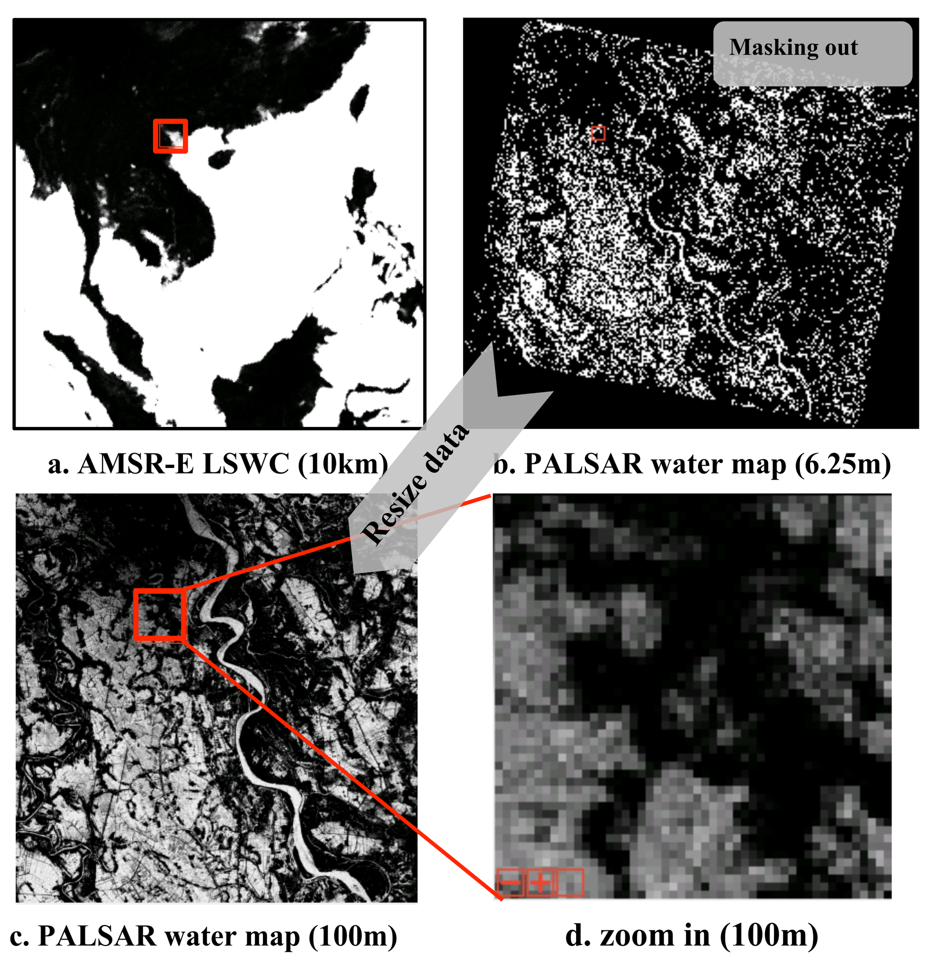


Figure 6: Two kinds of remote sensing image in Vietnam (20.9N, 105.8E)

