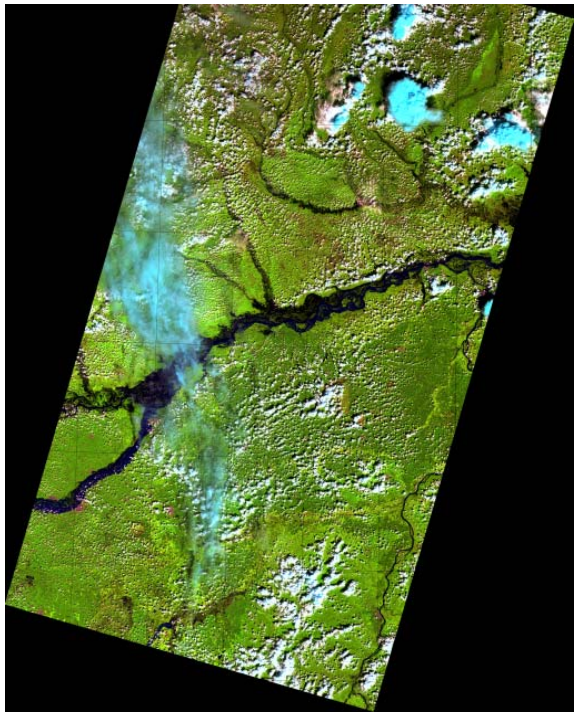
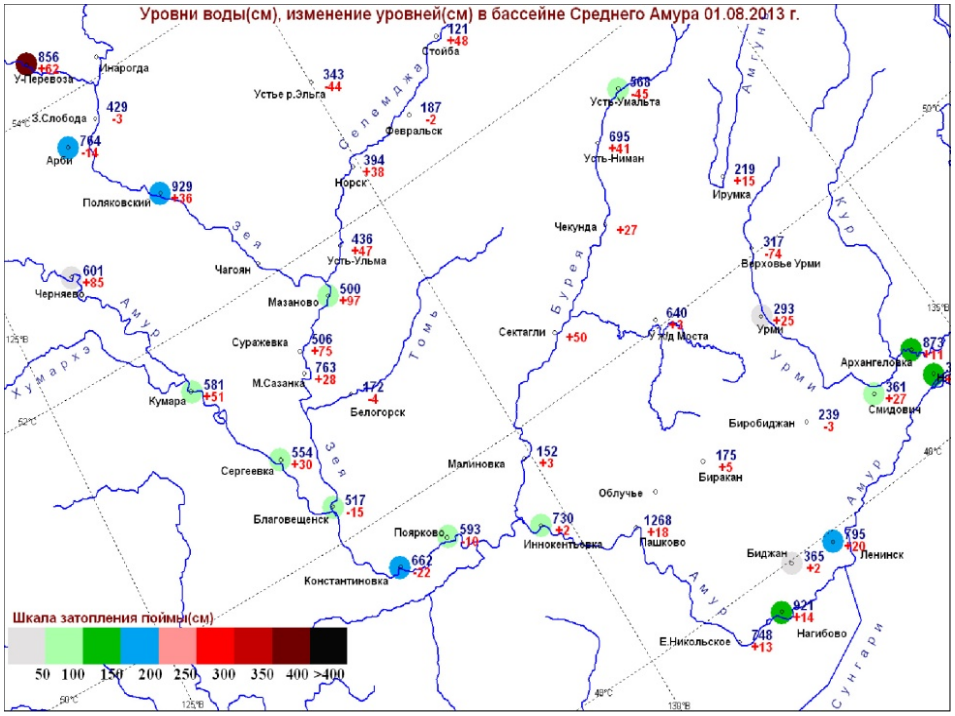
AMSR2 monitoring of extreme Amur River flood in 2013

Mitnik L.M., Mitnik M.L., and Kuleshov V.P.

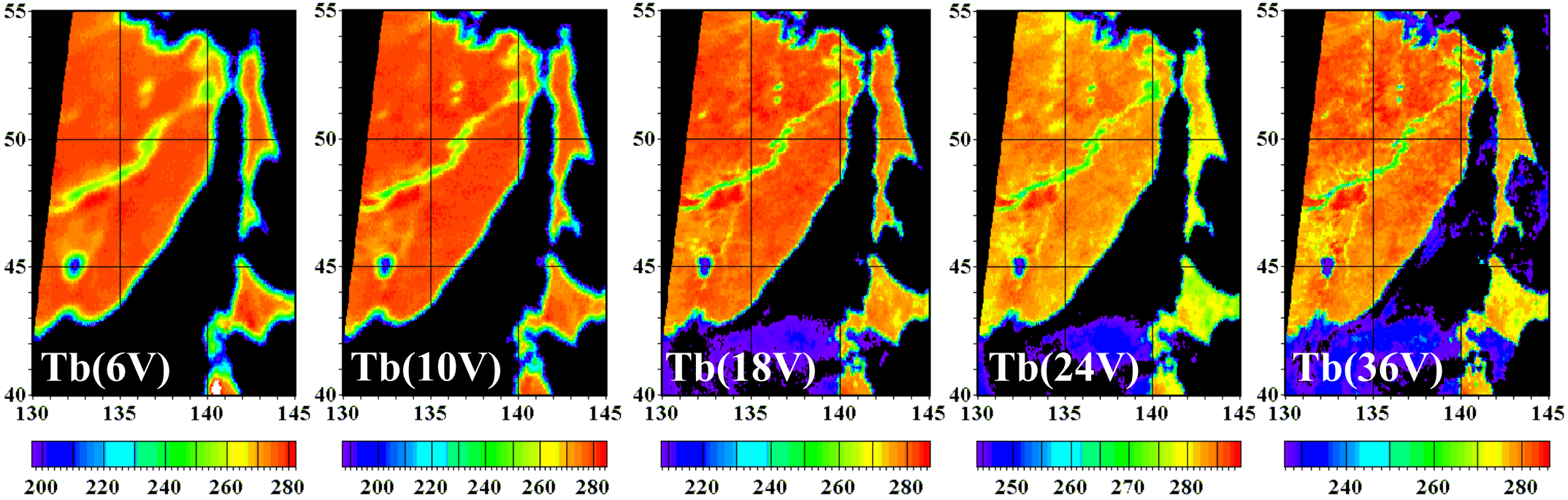
POI FEB RAS

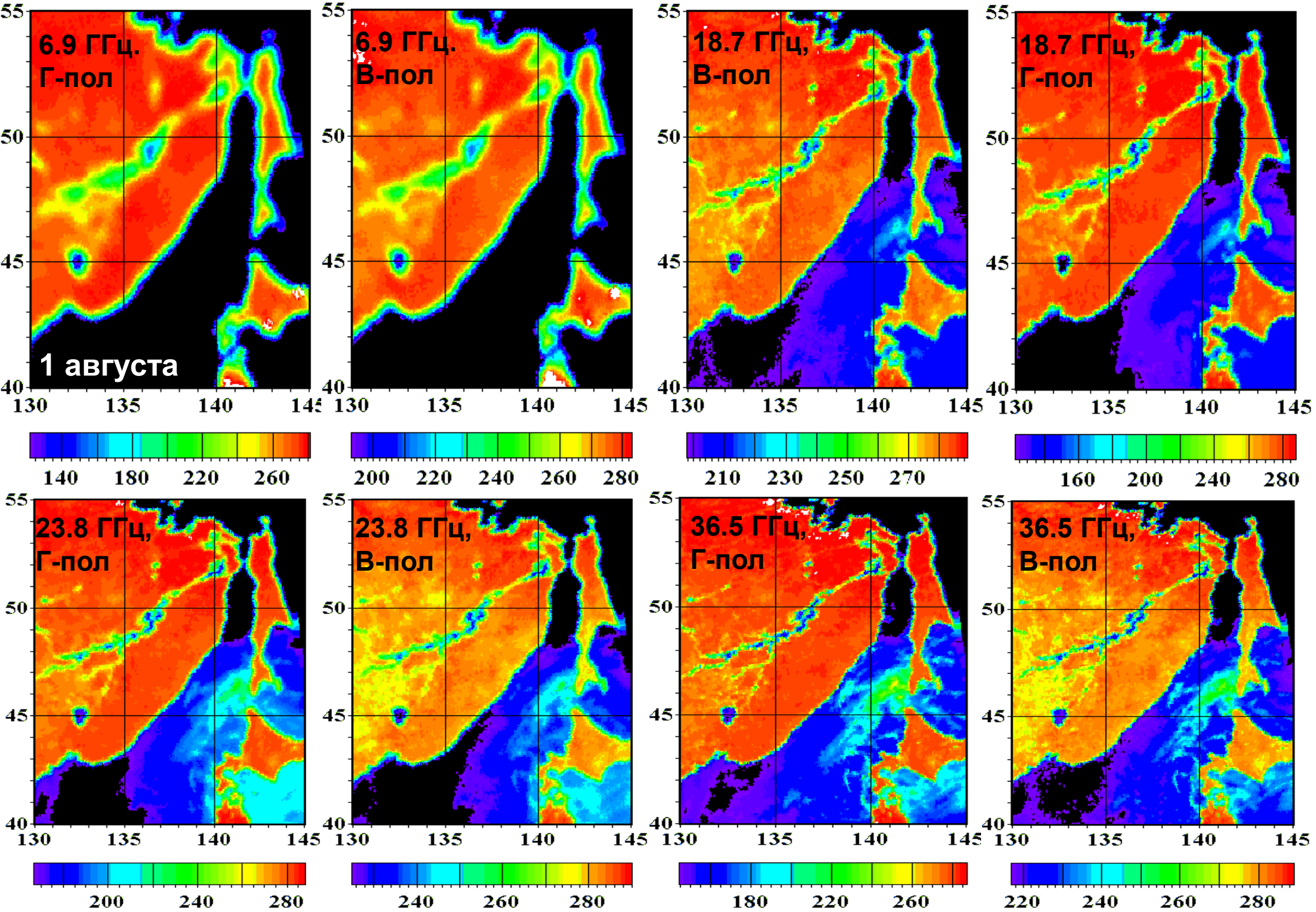
1 August





Amur water level
Blagoveshensk – 517 cm.
Zeya River near Polyakovskaya – 929 cm.




