

Tartu, Estonia, 19-20 June 2012

**REGIONAL CLIMATE CHANGE AND
COMPLEX SATELLITE MONITORING OF
TRANSBOUNDARY WATERS OF RUSSIA
AND ESTONIA**

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Lake Chudskoe-Pskov/Peipus



What can we do?

1. Satellite information

True Color, SST, Chl, WLR, ice, water level, shape, volume change

2. Regional climate change

Air and surface T, atm pressure, wind, solar radiation, precipitation, humidity, cloudiness

3. Operational weather and forecast

Main meteo parameters, forecast for every 3 hours

4. Satellite monitoring of the Gulf of Finland

Oil pollution, suspended matter, transboundary transport, Lukoil D-6 oil platform, Nord Strea gas pipeline (2010-2012)

5. Numerical modelling (Seatrack Web Model)

1. Satellite information

Daily MODIS-Terra and MODIS-Aqua, True color, SST, Chl, WLR, 250-1000 m



4 July 2011



22 July 2011



27 July 2011

28 December 2011

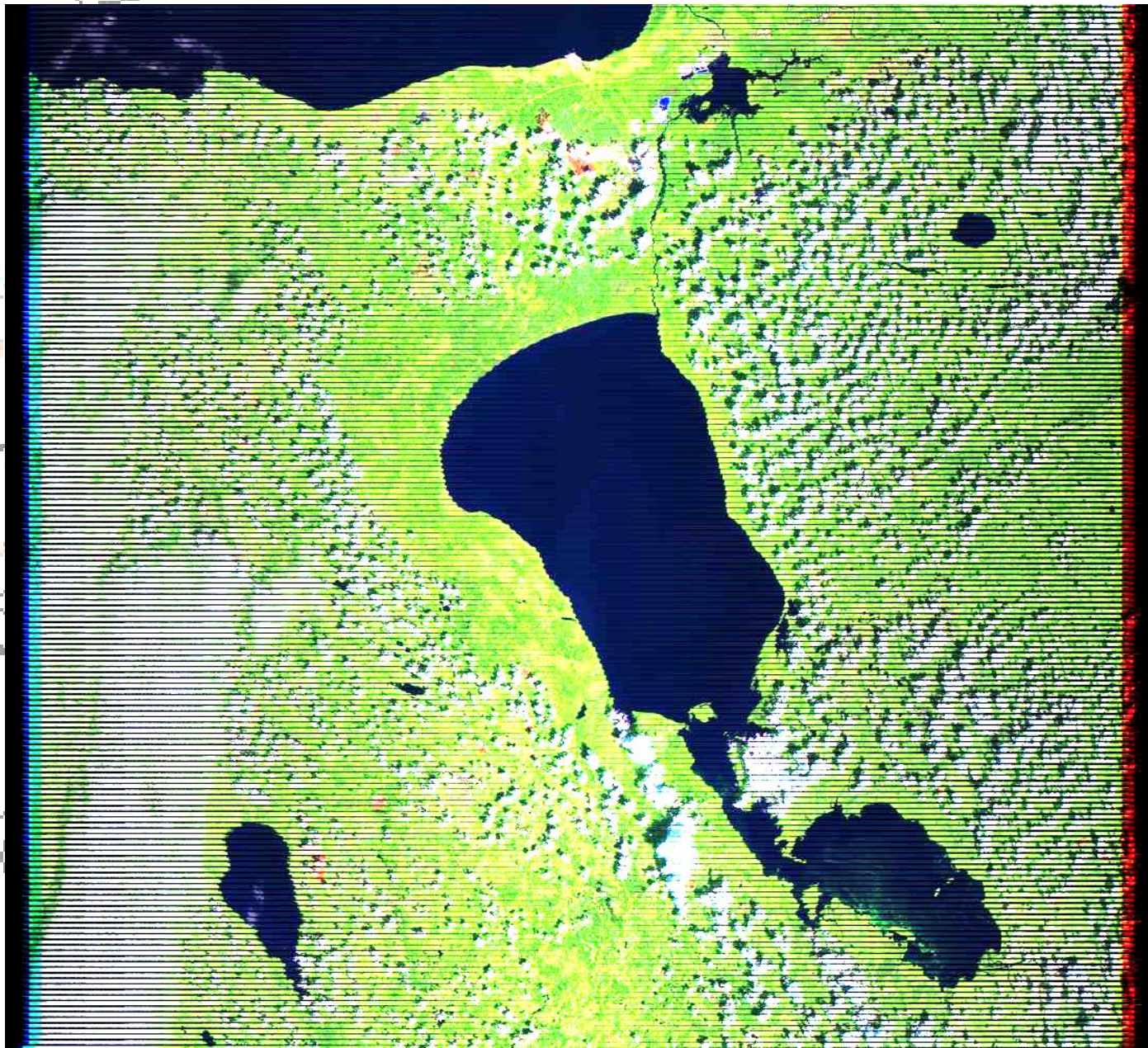
31 January 2012

25 May 2012



Daily MODIS-Terra and MODIS-Aqua, True color, SST, Chl, WLR, 250-1000 m

LANDSAT 11 July 2011, 20 m resolution

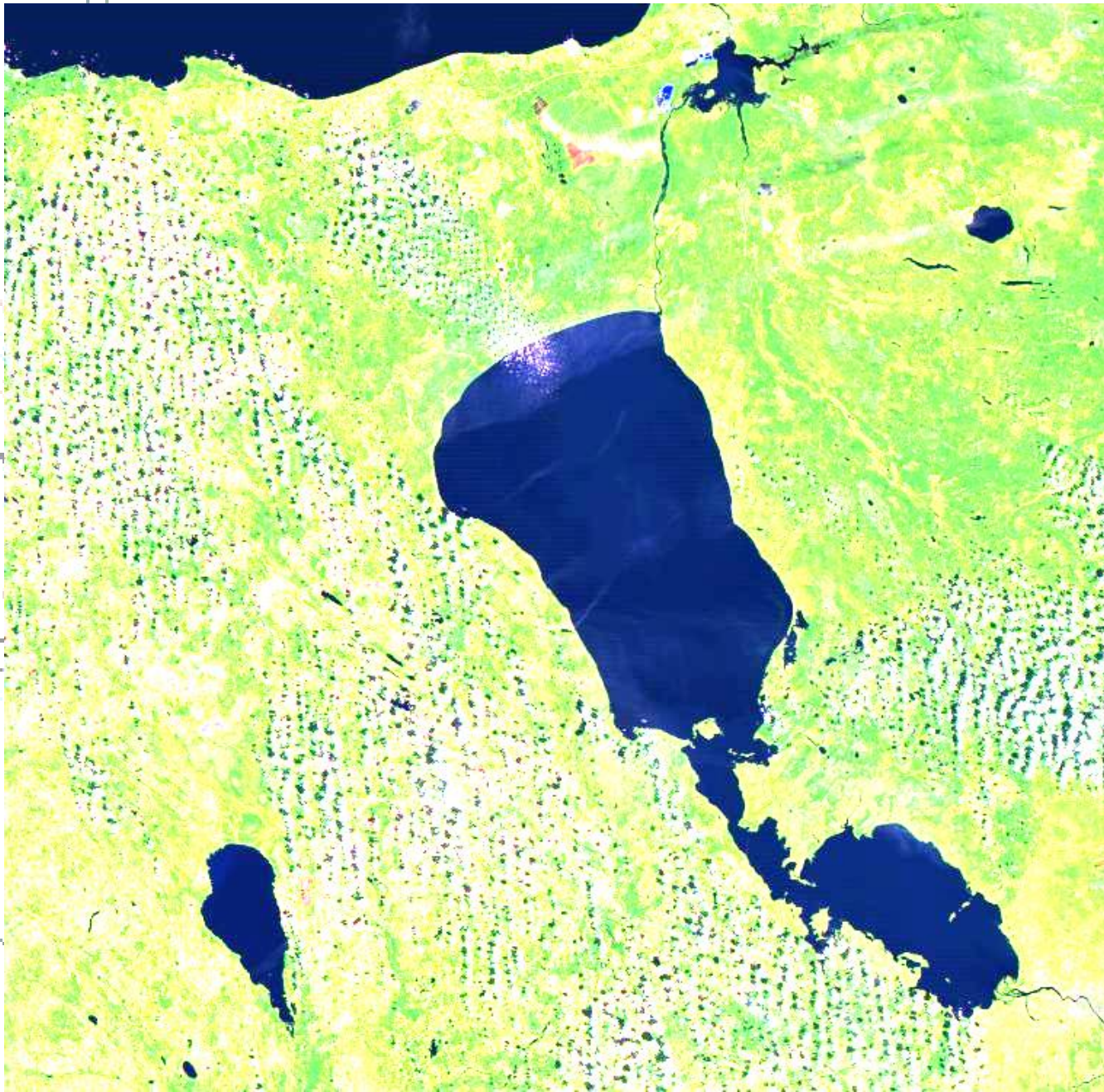


Narva

la-
e

RUSSIA

LANDSAT 5 September 2011, 20 m resolution



Narva

