National Institute of
Advanced Industrial Science
and Technology
AIST

Workshop on “Renovation of Observation of Natural Disasters
using High Resolution Satellite Remote Sensing”
DPRI, Kyoto Univ.
9 September, 2009

Estuarine Shoreline Mapping Using Satellite SAR Data in Yellow Sea Delta

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Acknowledgements: The ownership of ALOS/PALSAR JERS-1/SAR data belongs to JAXA and METI.

Outline

What SAR can do for Coastal Studies?

-Use of spaceborne SAR data to Map and Monitor Coastal Regions (JERS-1, PALSAR)

- Multitemporal SAR Intensity Images
- Colour Assignment images
- Changes in “Area”
- InSAR

World's Ten “Longest” Rivers

Rank	River	Location	Approximate Length—miles
1.	Nile	Africa	4,180
2.	Amazon	South America	3,912
3.	Mississippi-Missouri-Red Rock	United States	3,710
4.	Chang Jiang (Yangtze)	China	3,602
5.	Ob	Russia	3,459
6.	Huang Ho (Yellow)	China	2,900
7.	Yenisei	Russia	2,800
8.	Parana	South America	2,795
9.	Irtish	Russia	2,758
10.	Zaire (Congo)	Congo	2,716

http://www.infoplease.com/toptens/worldrivers.html

No.	River name	Basin area, 10^3 km^2	Discharge, km^3·year^{-1}	Runoff, mm·year^{-1}	Basin latitude
1	Amazon	5,854	6,642	1,135	2
2	Congo	3,699	1,308	354	4
3	Orinoco	1,039	1,129	1,087	7.5
4	Changjiang	1,794	944	526	30
5	Brahmaputra	583	628	1,077	25
6	Mississippi	3,203	610	190	36
7	Yenisei	2,528	599	232	60
8	Parana	2,661	568	213	23
9	Lena	2,418	531	220	63
10	Mekong	774	525	678	20
11	Ob	2,570	412	160	60
12	Ganges	956	404	423	26
13	St Lawrence	1,267	363	287	47
14	Pearl River	477	343	719	23
15	Xijiang	409	270	660	23
16	Mackenzie	1,713	290	169	64
17	Columbia	724	252	348	42
18	Ubangi	356	228	640	2.5
19	Yukon	852	212	249	64
20	Danube	788	202	256	48
21	Niger	2,240	193	86	10
22	Kolyma	666	118	177	67
23	Indus	1,143	104	91	29
24	Godavari	312	97	311	21
25	Huanghe	894	47	53	36

Basin area, discharge, runoff and basin latitude for the 25 world's “largest” rivers

Bianchi and Allison [2009]

World's Ten “Largest” Rivers

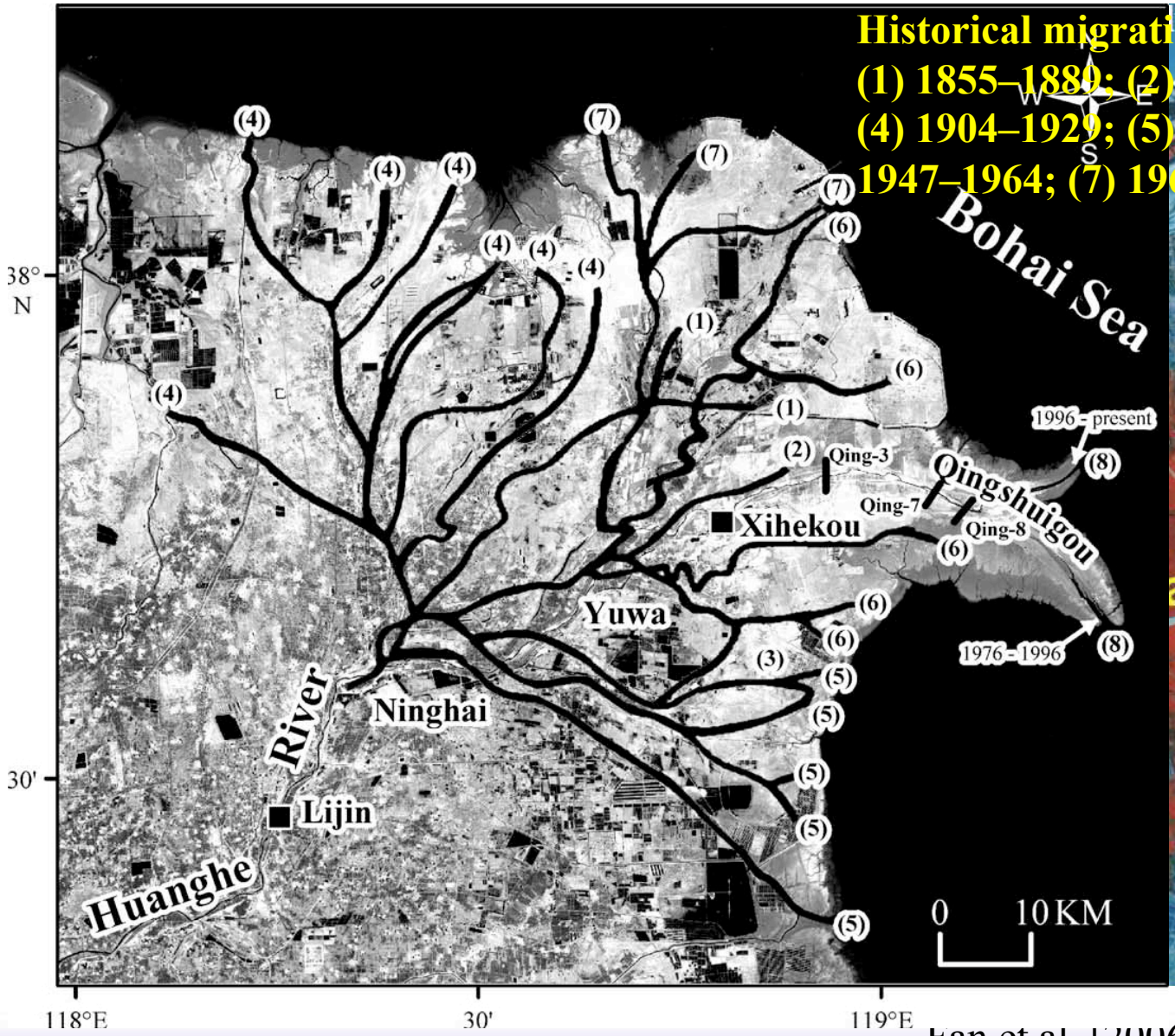
The average annual suspended load for the ten biggest (in terms of sediment load) rivers is as follows (in 10^6 tonnes per year):