6.9 ГГц.
Г-пол
1 августа
6.9 ГГц.
В-пол
18.7 ГГц,
В-пол
18.7 ГГц,
Г-пол
23.8 ГГц,
Г-пол
23.8 ГГц,
В-пол
36.5 ГГц,
Г-пол
36.5 ГГц,
В-пол
55
50
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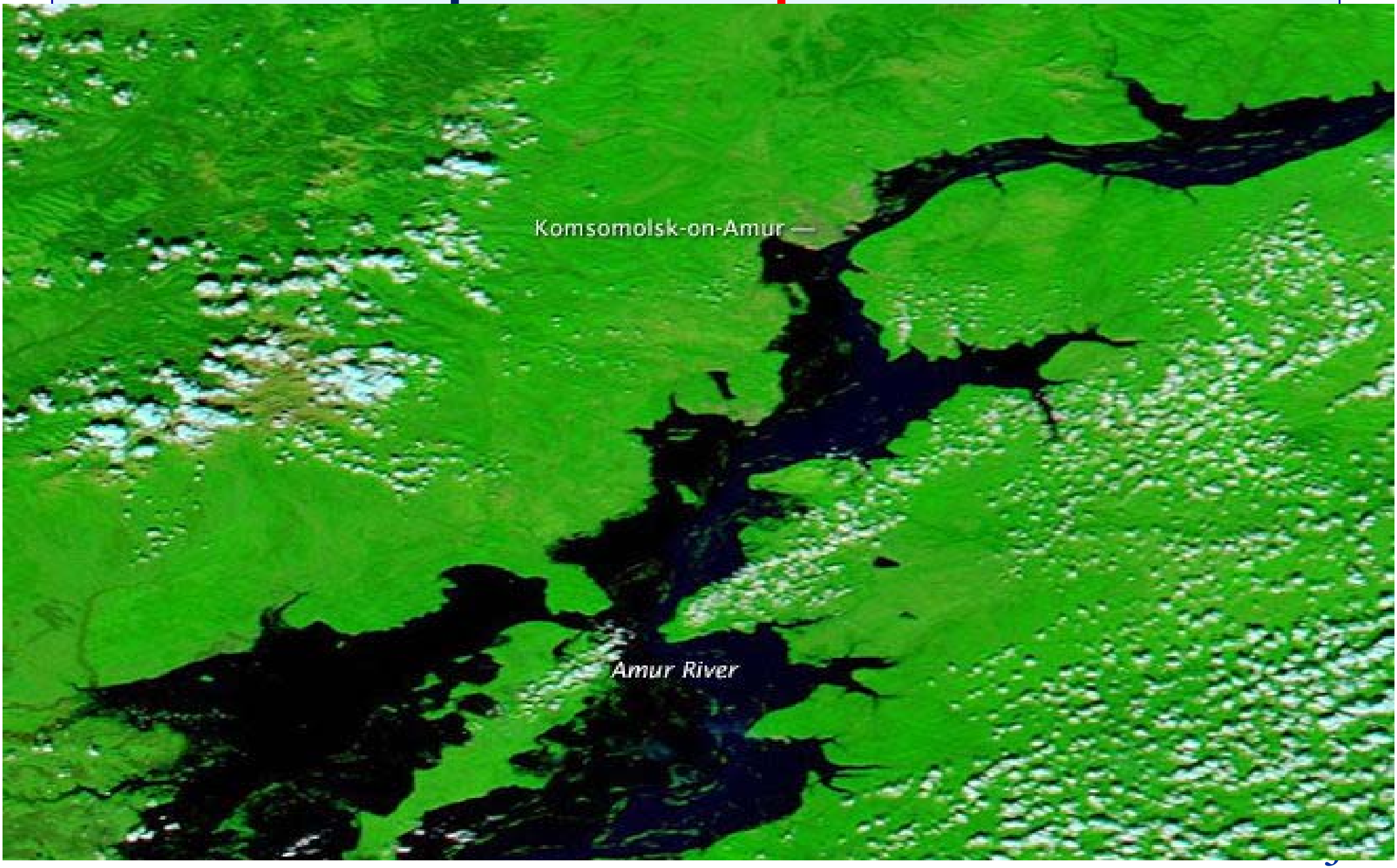
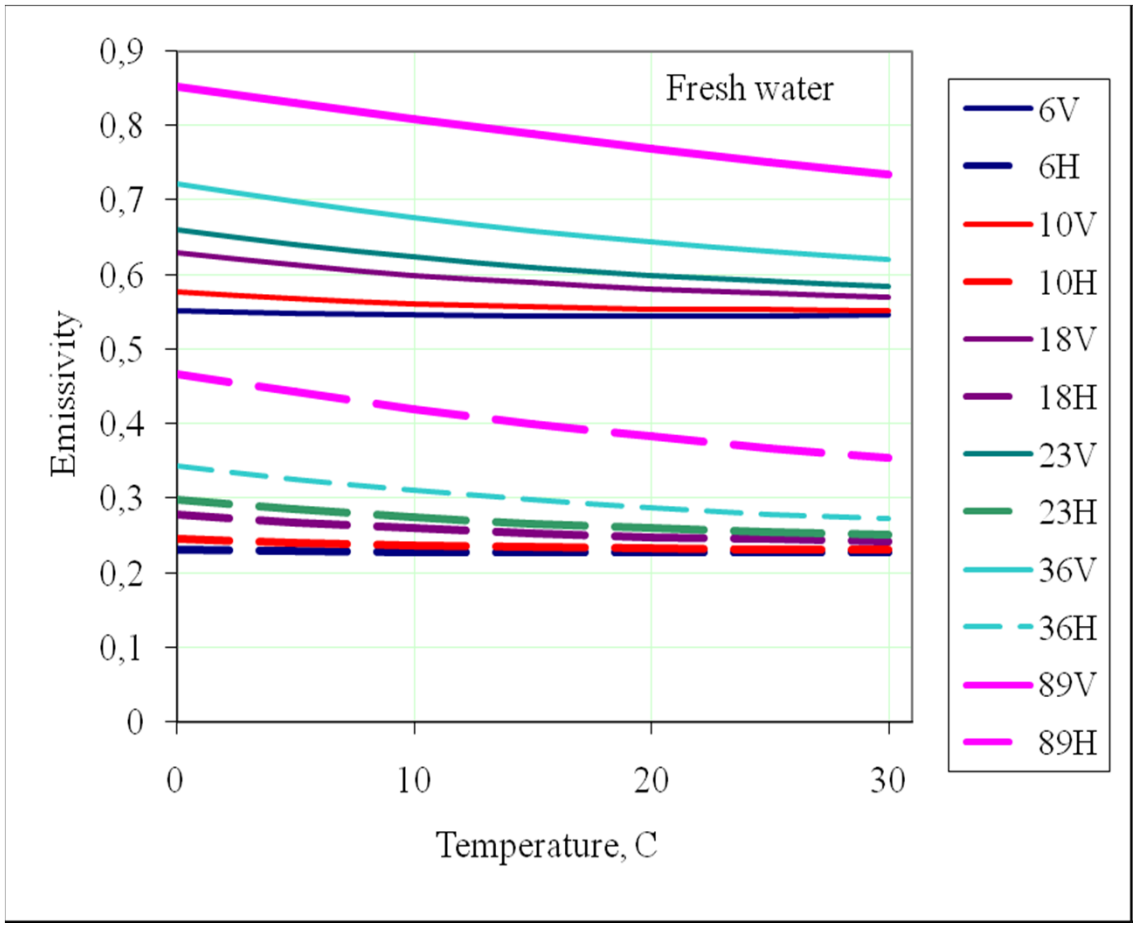
40
130
135
140
145
140 180 220 260
200 220 240 260 280
210 230 250 270
160 200 240 280
200 240 280
240 260 280
180 220 260
220 240 260 280