kla-
ve
a

RUSSIA

Hiuma

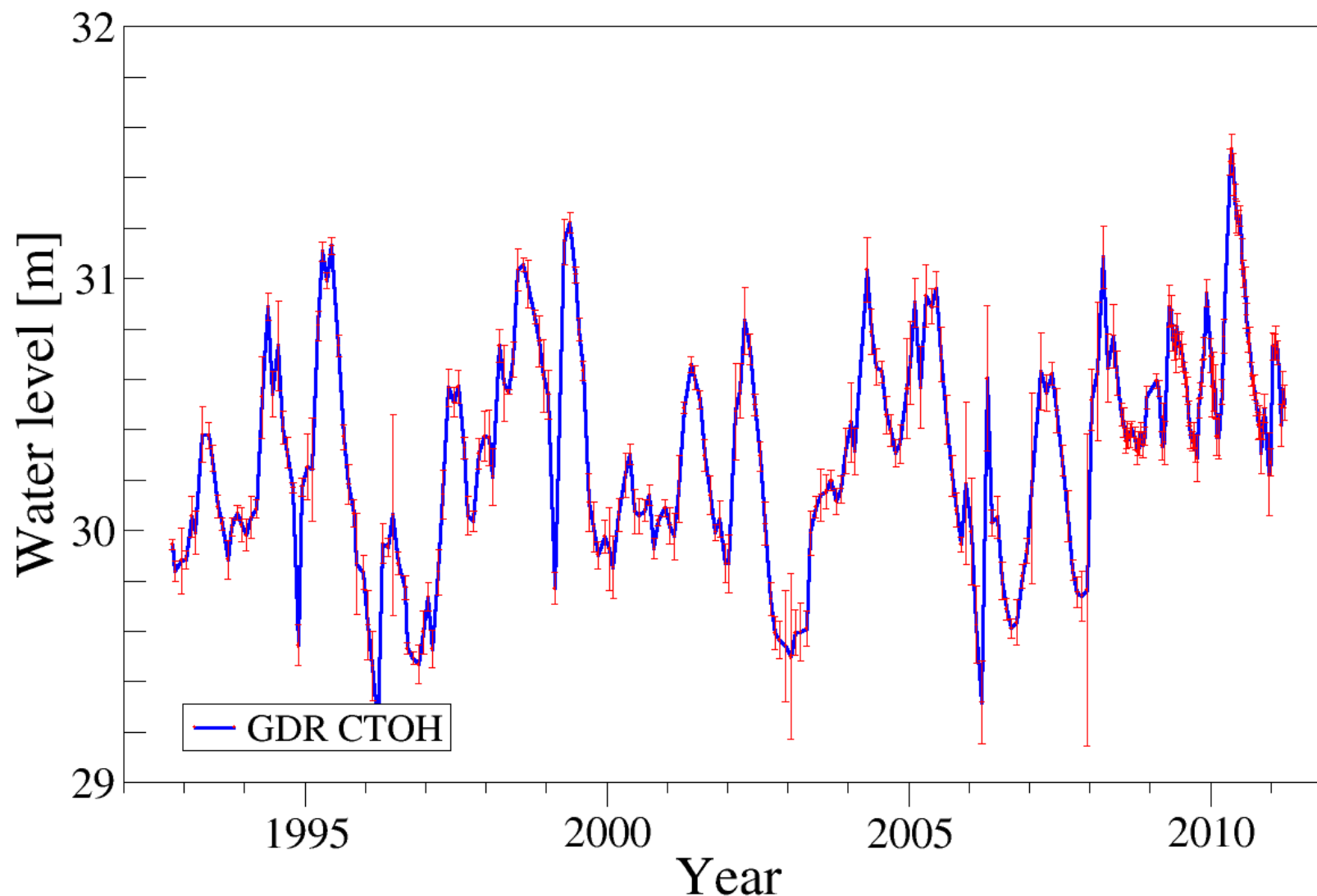
Saaremaa

Kur



<http://www.legos.obs-mip.fr/soa/hydrologie/hydroweb/index.html>

Lake Peipus lat=58.00 lon=28.00



2. Regional Climate Change Analysis

NASA

**Goddard Earth Sciences Data and Information
Services Center**