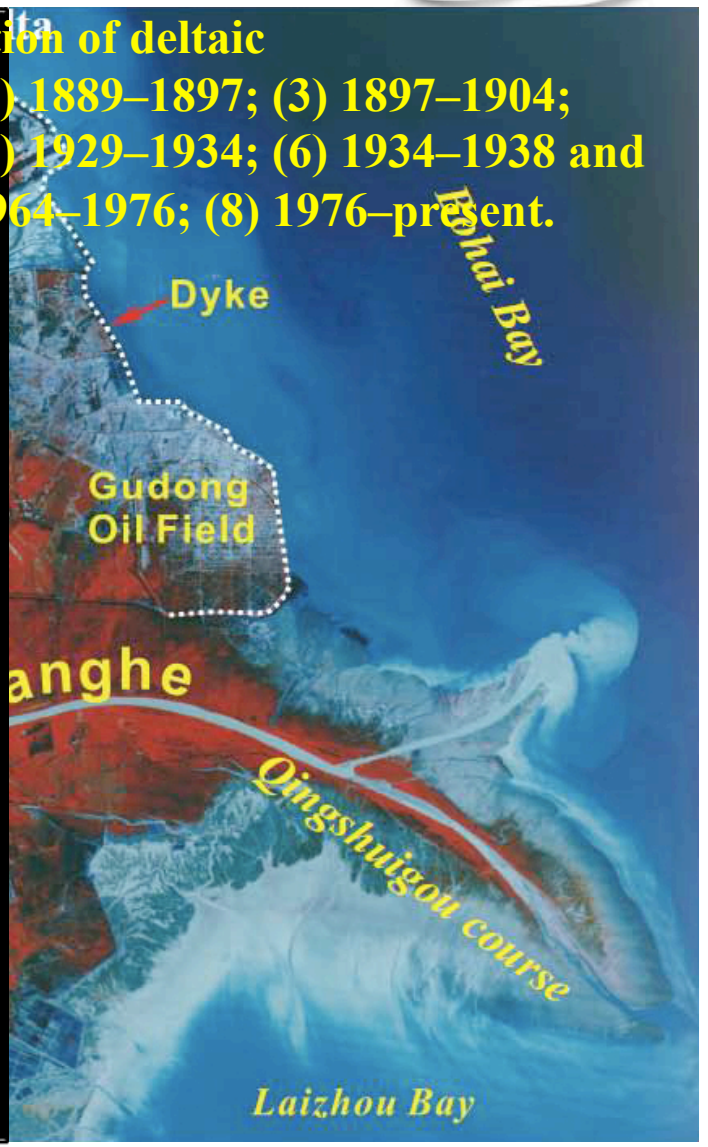
Ganga/Brahmaputra	1670	Magdalena	220
Huang He (Yellow River)	1080	Mississippi	210
Amazon	900	Orinoco	210
Changjiang (Yangtze)	478	Hunghe (Red River)	160
Irrawaddy	285	Mekong	160

In all, this amounts to about 40 per cent of the world total.

Goudie [2001]

Yellow River Delta





Fan et al. [2006]

Hu et al. [2008]

Yellow River Delta

Landsat 7/TM 2000/05/02

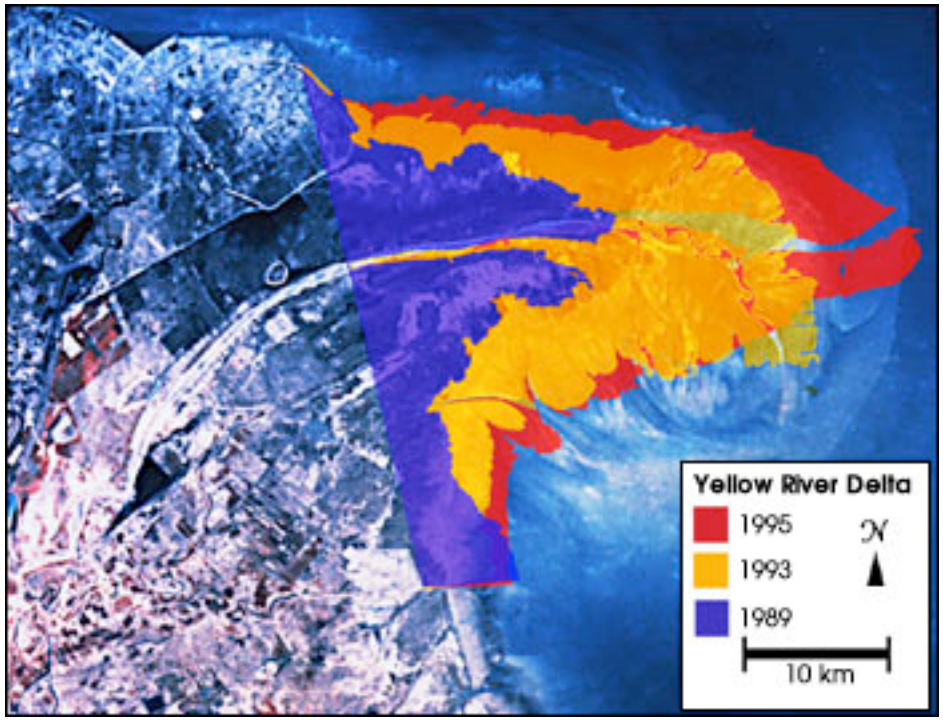
http://earthobservatory.nasa.gov

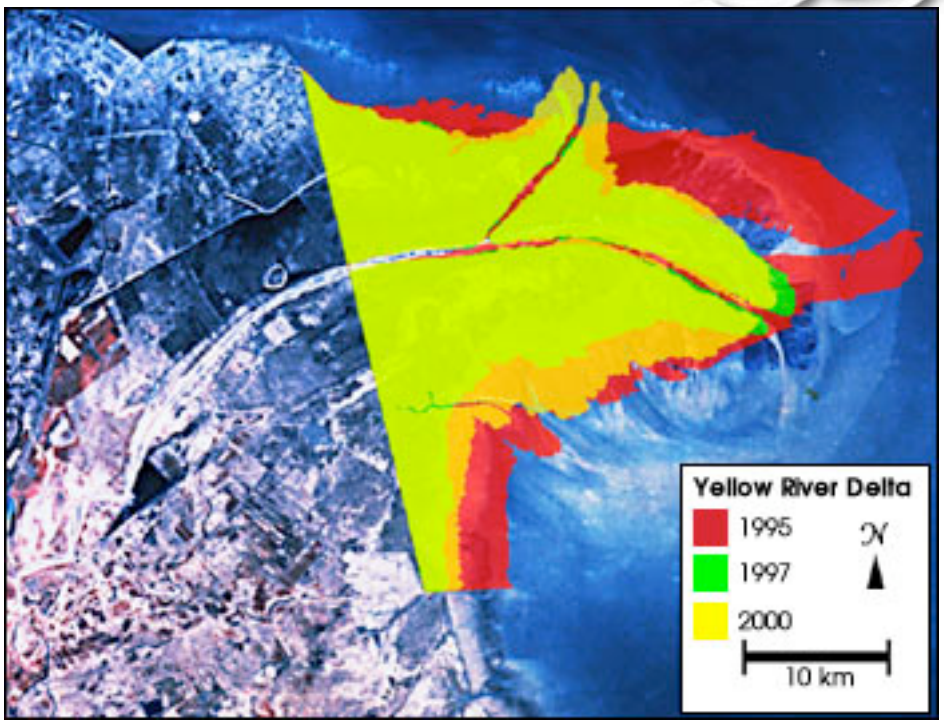
Yellow River Delta

Image of the Yellow River delta was taken from the Space Shuttle in February 2000 using an electronic still camera

http://earthobservatory.nasa.gov/Study/AstronautPhotography/astronaut_photography2.html

Yellow River Delta (Astronaut Photography)