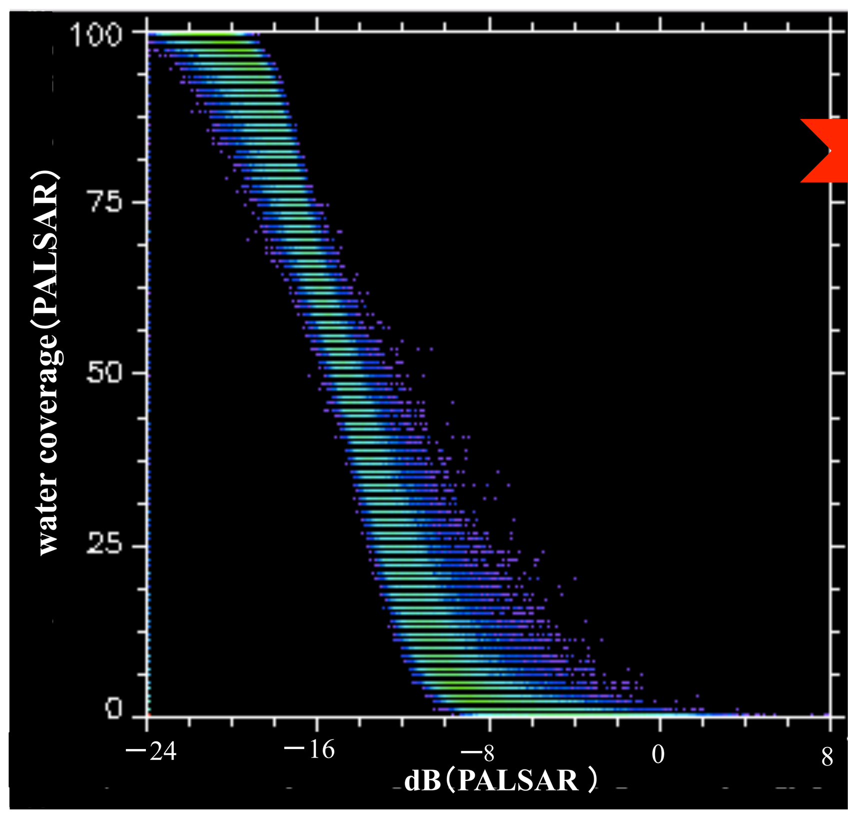
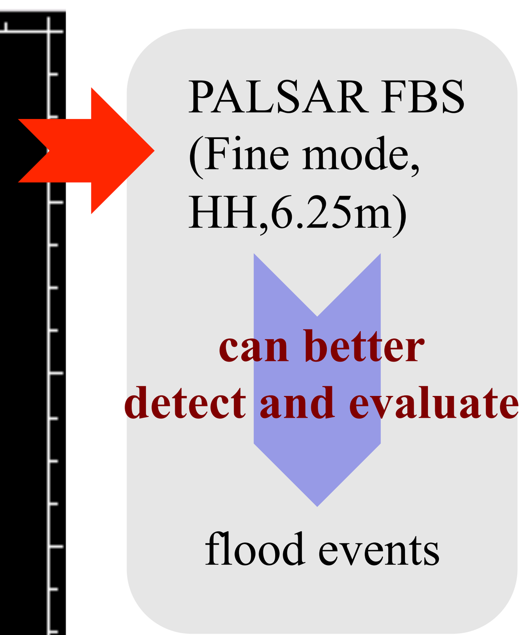
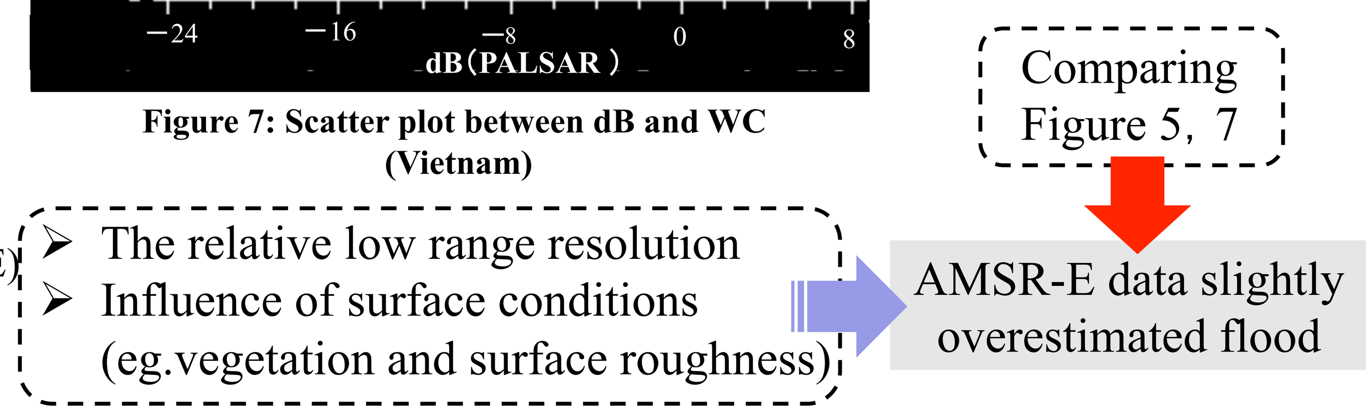


Figure 7: Scatter plot between dB and WC (Vietnam)





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Zheng, W, Liu, C, Xin, ZB, Wang, ZX, 2008. Flood and waterlogging monitoring over Huaihe River Basin by AMSR-E data analysis, *Chinese Geographical Science* 18(3): 262-267.

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Future work

- To calculate the threshold value in order to clearly distinguish the flood areas.
- To analysis the differences on flood detection based on different mechanism of AMSR-E and PALSAR.
- To carry out precise flood detection by combining other data in complex environments such as impact of buildings and vegetation in order to supply accurate information for BCP of enterprises.

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