Global Land Data Assimilation System

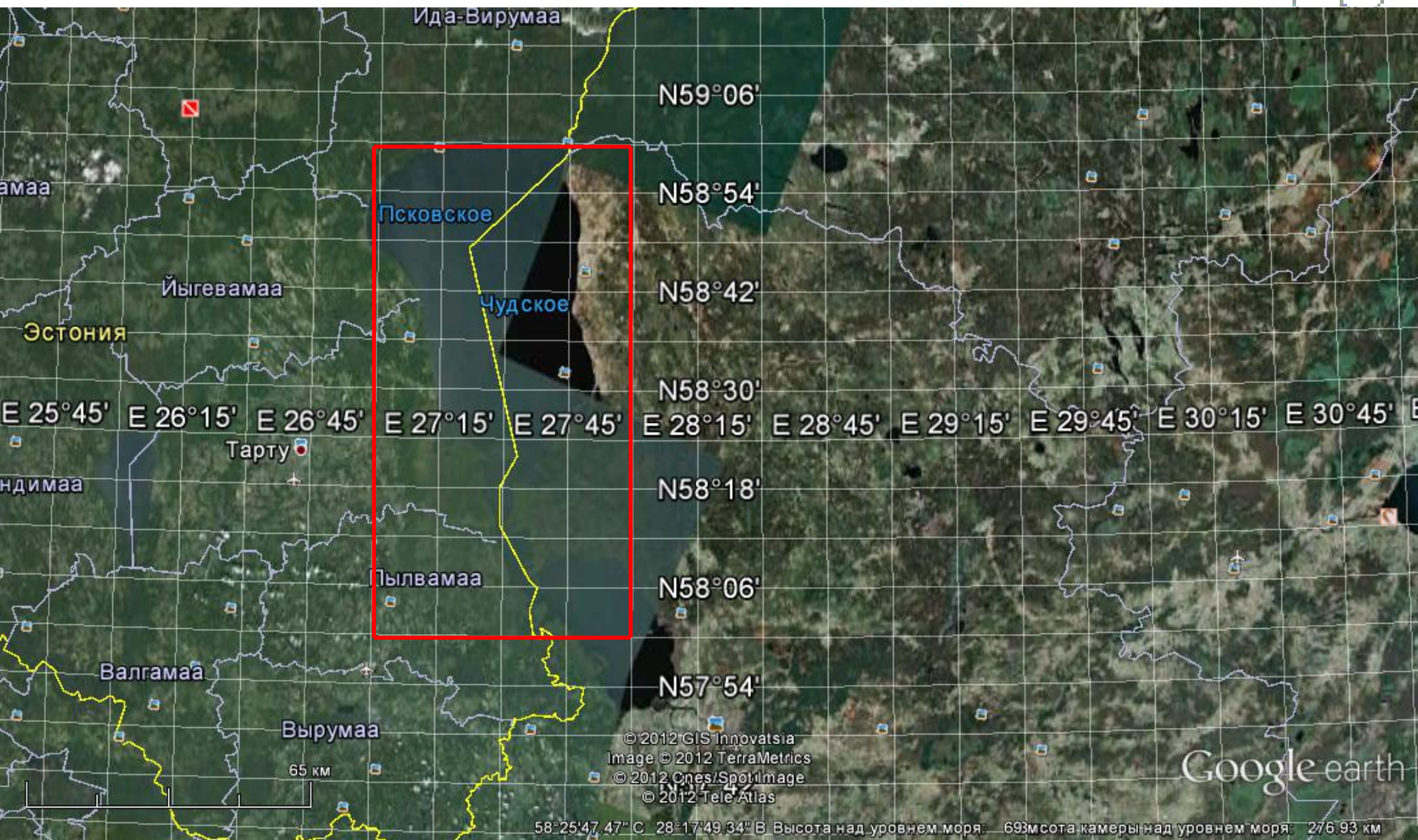
Model: GLDAS-1, NOAH10_M.001

1 Degree Monthly Product

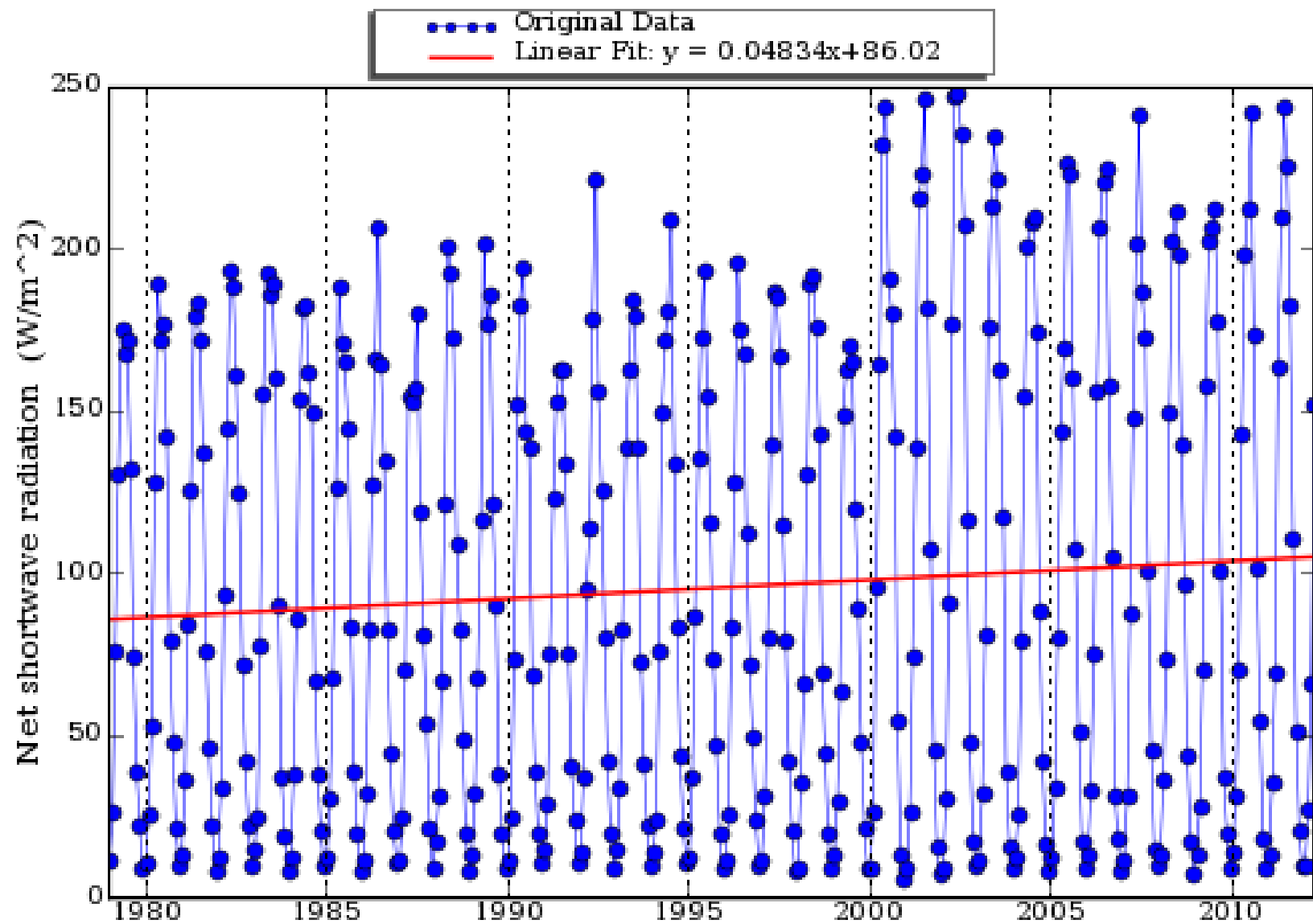
Period: January 1979 –April 2012

Area: 27-28E, 58-59N

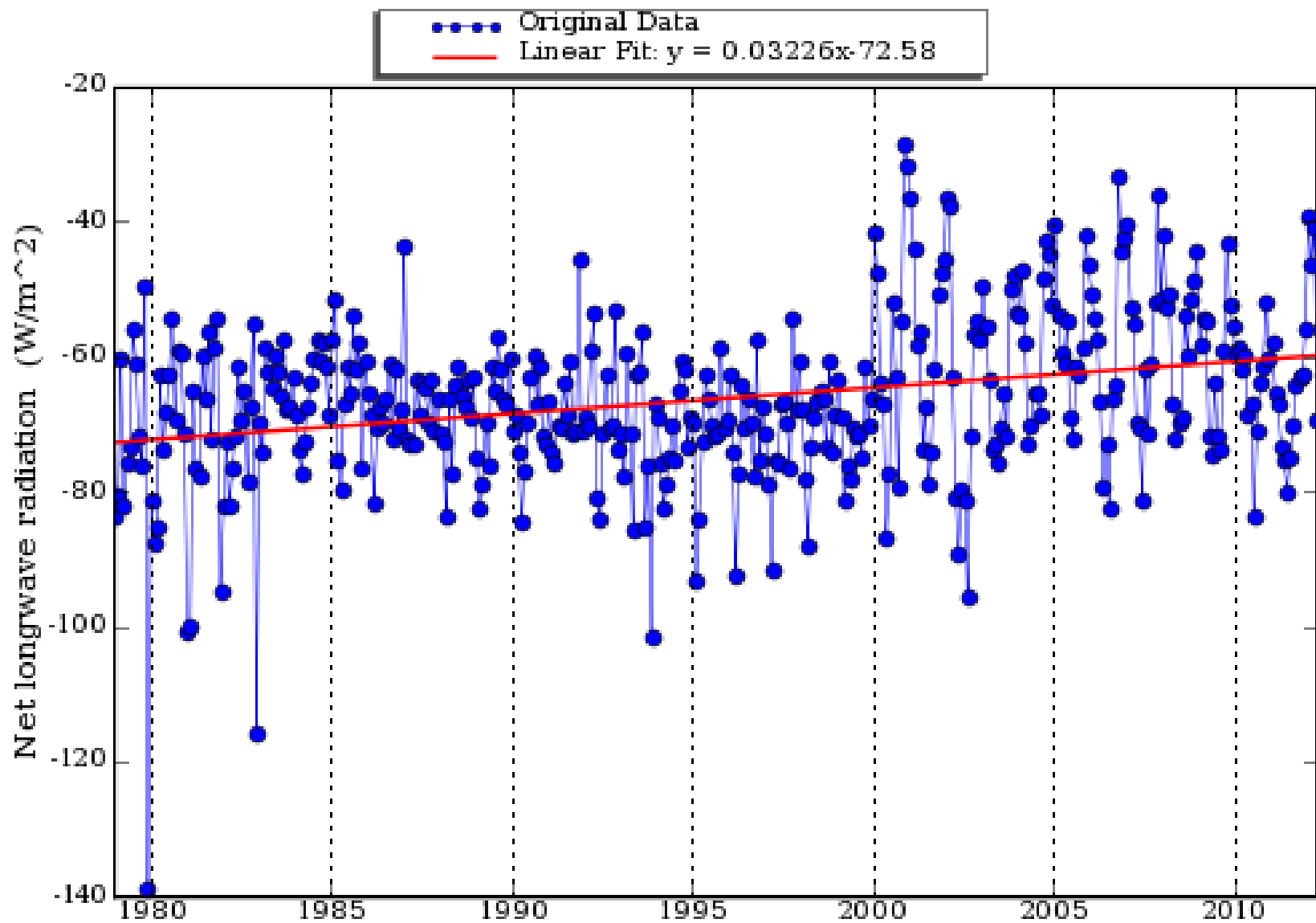
Area for regional climate change analysis