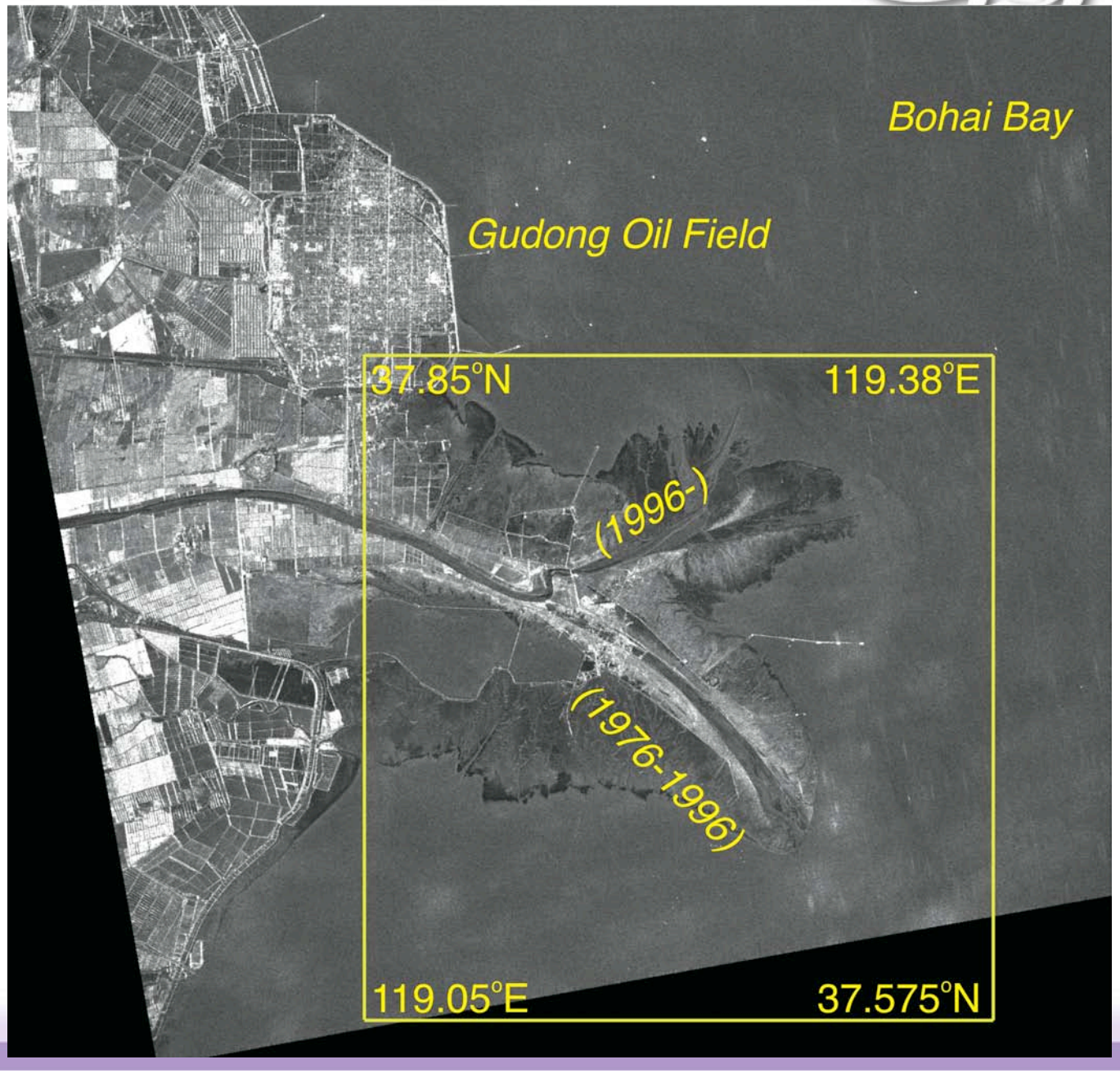
From 1989 to 1995 the Yellow River delta accreted (grew in area).

From 1995 to 2000 the Yellow River delta eroded (shrank in area).

Each of these outlines of the above-surface delta was measured from an astronaut photograph mapped to the common base.

http://earthobservatory.nasa.gov/Study/AstronautPhotography/astronaut_photography2.html

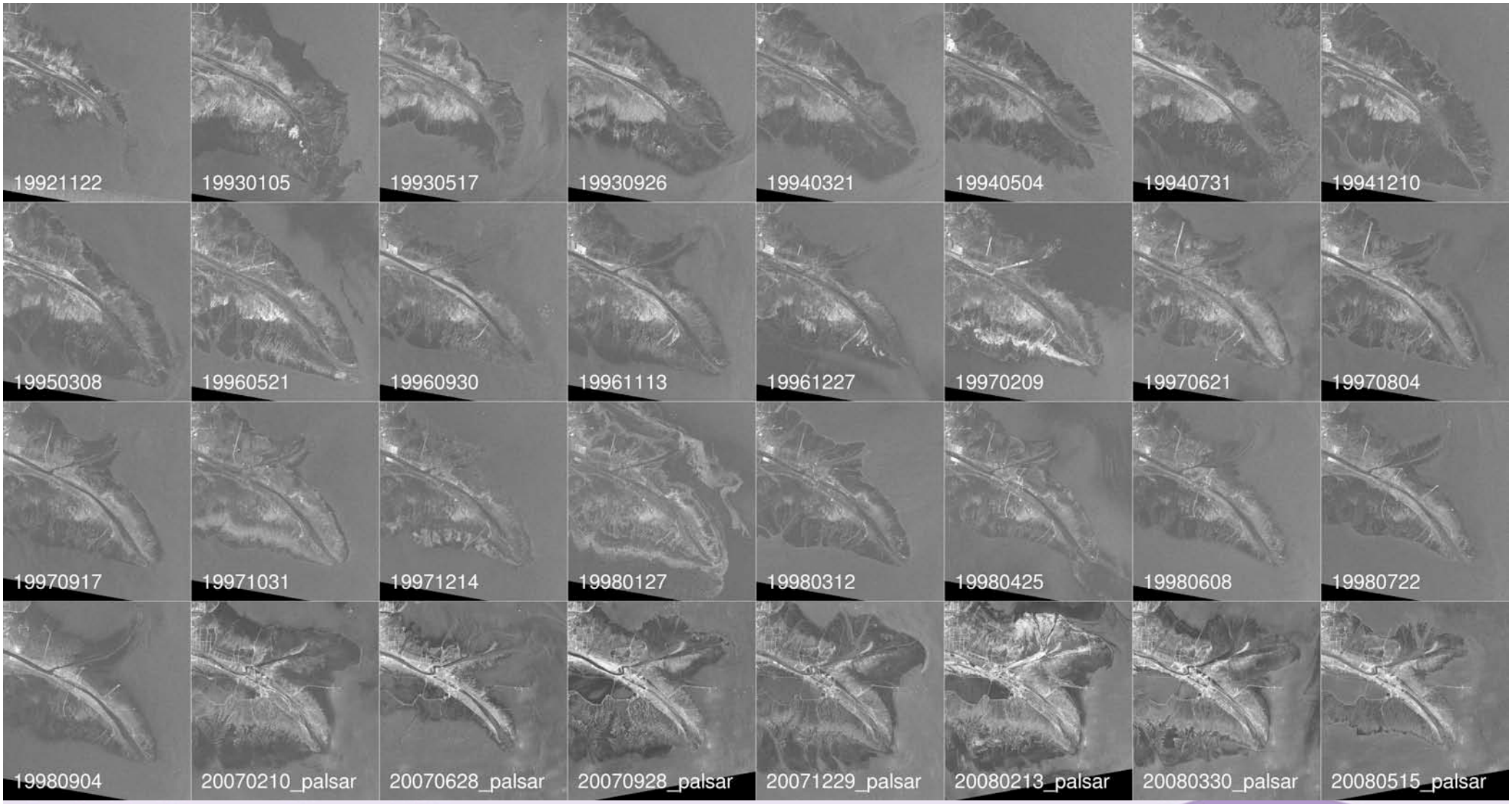
JERS-1 & PALSAR Amplitude (1992-2008)



JERS-1 & PALSAR Amplitude (1992-2008)