8 September. Aqua MODIS

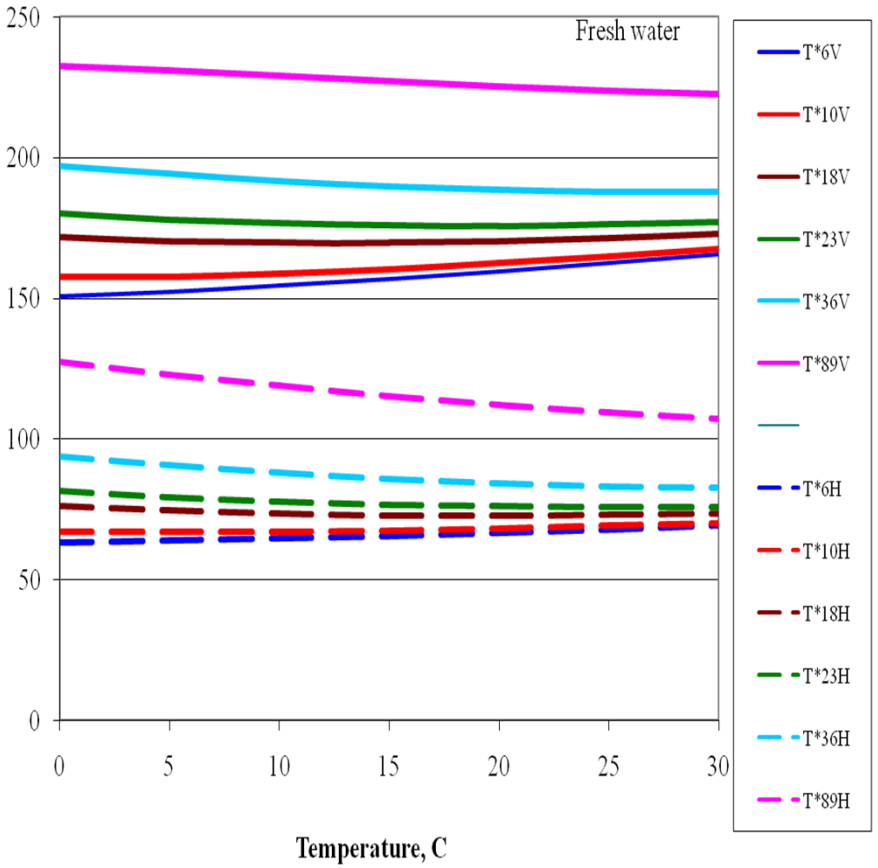


Hanka Lake

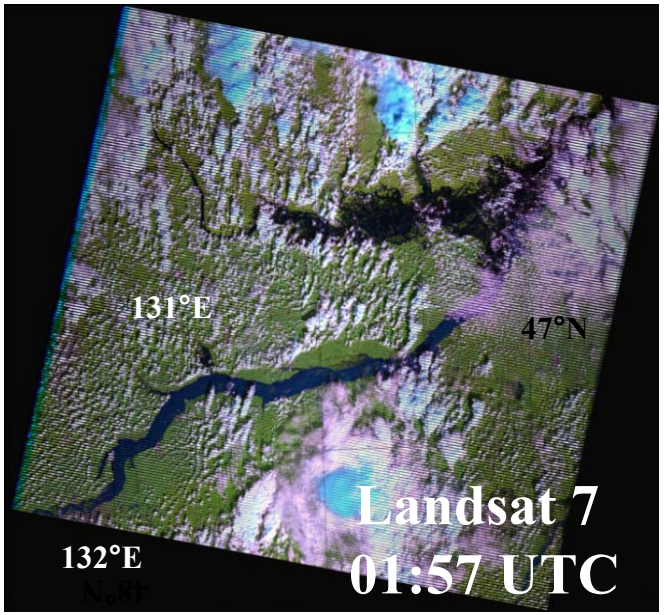
Fresh water emissivity

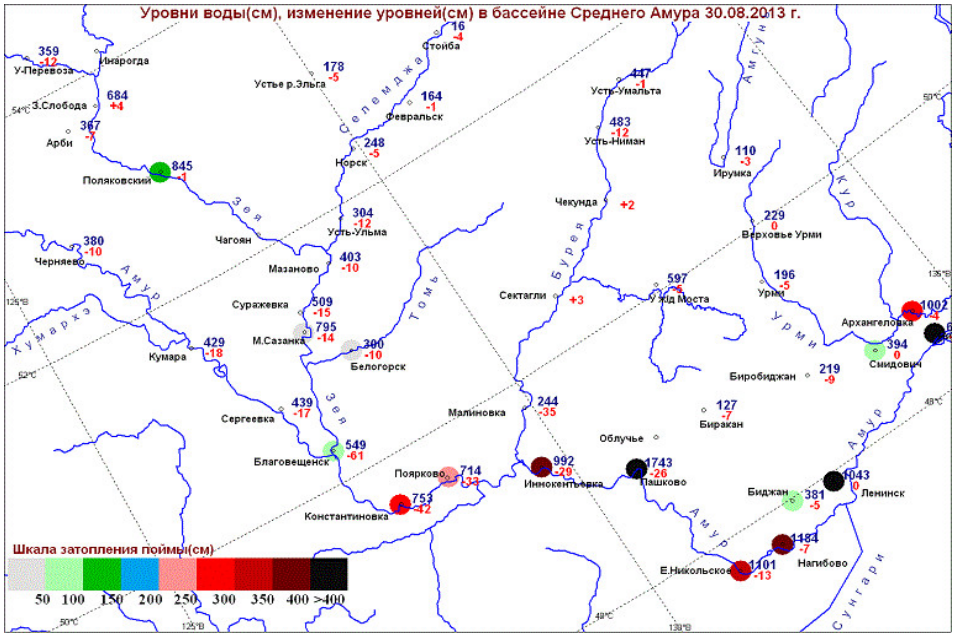


Brightness temperatures

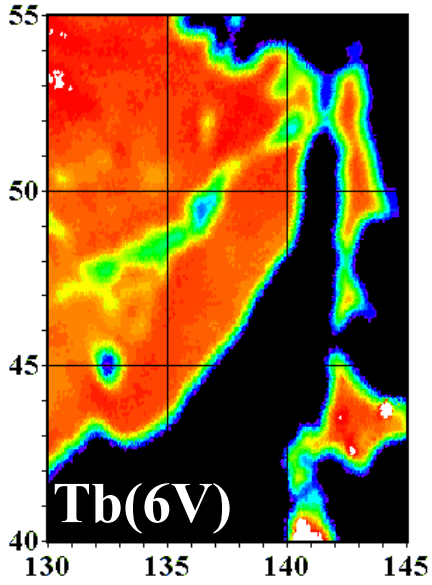


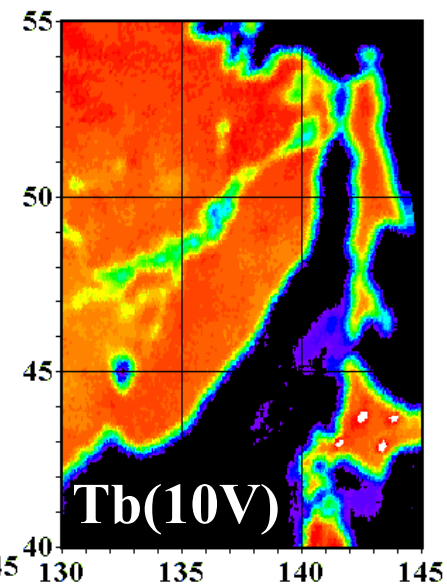
1 September

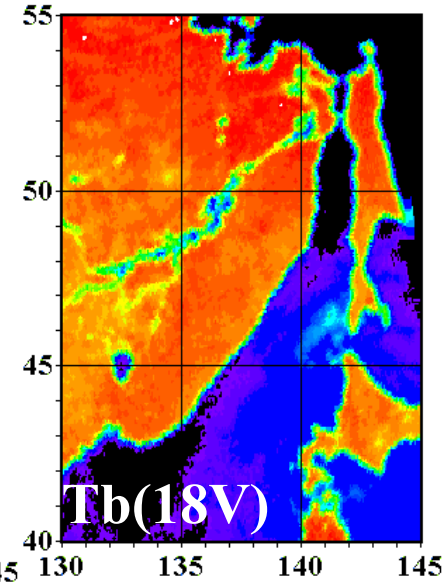


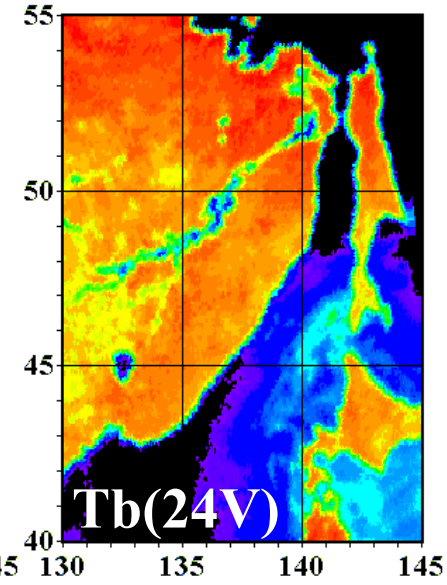


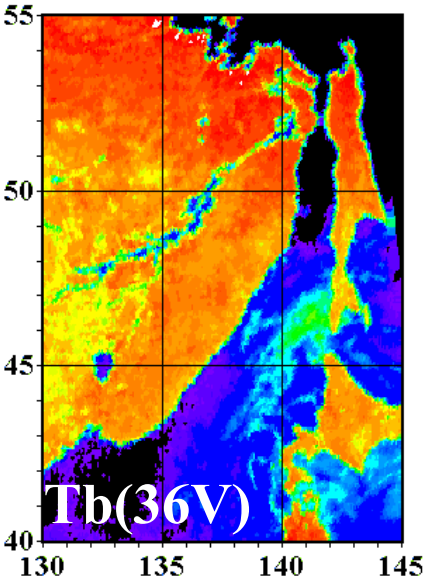
Amur level
Khabarovsk – 794 sm,
Blagoveshensk 489 cm
Zeya 501 cm.