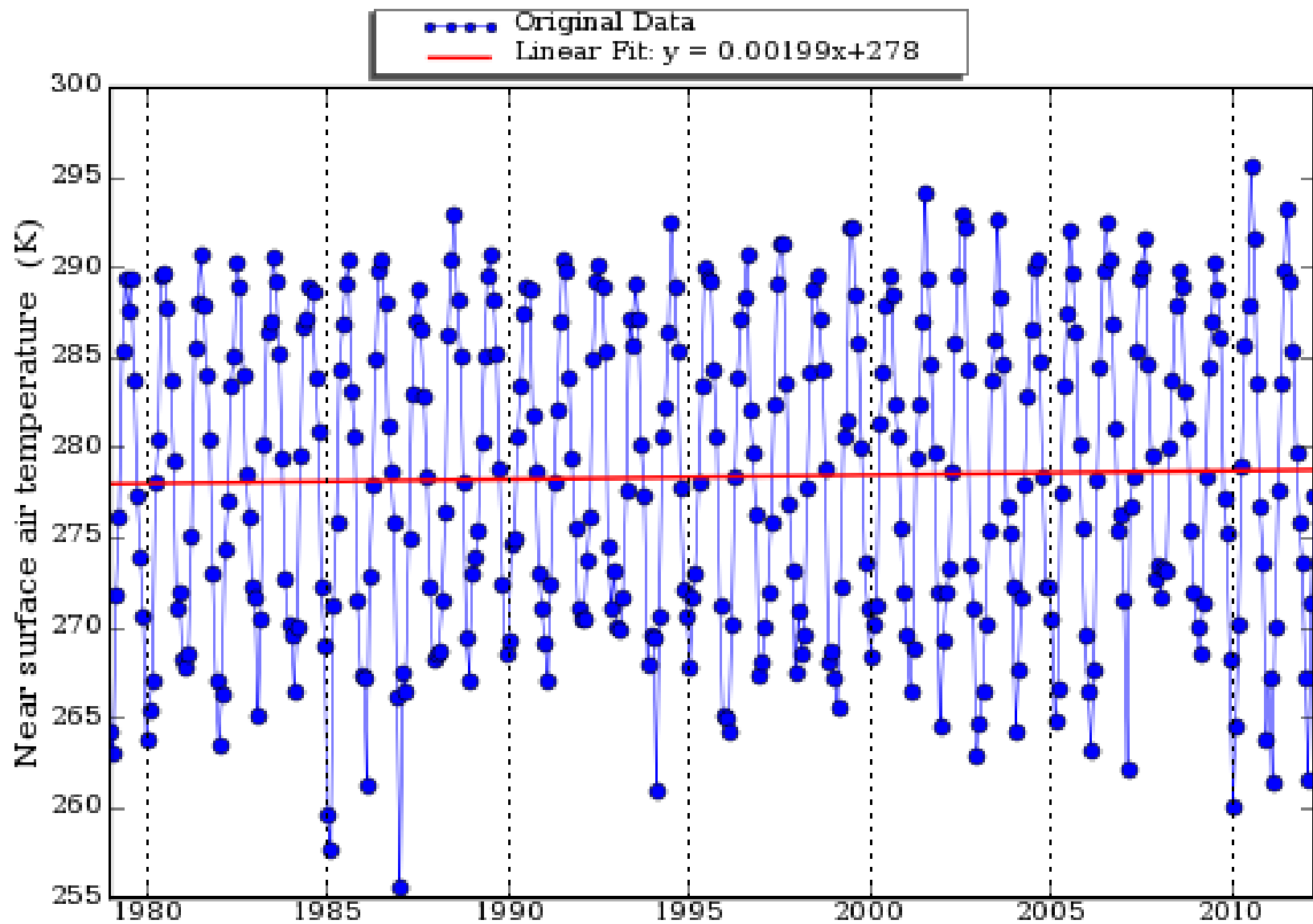
Area-Averaged Time Series (GLDAS_NOAH10_M.001)
(Region: 27E-28E, 58N-59N)