25 Descending (Nov. 1992 – Sept. 1998)

7 Ascending (Feb. 2007 – May 2008)



Drift Ice

人民网 people
www.people.com.cn

現在位置: 人民網日本語版>>社会・生活　　更新時間：10：52 Dec 24 2008

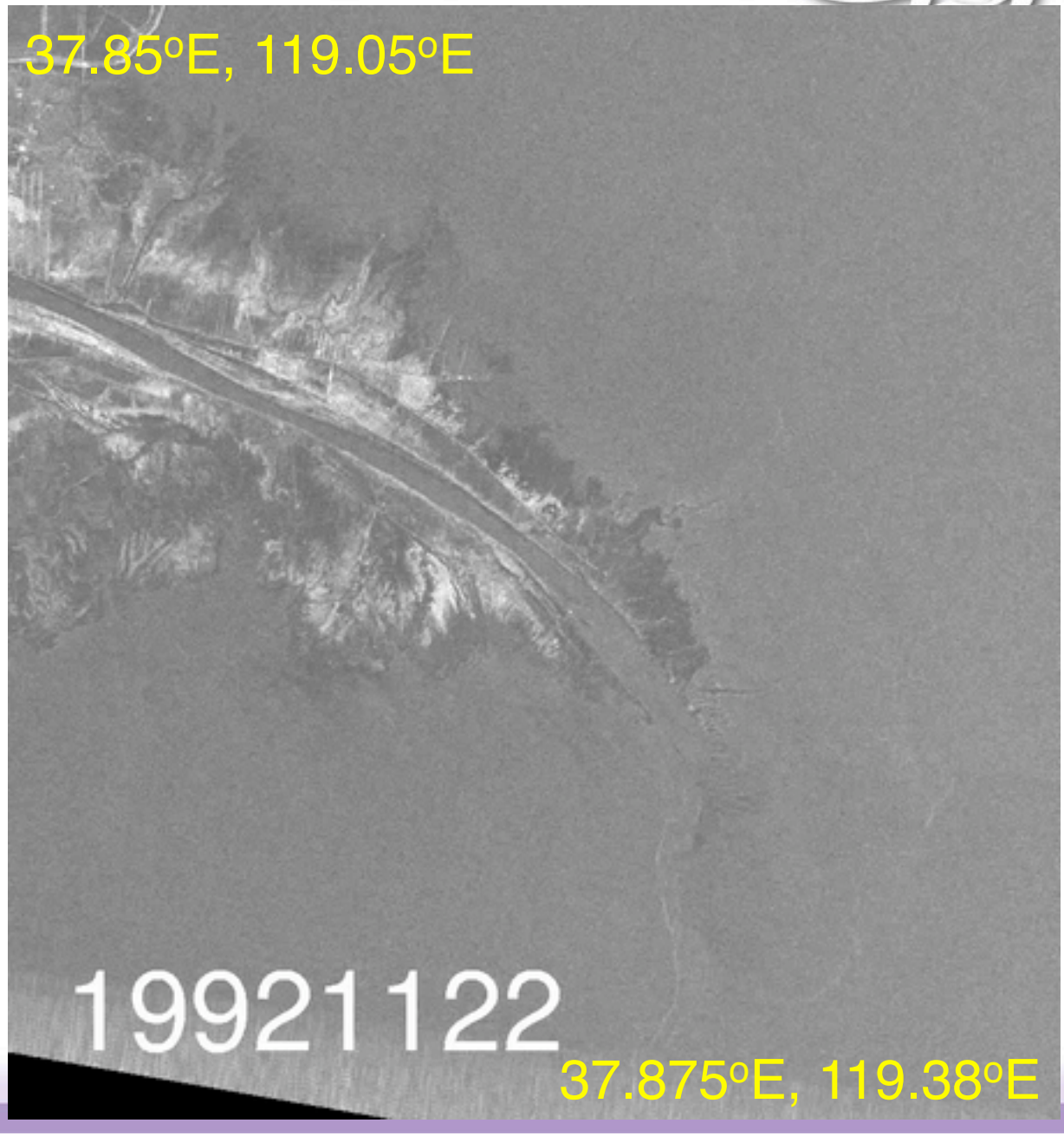
黄河に今冬初の流氷　山東省

流氷を観賞する観光客。

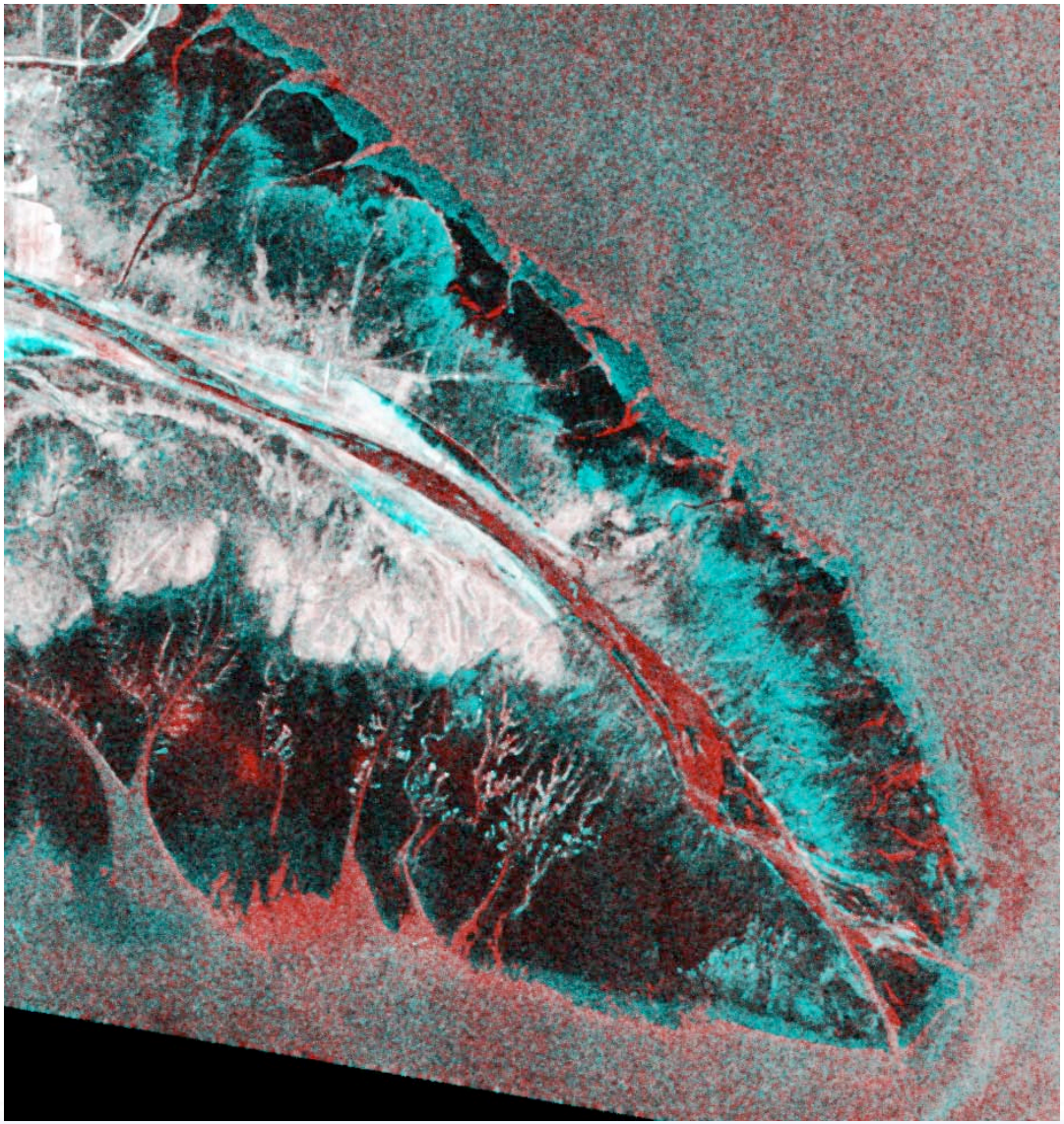
山東省済南区間の黄河で22日早朝、強い寒気の影響を受け、今冬初の流氷が昨年よりも23日早く観測された。済南黄河河務局では災害が発生しないよう、24時間態勢で流氷の変化を見守っている。（編集KA）