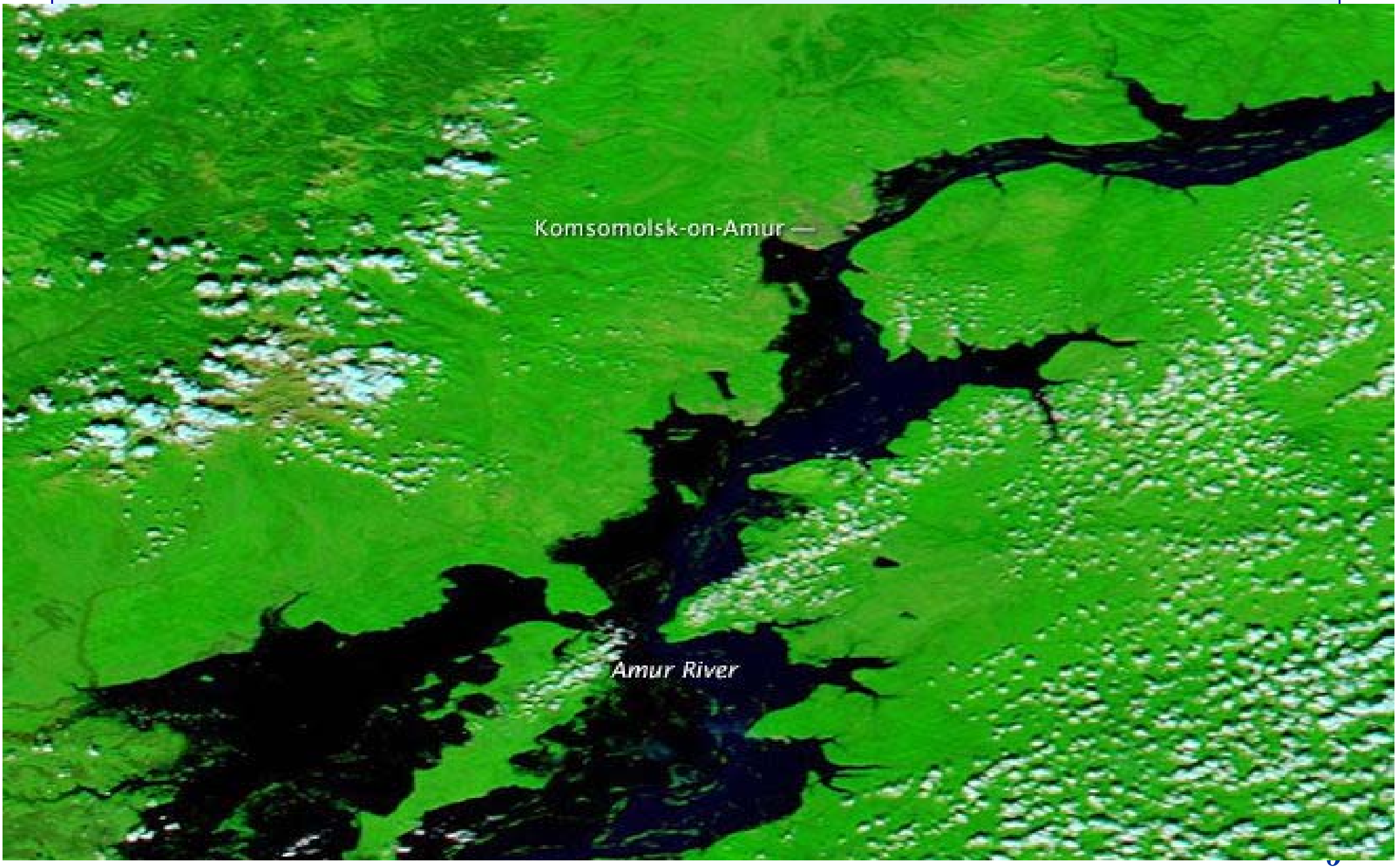


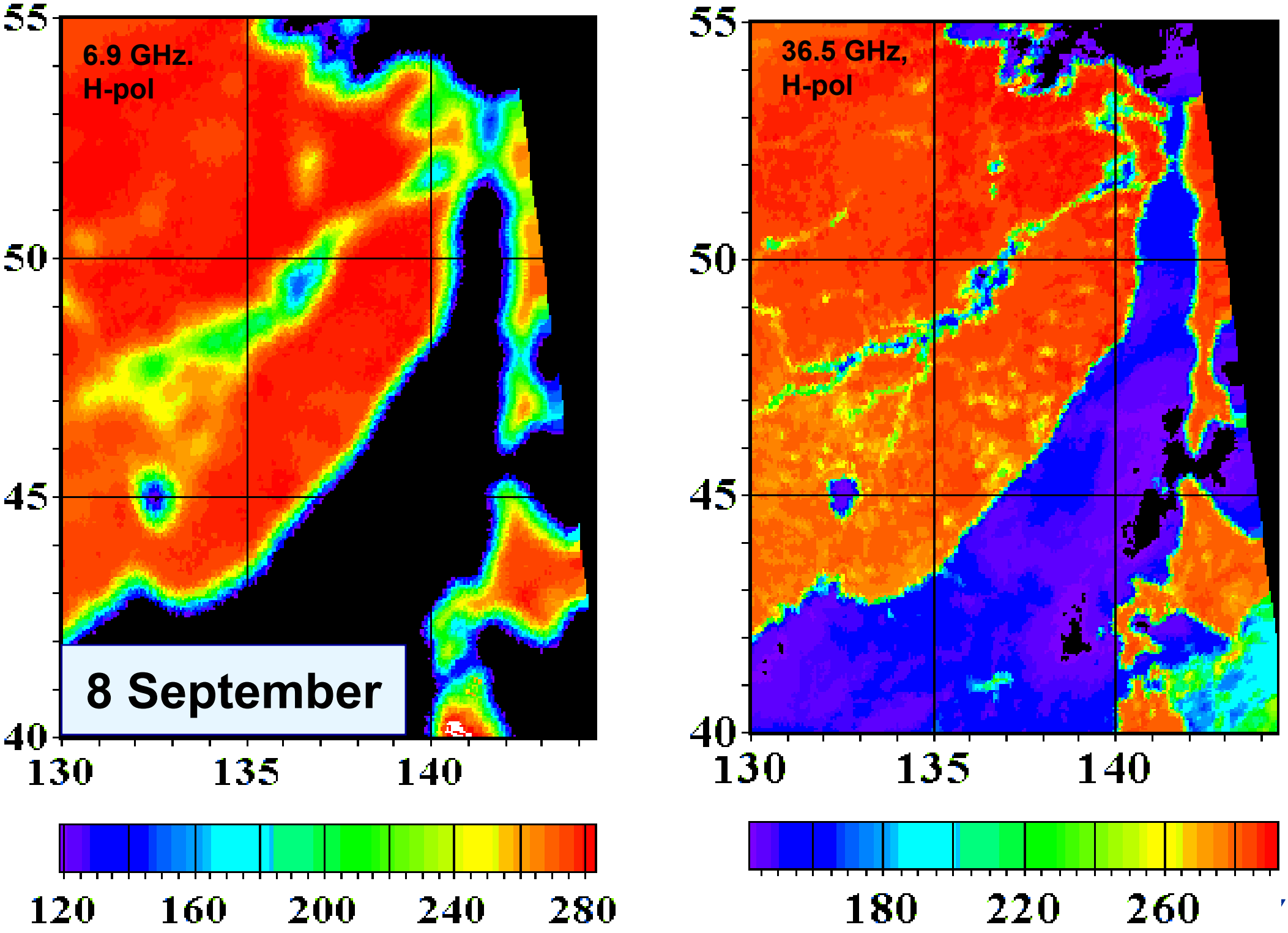






8 September. Aqua MODIS




6.9 GHz.
H-pol
36.5 GHz,
H-pol
8 September
55
50
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200
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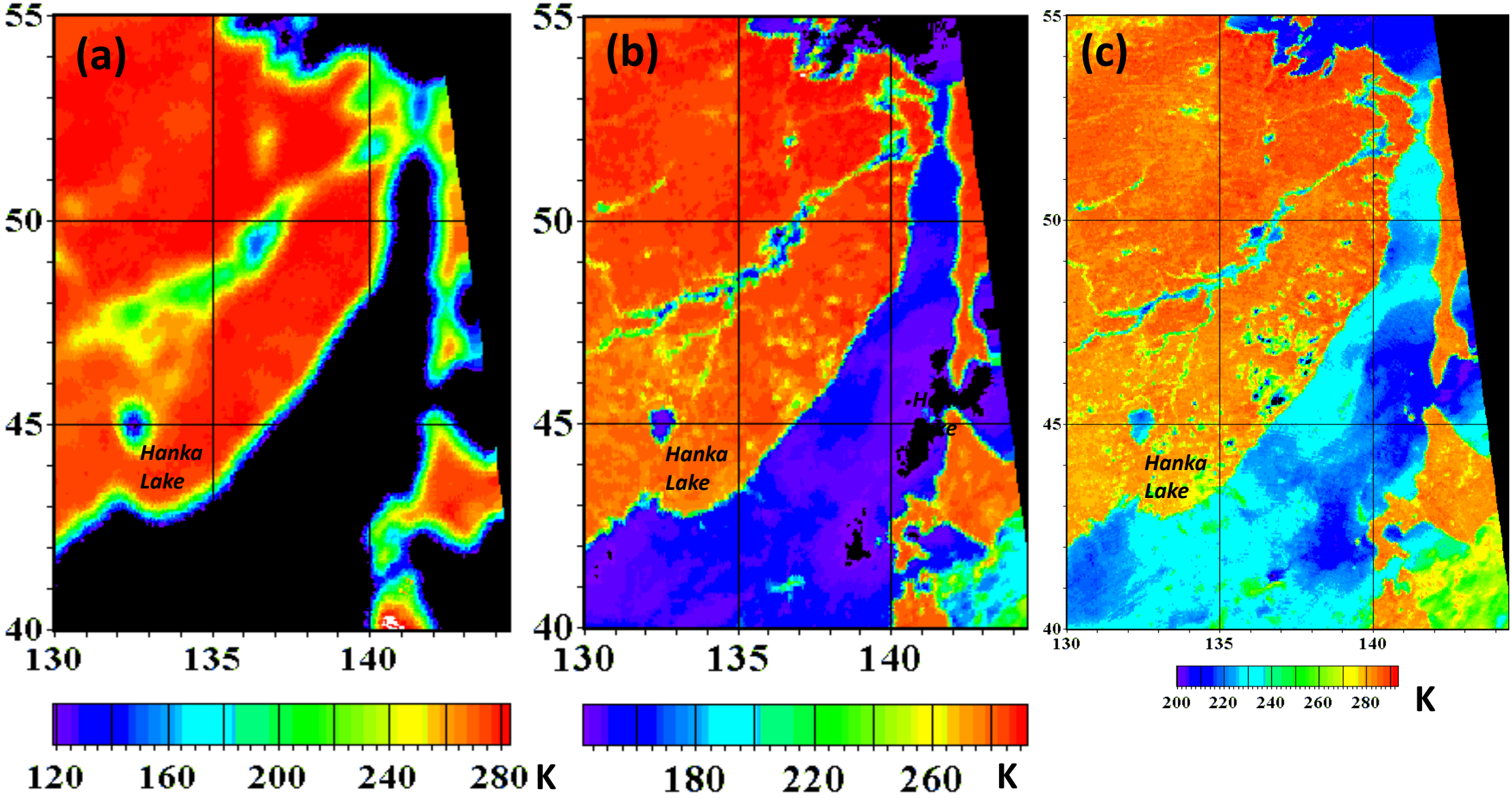
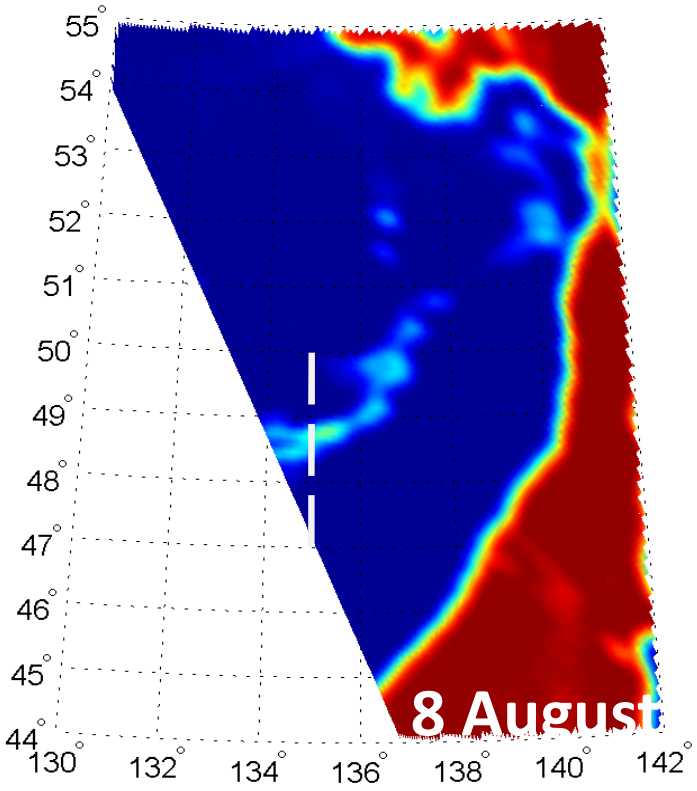
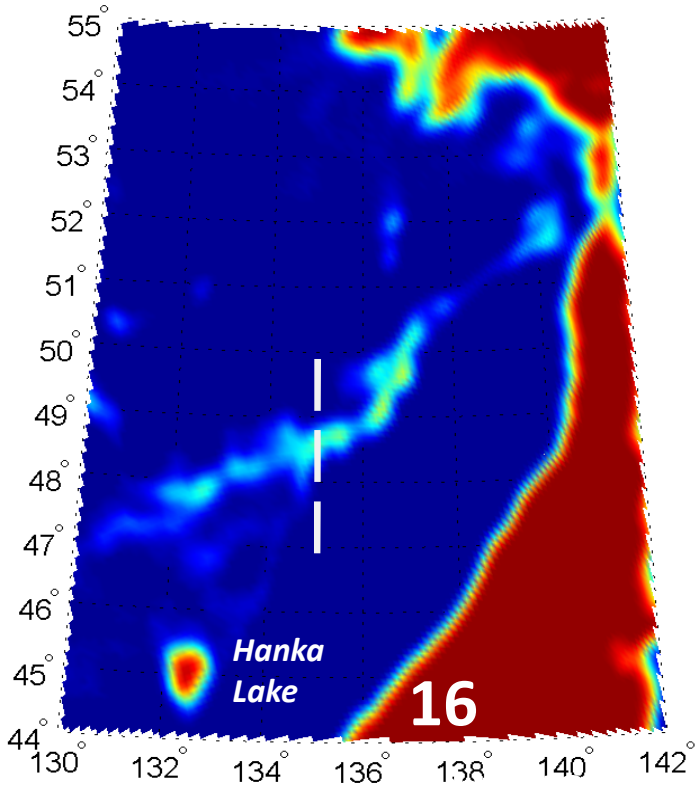
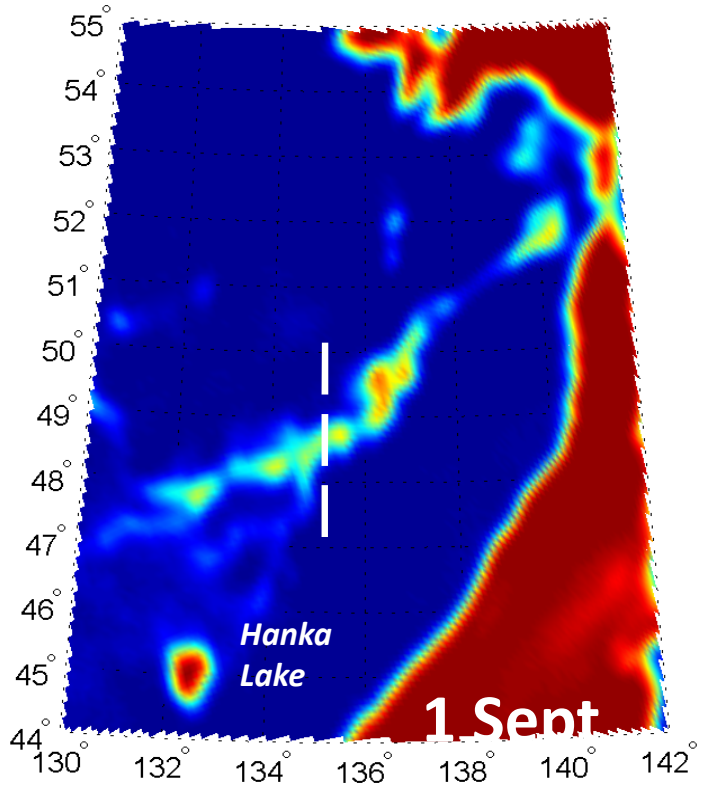
280
180
220
260

GCOM-W1 AMSR2 brightness temperatures with horizontal polarization at 6.9 GHz (a), 36.5 GHz (b) and 89.0 GHz (c). 8 September, 04:45 UTC