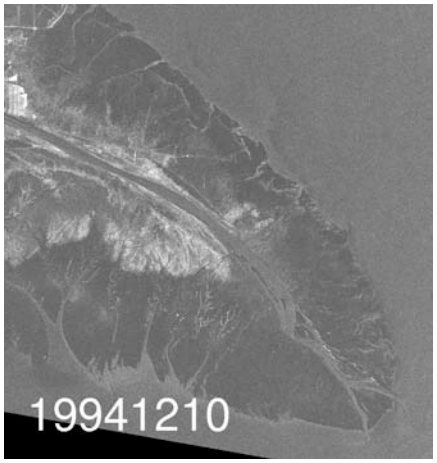
「人民網日本語版」2008年12月24日

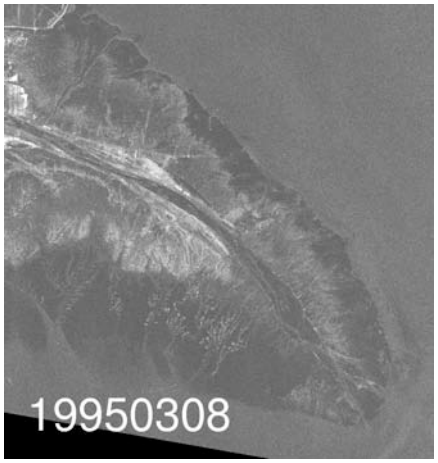
JERS-1 & PALSAR Amplitude (1992-2008)



Composite Image

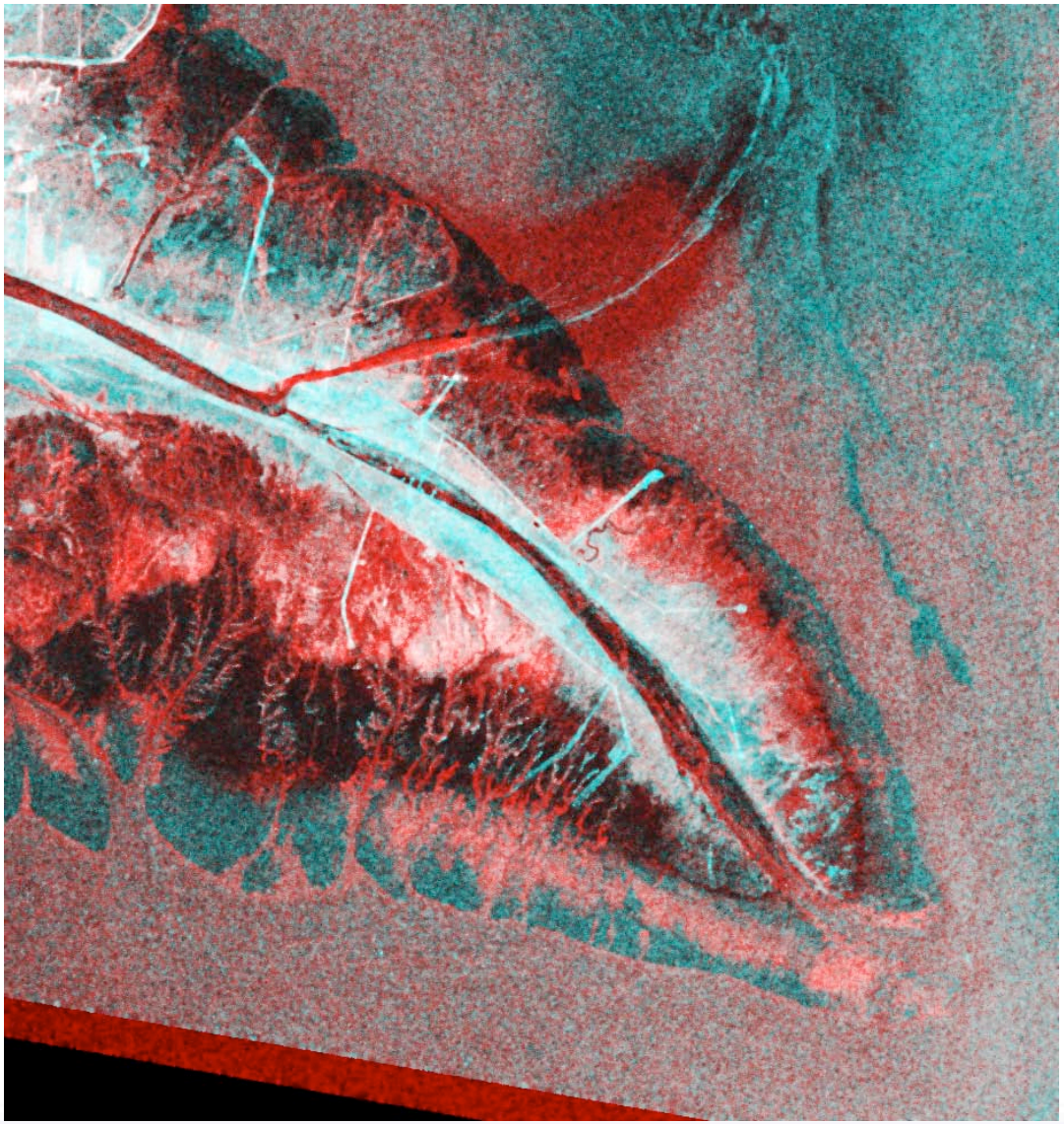


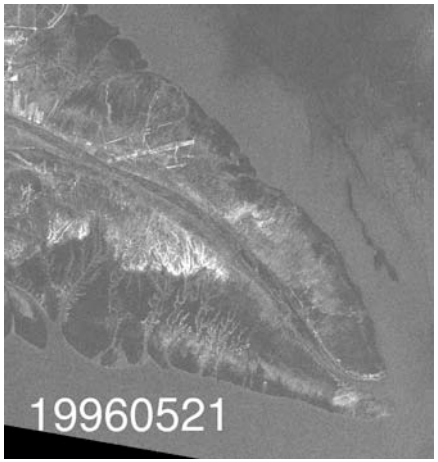


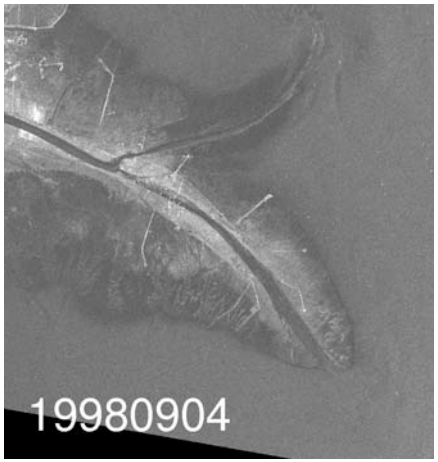


JERS-1/SAR
R: 94/12/10
GB: 95/03/08

Composite Image

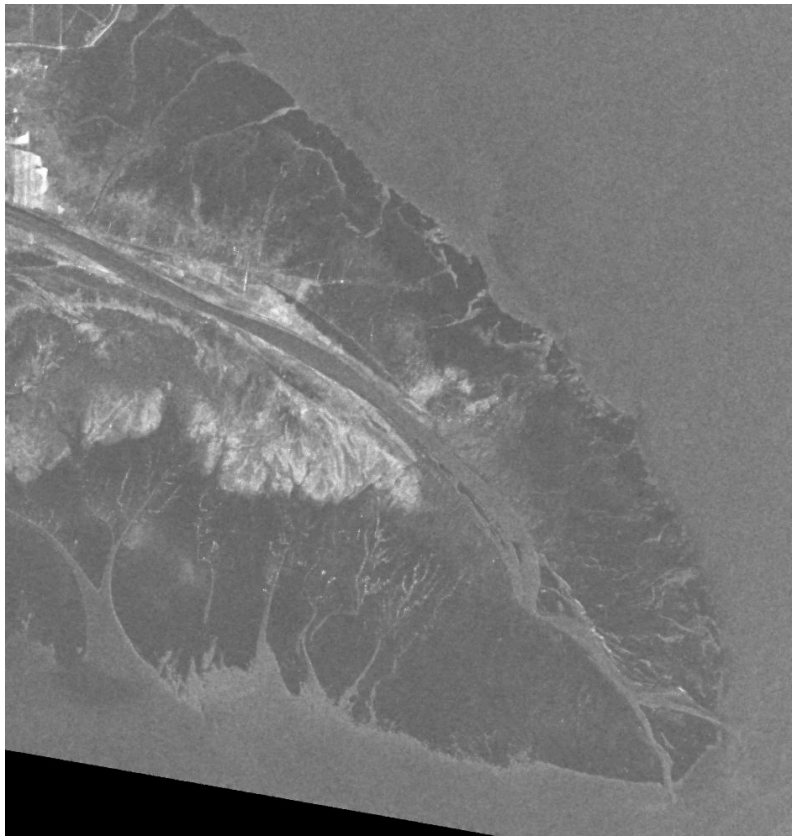






JERS-1/SAR
R: 96/05/21
GB: 98/09/04

Changes in “Smooth Area”

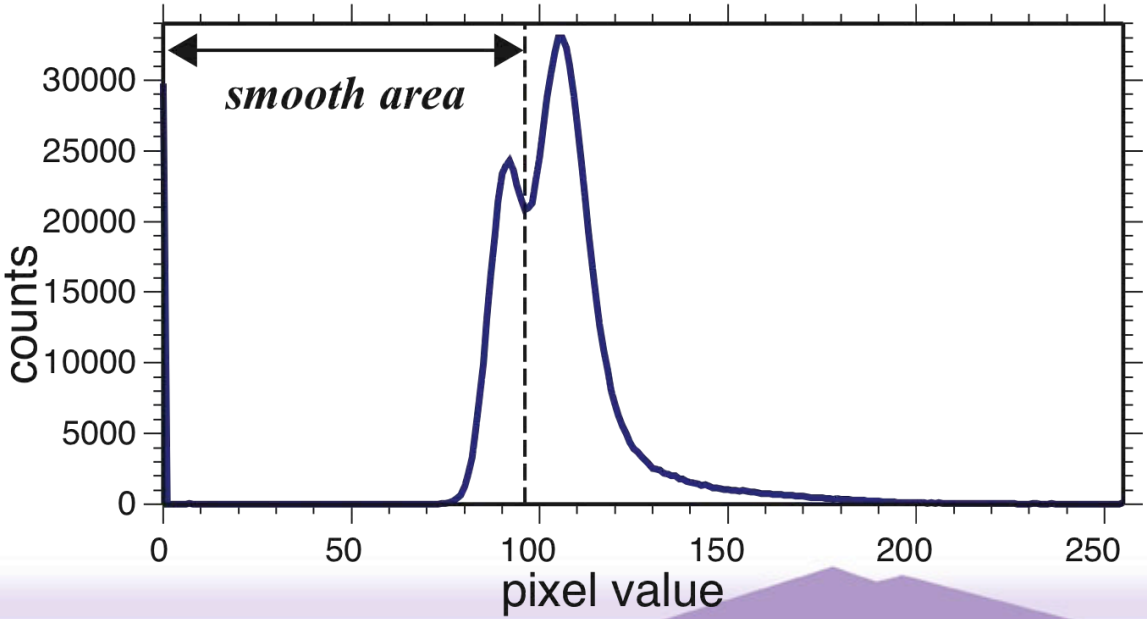


JERS-1/SAR 1994/12/10

NIH ImageJ 1.42q software
(http://rsbweb.nih.giv/ij)

-Despeckle filtering
(Sigma Filter [e.g., Lee, 1983])