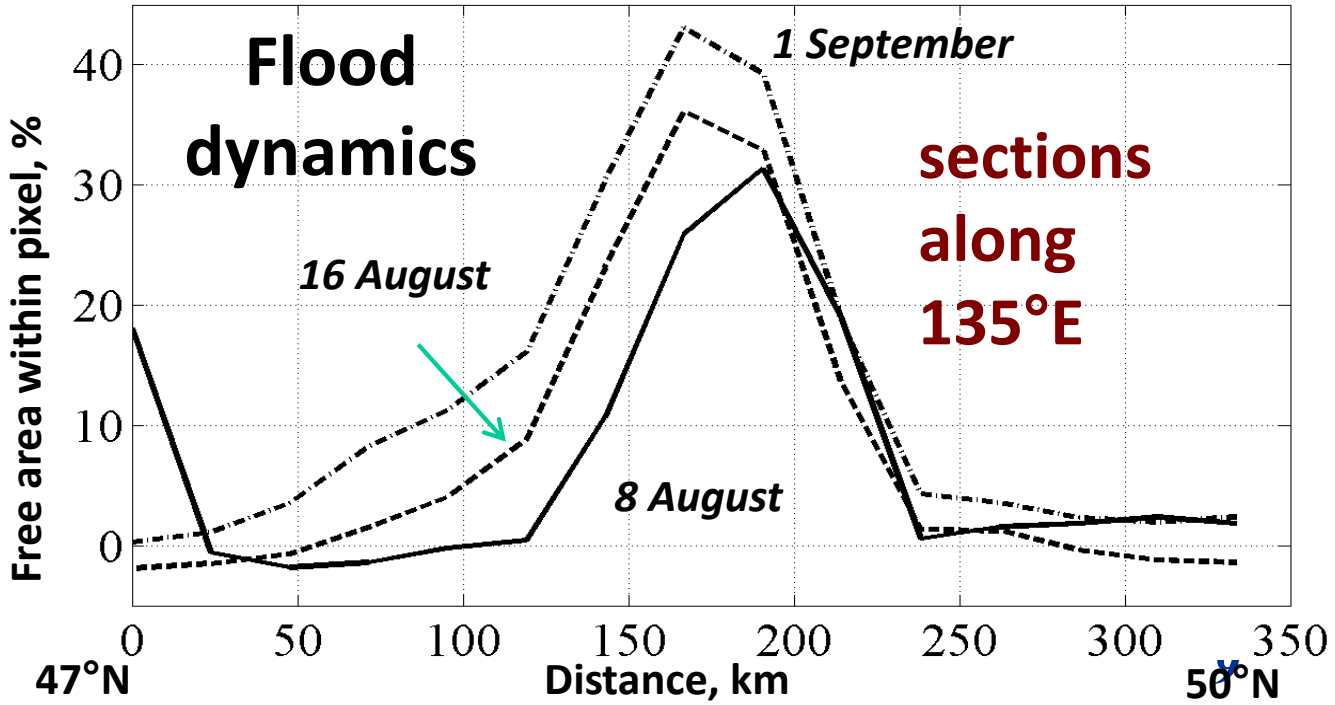


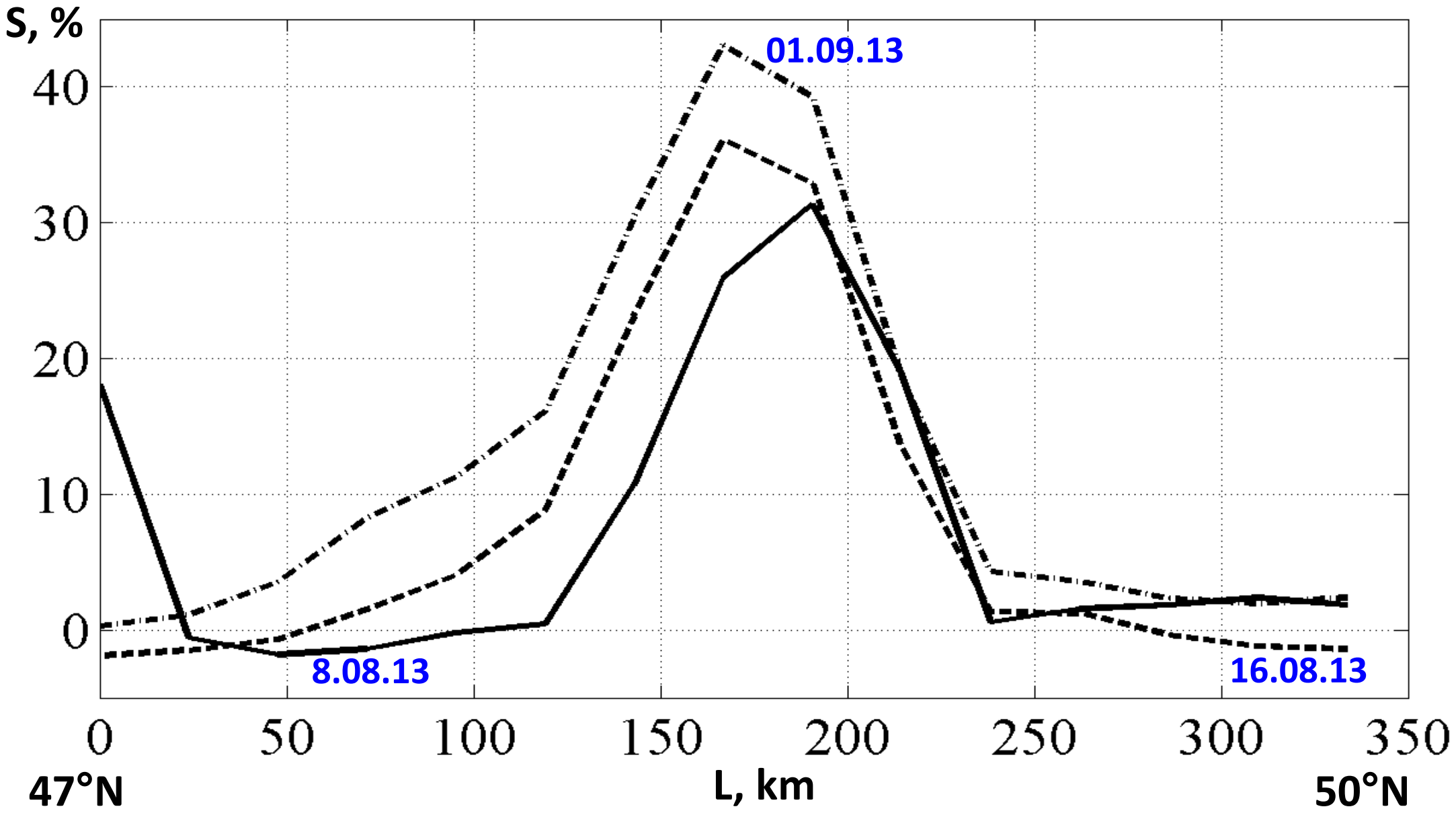


land

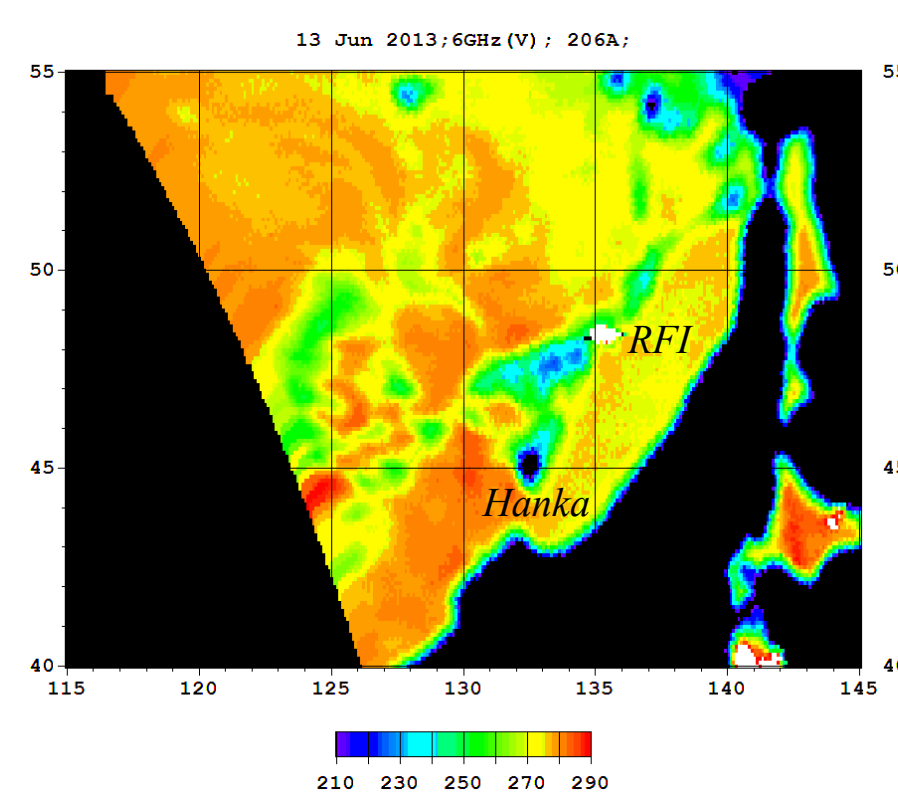
water

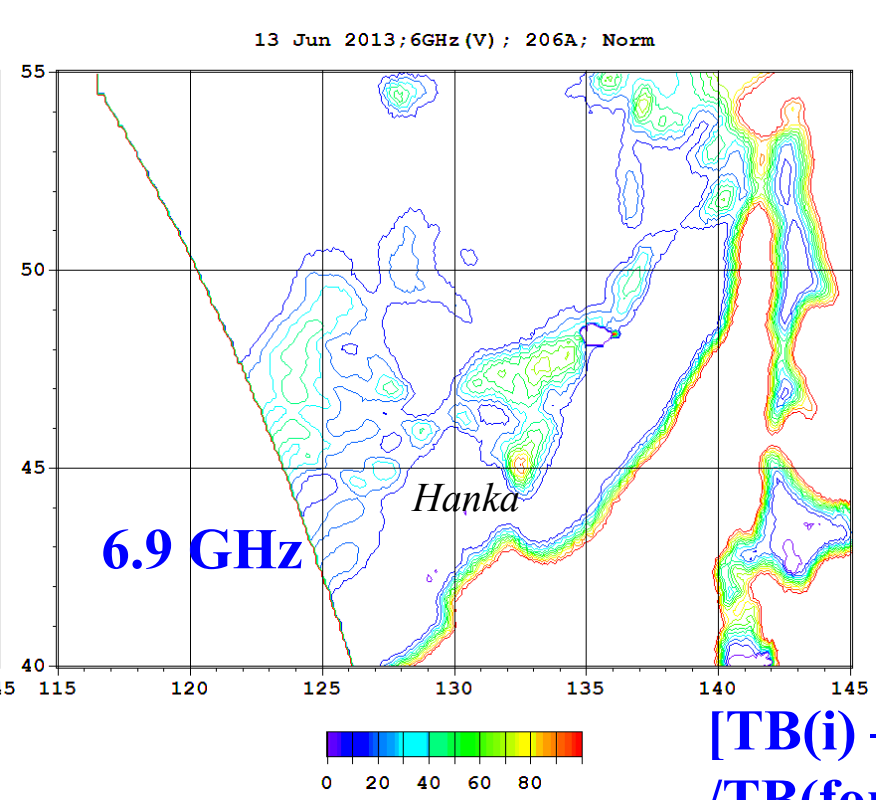
Free area within pixel, %





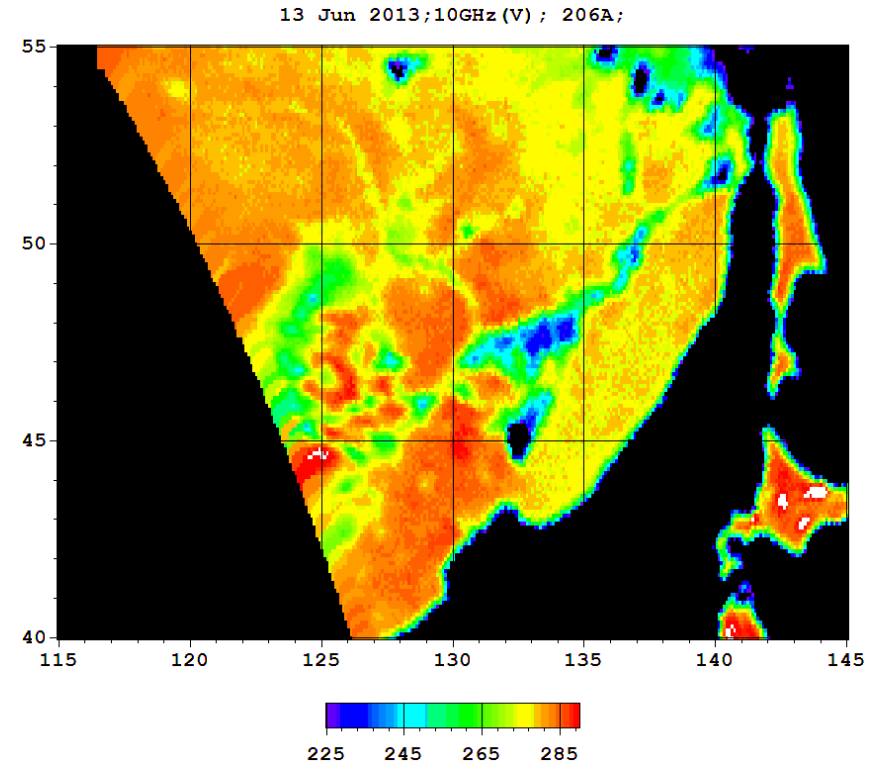
Section along 135°E

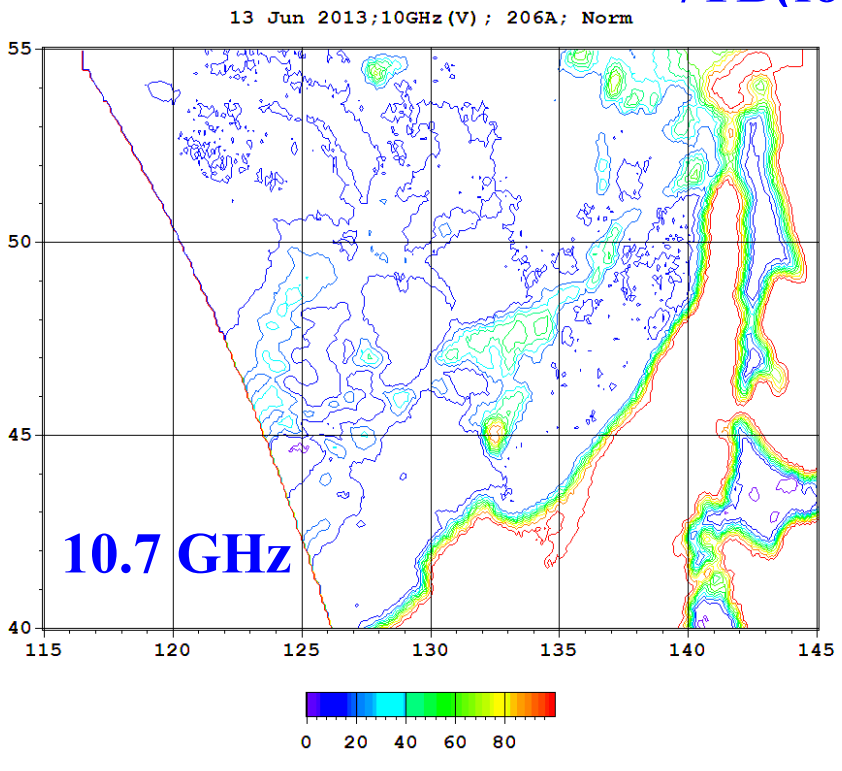




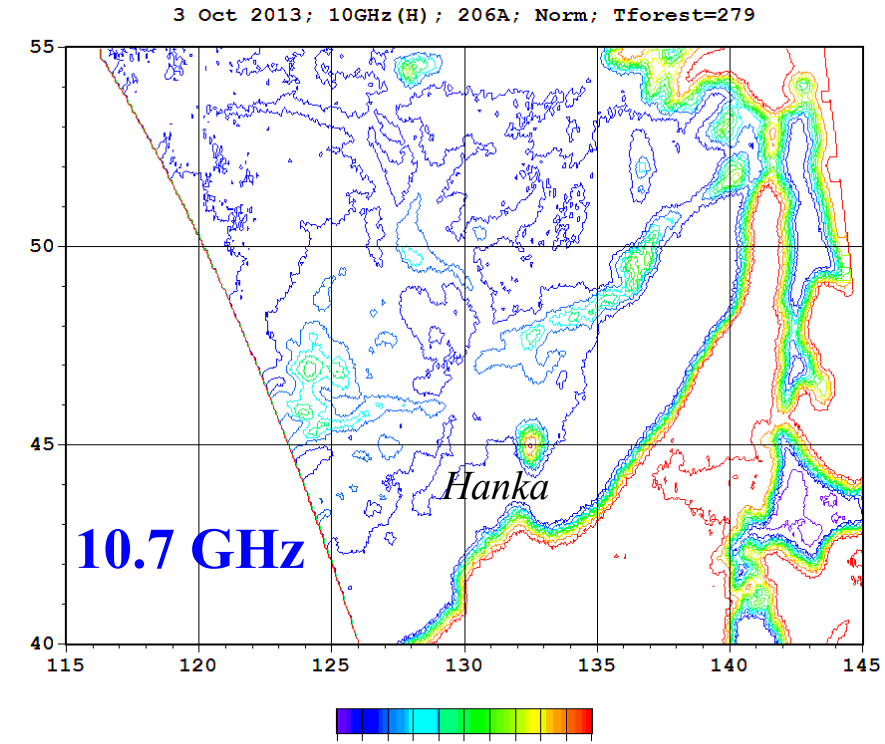
13 June 2013

[TB(i) – TB(lake)] /TB(for – TB(lake)

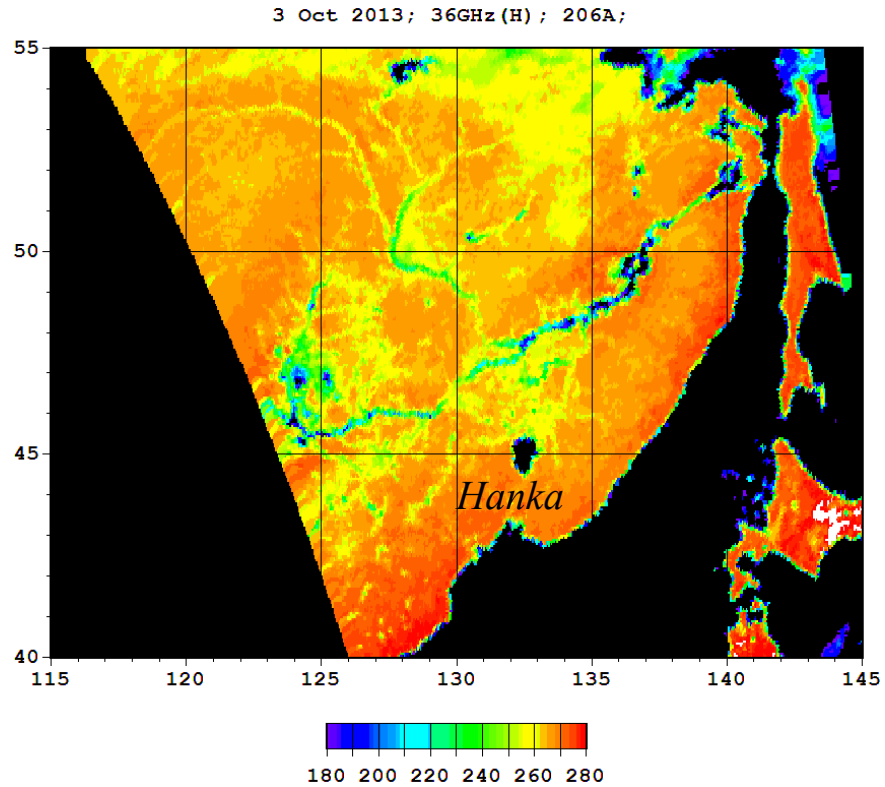


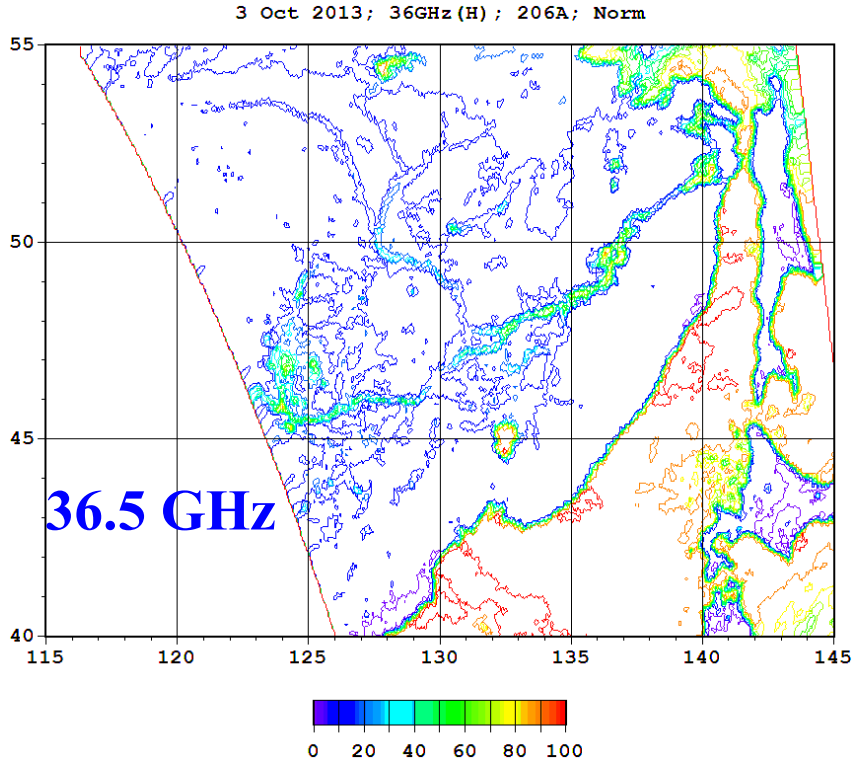


3 Oct 2013



[TB(i) – TB(lake)] /TB(for – TB(lake)