- Threshold



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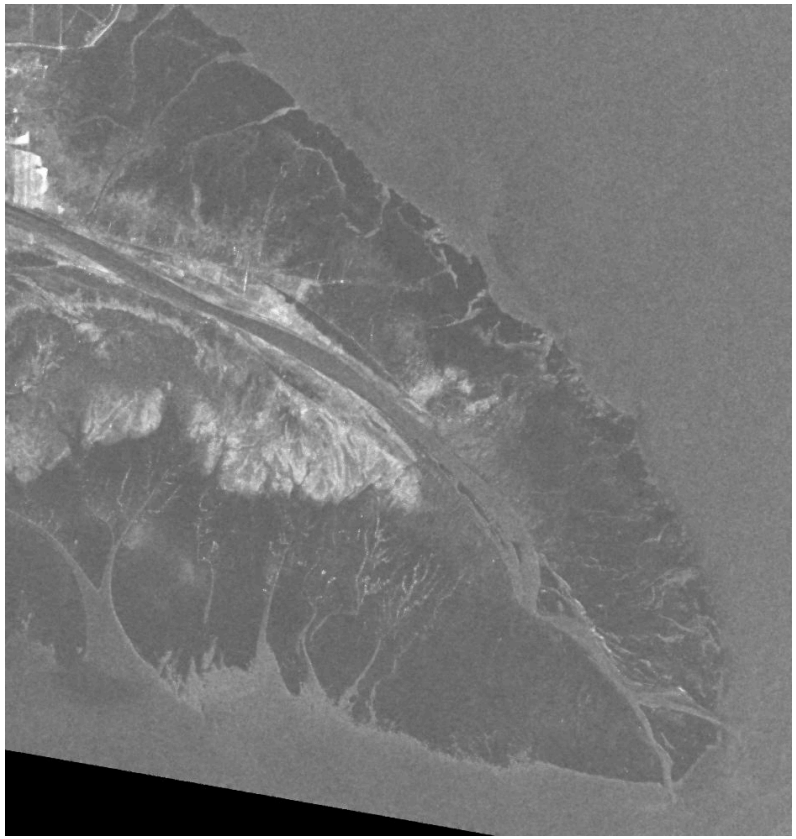
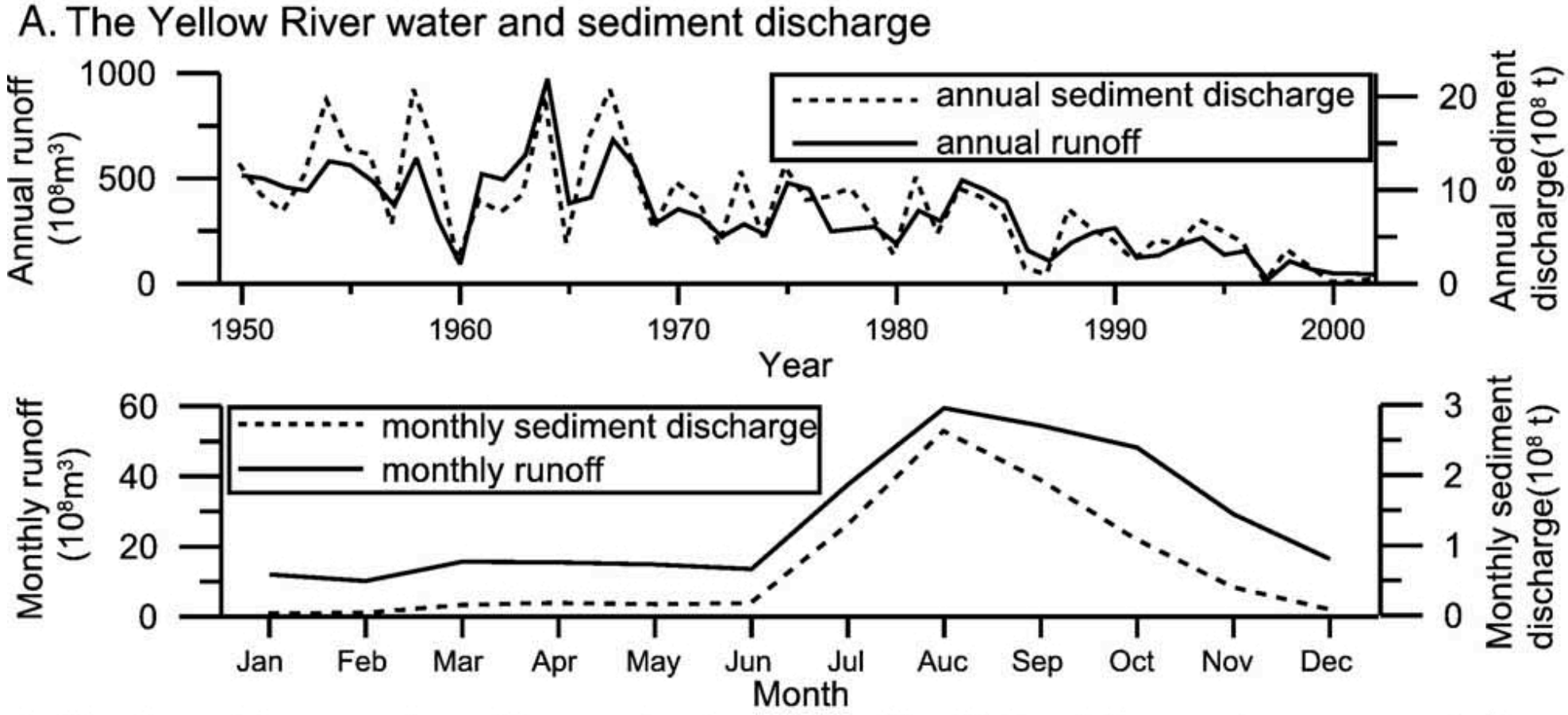