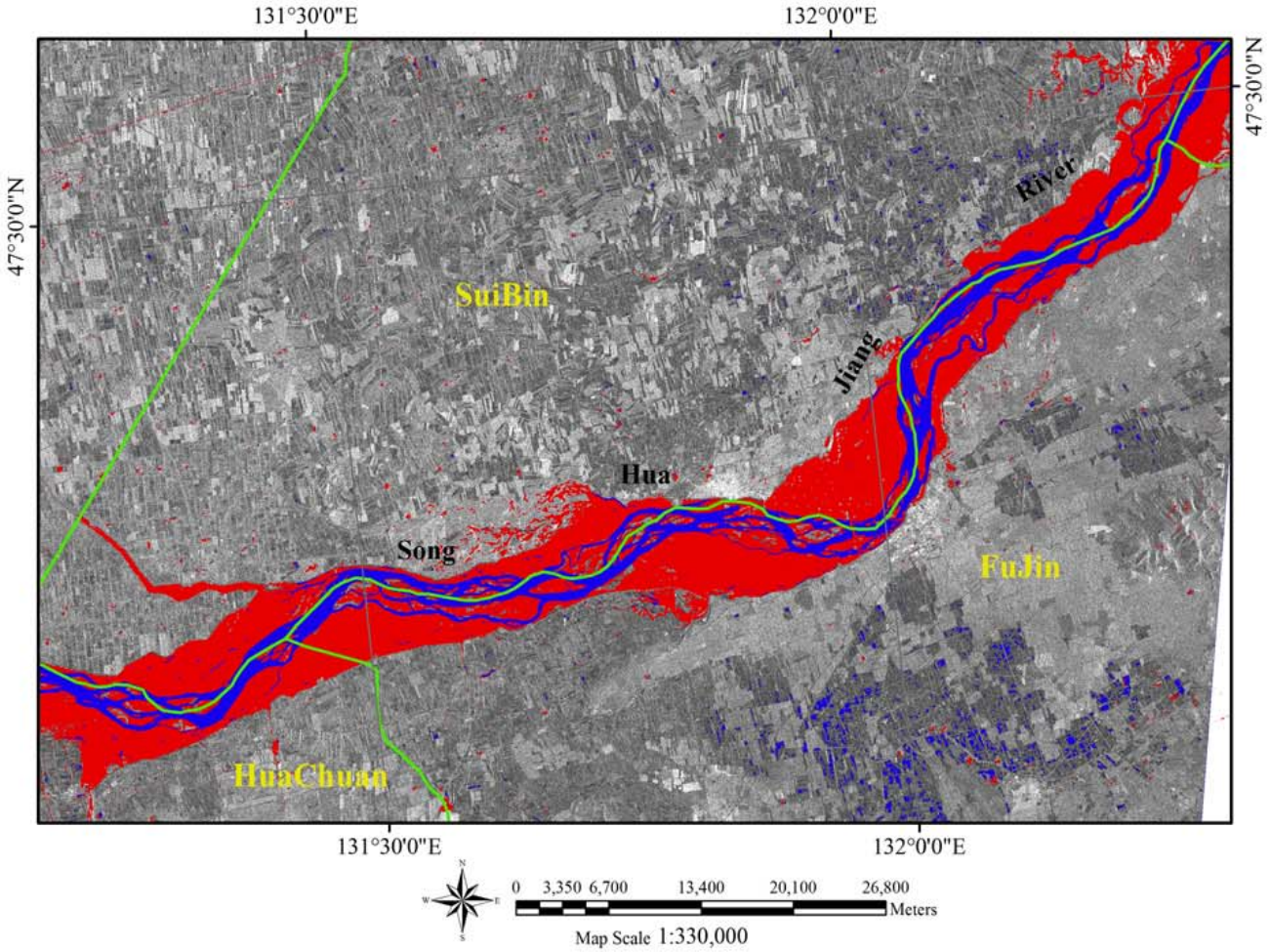
Flood in northeast China (August 2013)

Water surface extension at 2013-8-27

Song Hua Jiang River Basin

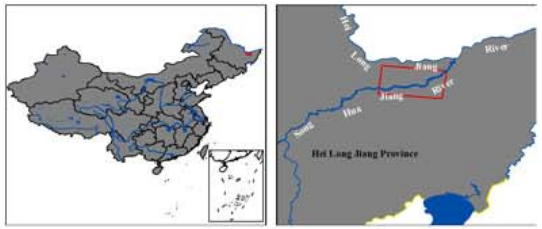
Charter Call ID: 447 Date: August 16, 2013

16 August. China. Charter



RADARSAT-2 before flood, RISAT -28 Aug 2013

Area Location



Legend

Satellite image extent — River — Lakes — Province Boundary

Post-Disaster Flooded Areas — Pre-Disaster Water Extent

Description

The post-disaster flood extent was obtained from RISAT-1 image in ScanSAR model with HH polarization at 18m resolution acquired at 27/8/2013 08:50 UTC.

The pre-disaster water extent was obtained from Radarsat-2 SAR in Multi-Look Fine with HH polarization at 12.5m resolution acquired at 28/6/2011 21:26 UTC.

The pre-disaster and post-disaster Water bodies which detected from Radarsat-2 and RISAT-1images are superposed to Radarsat-2 image (backscatter intensity values in gray scale).

Copyright

Cartographic Information

Map Projection: UTM
Datum: WGS84
Units: Meter

Map Production

Map was generated on August 2013
by the National Satellite Meteorological Center (NSMC),
China Meteorological Administration (CMA).
http://www.nsmc.cma.gov.cn/

The satellite data in this map were provided under the International Charter "'Space and Major Disasters".

Conclusion

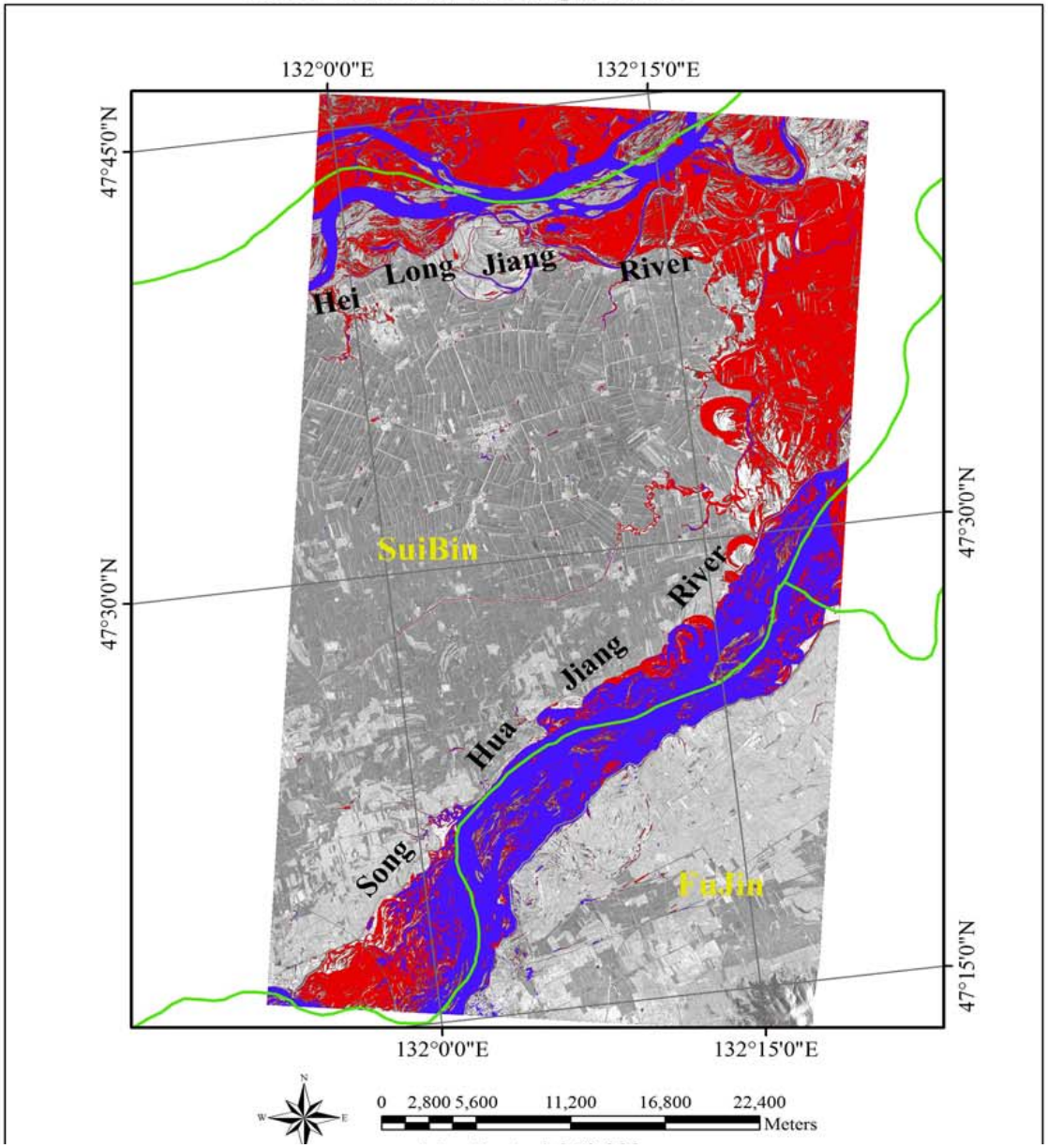
- AMSR2 measurements can be used for large-scale flood monitoring.
- Flood size and frequency reflect likely climate change.

Flood in northeast China (August 2013)

Water surface extension at 2013-8-19

Song Hua Jiang River and Hei Long Jiang River Basin

Charter Call ID: 447 Date: August 16, 2013



Area Location

Legend

Satellite image extent — River — Lakes — Province Boundary

Post-Disaster Flooded Areas — Pre-Disaster Water Extent

Description

The post-disaster flood extent was identifieded from TerraSAR-X in Strip model with HH polarization at 3.25m resolution acquired at 22/8/2013 21:24 UTC.

The pre-disaster water extent was estimated from Landsat-8 image at 30m resolution acquired at 23/7/2013 04:48 UTC.

The pre-disaster and post-disaster Water bodies which detected from Landsat-8 and TerraSAR-X images are superposed to TerraSAR-X image (backscatter intensity values in gray scale).

Copyright

Cartographic Information

Map Projection: UTM
Datum: WGS84
Units: Meter

Map Production

Map was generated on August 2013
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http://www.nsmc.cma.gov.cn/

The satellite data in this map were provided under the International Charter "Space and Major Disasters".

Landsat-8 before flood, TerraSAR -19 Aug 2013

Между поверхностным притоком воды в речную сеть g и объёмом воды W, находящемся на поверхности бассейна, существует близкая к функциональной связь

$$g = f(\omega)$$

С другой стороны, между площадью бассейна, покрытой водой ω, и W также имеет место близкая к функциональной связь

$$W = \varphi(\omega).$$

Отсюда

$$g = \varphi(\omega).$$

Таким образом, для определения притока поверхностных вод в речную сеть нужно решить две задачи:

1)определить долю площади бассейна, покрытую водой,

2)раскрыть форму связи между размерами этой площади и притоком воды в речную сеть.

Г.П. Калинин, Ю.В. Курилова, П.А. Колосов. ***Космические методы в гидрологии*****. Л. Гидрометеоиздат. 1977. 184 с.**

Landsat-8

Satellite Landsat-8 spacecraft has been launched on 11 February 2013 on sun-synchronous orbit the altitude of 705 km, inclined orbit 98,2°. Landsat 8 carries two push-broom sensors: the Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS). The OLI collects data in 9 shortwave bands — 8 spectral bands at 30-m resolution and one panchromatic band at 15 m. The TIRS captures data in two long wave thermal bands with 100-m resolution.

GCOM-W1 “Shizuku”

Запущен 18 мая 2012.