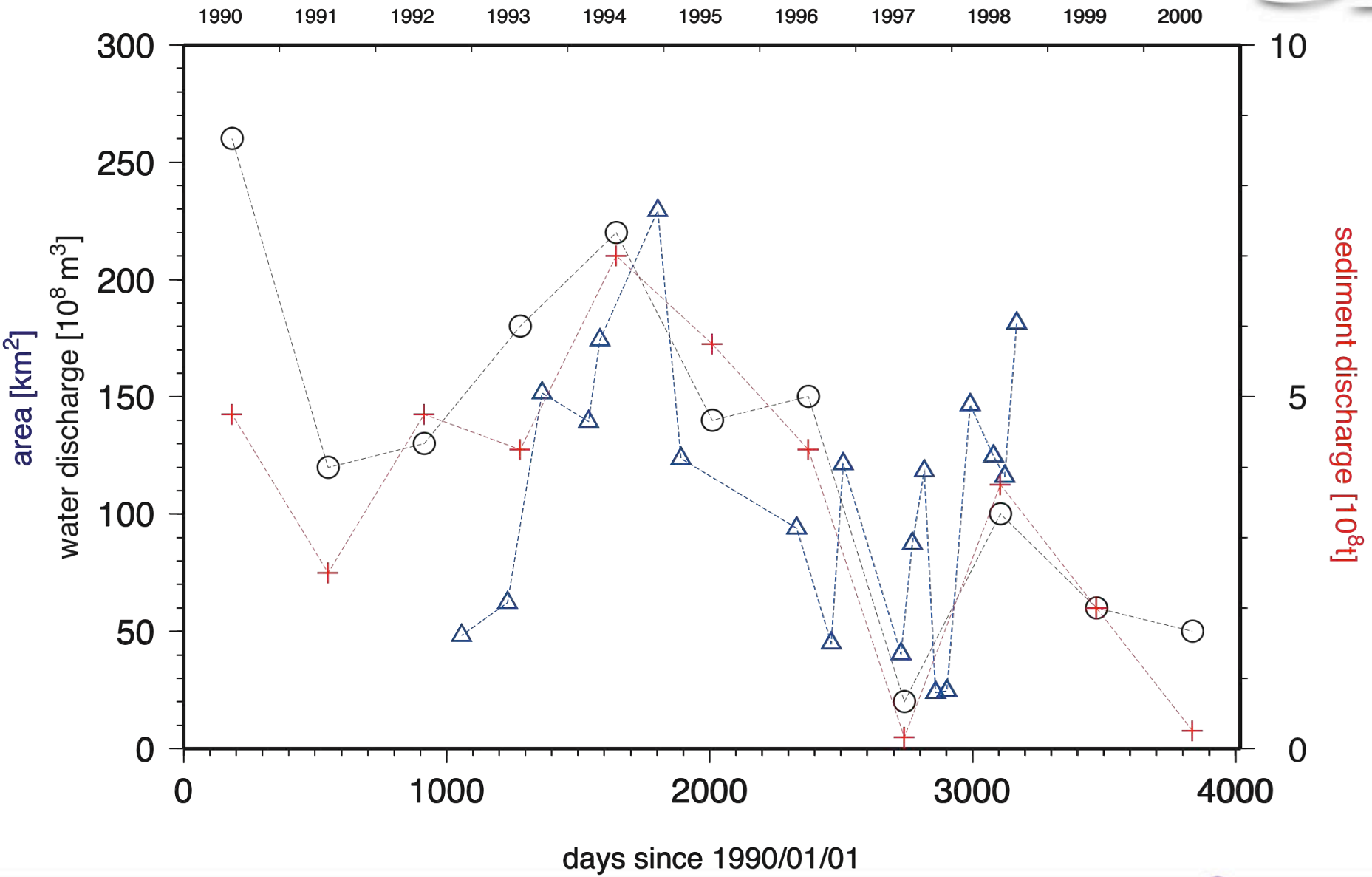
- Area Measurements

Annual and Monthly Water and Sediment Discharge

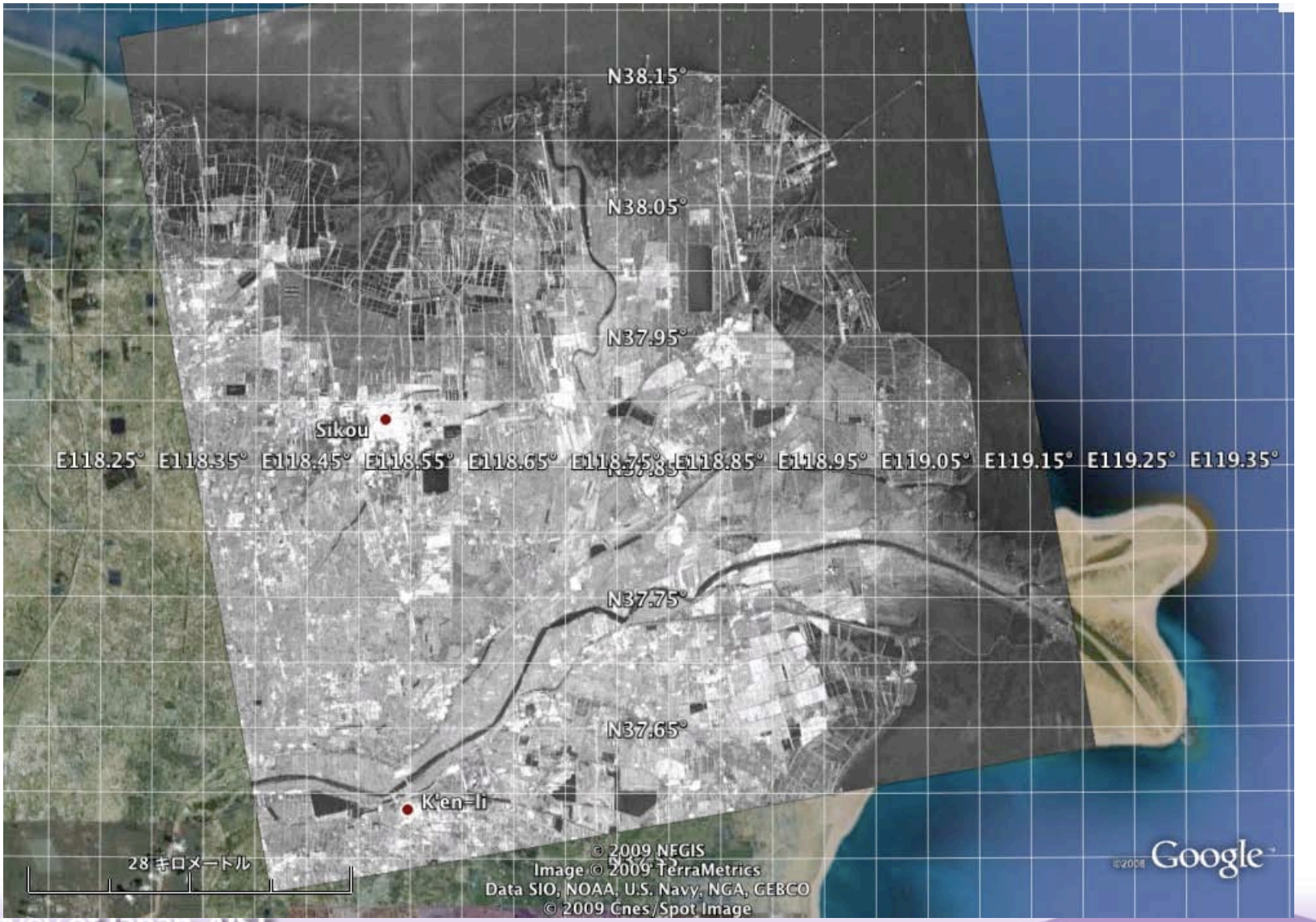


[Chu *et al.*, 2006]

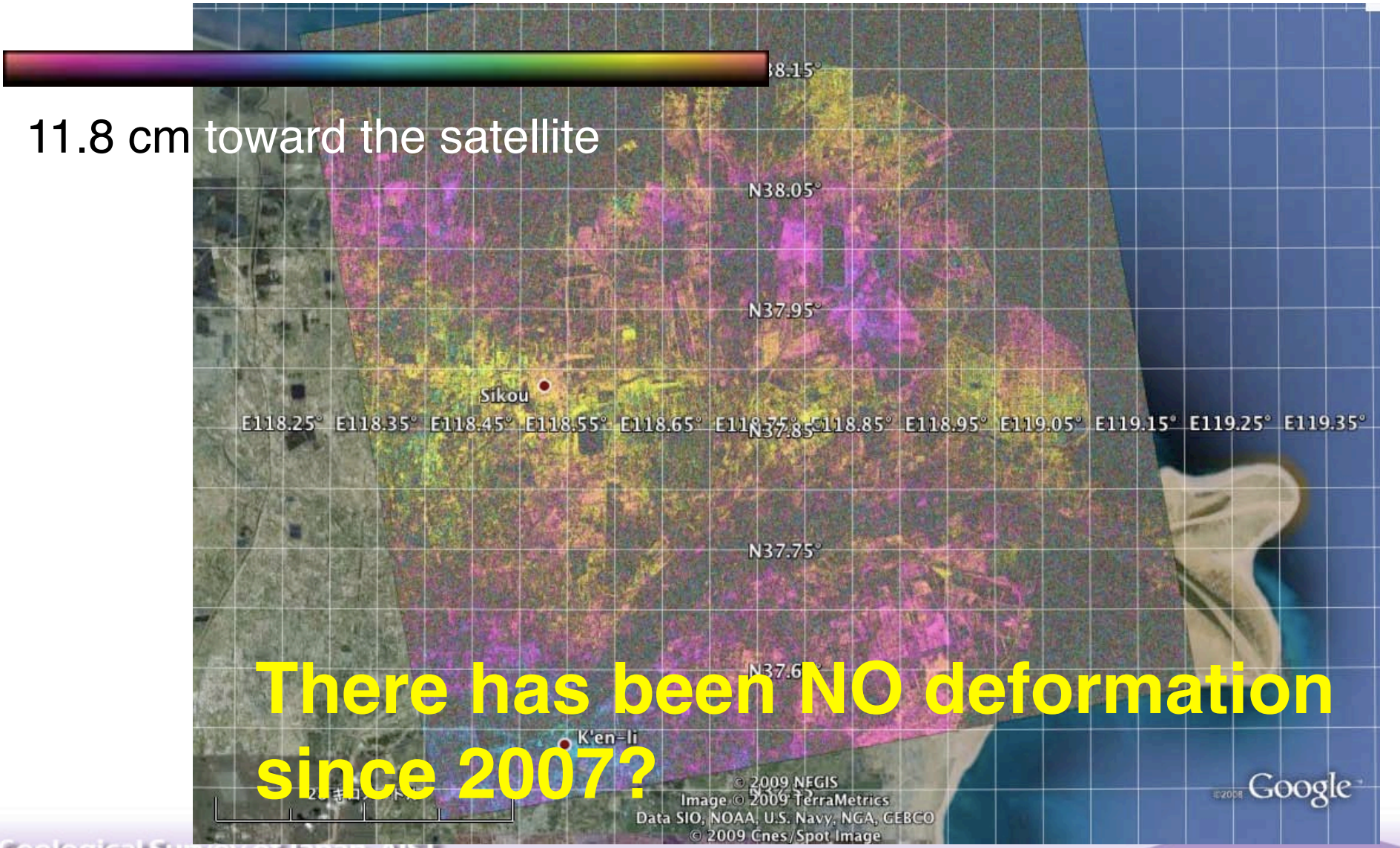
Changes in “Smooth Area”



PALSAR Amplitude
2008/06/012



PALSAR Interferogram
Master: 2007/07/15; Slave: 2008/06/01



Concluding Remarks

What SAR can do for Coastal Studies?

- It provides valuable information about the historical evolution of the delta area and water-course changes.

- Changes in the “smooth area” correlate well with water and sediment discharges.

- InSAR analysis of PALSAR reveals no notable ground deformation during July 2007 and June 2008.