Major characteristics of AMSR2

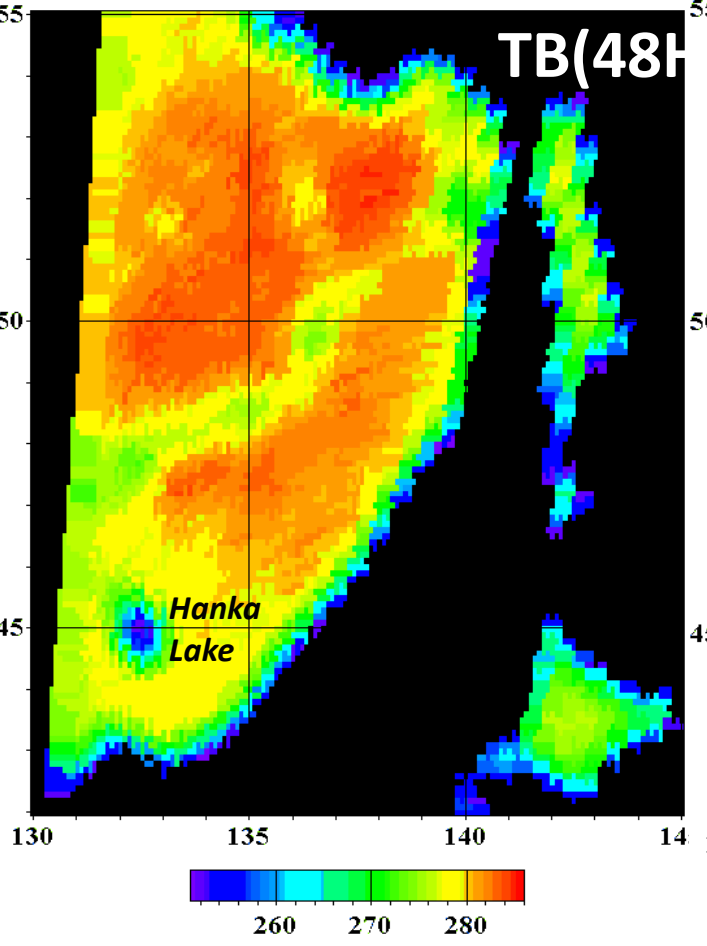
- Deployable main reflector system with 2.0 m diameter.
- Frequency channel set is identical to that of AMSR‐E except 7.3 GHz channel for helping RFI mitigation.
- Two‐point external calibration with the improved HTS (hot‐load).
- Deep space calibration maneuver to check consistency between main reflector and Cold Space Mirror (CSM)

GCOM-W1/AMSR2 characteristics	
Scan and rate	Conical scan at 40 rpm
Antenna	Parabola with D = 2.0 m
Swath width	1450 km
Incidence angle	Nominal 55 degrees
Digitization	12 bits
Dynamic range	2.7-340 K
Polarization	Vertical and horizontal

AMSR2 Channel Set				
Frequency [GHz]	Band width [MHz]	Pol.	Beam width [deg] (ground res. [km])	Sampling interval [km]
6.925/7.3	350	V and H	1.8 (35 x 62)	10
10.65	100		1.2 (24 x 42)	
18.7	200		0.65 (14 x 22)	
23.6	400		0.75 (15 x 26)	
36.5	1000		0.35 (7 x 12)	
89.0	3000		0.15 (3 x 5)	5

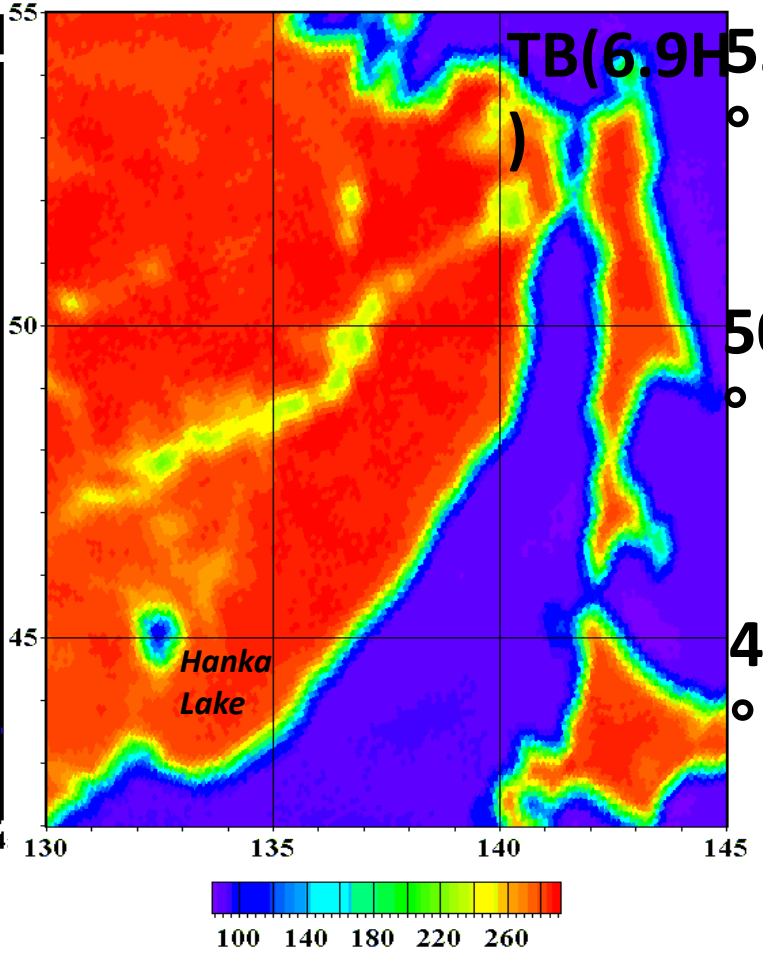
2 August 2013

Meteor –M N 1 MTVZA-GYa



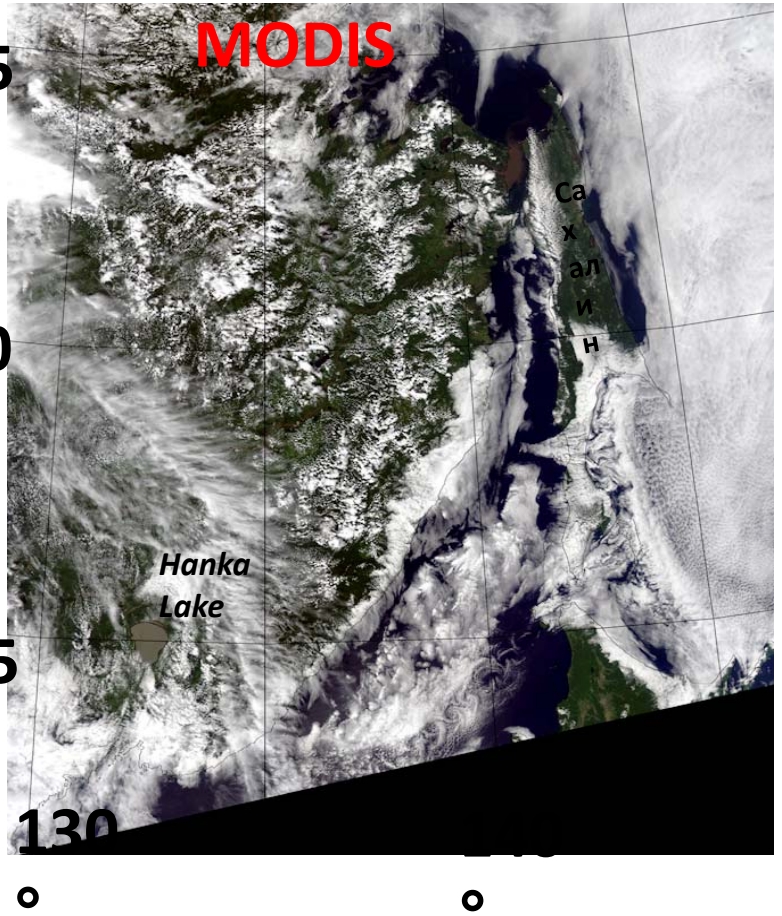
00:50 UTC

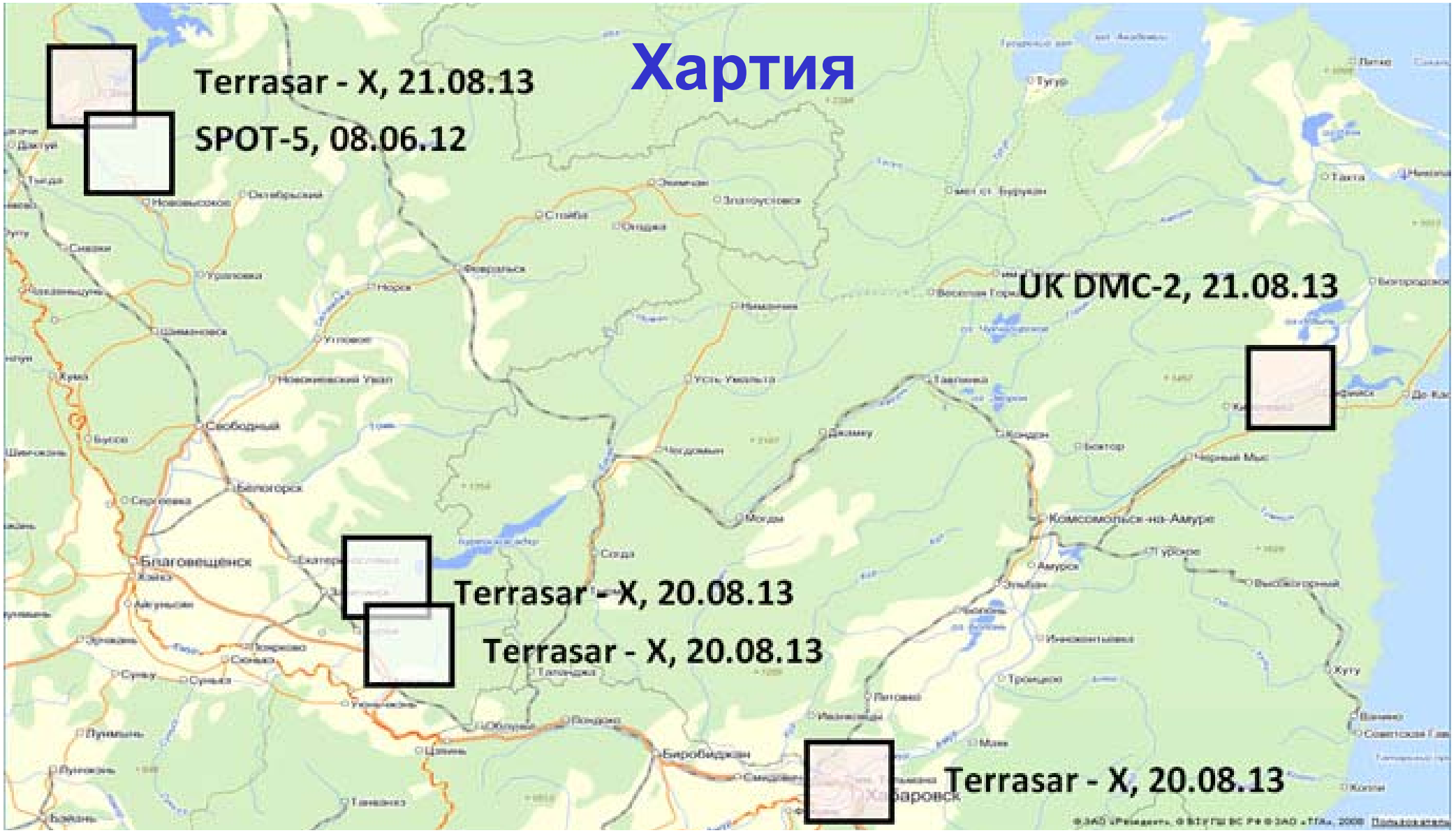
GCOM-W1 AMSR2



03:50 UTC

Aqua MODIS





Вся информация после первичной обработки в НЦ ОМЗ была оперативно передана в НЦУКС МЧС России. Поставки данных ДЗЗ от участников Хартии будут продолжаться до тех пор, пока в этом будет практическая необходимость. Images and/or Image product Delivered under the Charter will be published here as soon as they become available