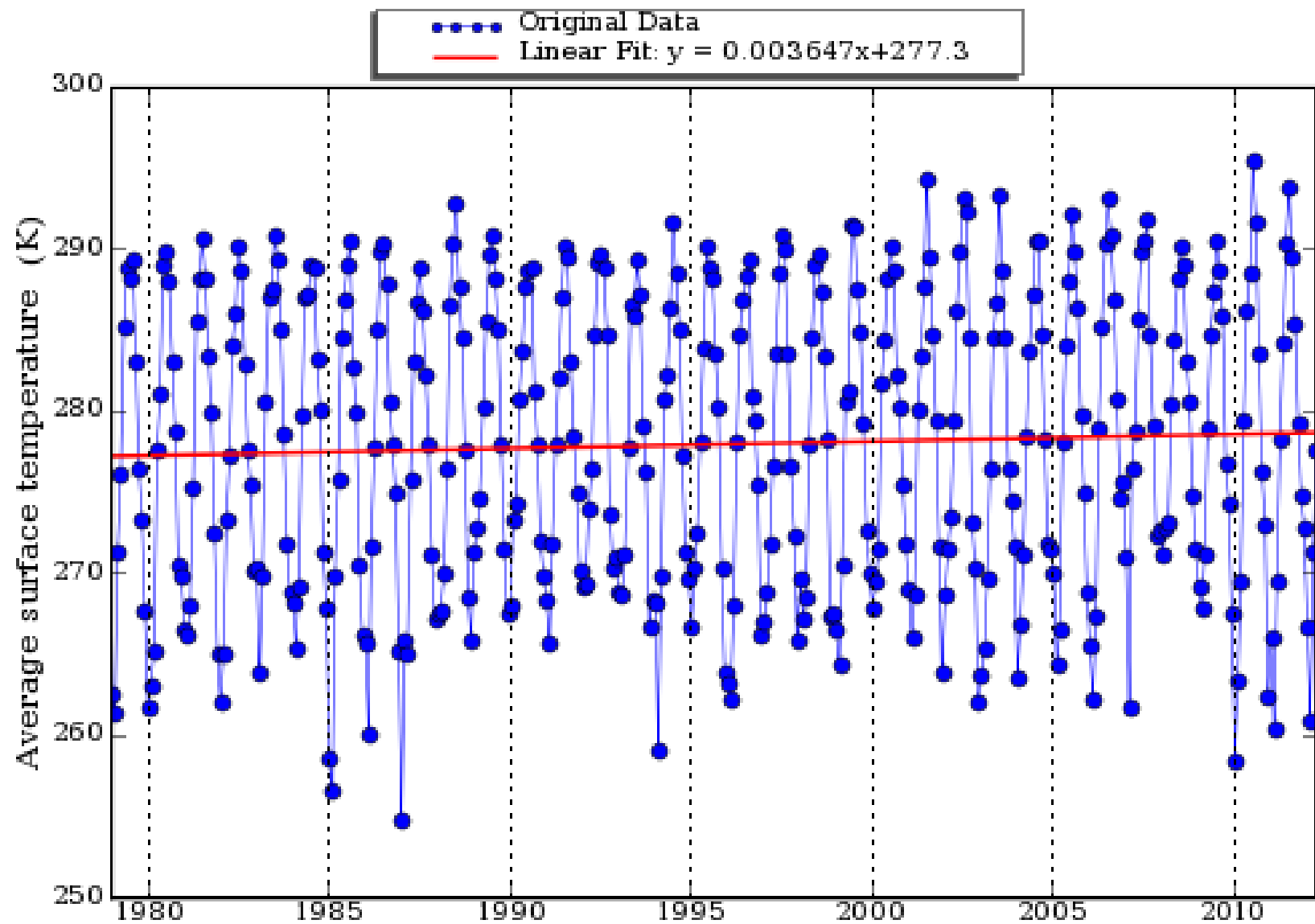
Area-Averaged Time Series (GLDAS_NOAH10_M.001)
(Region: 27E-28E, 58N-59N)



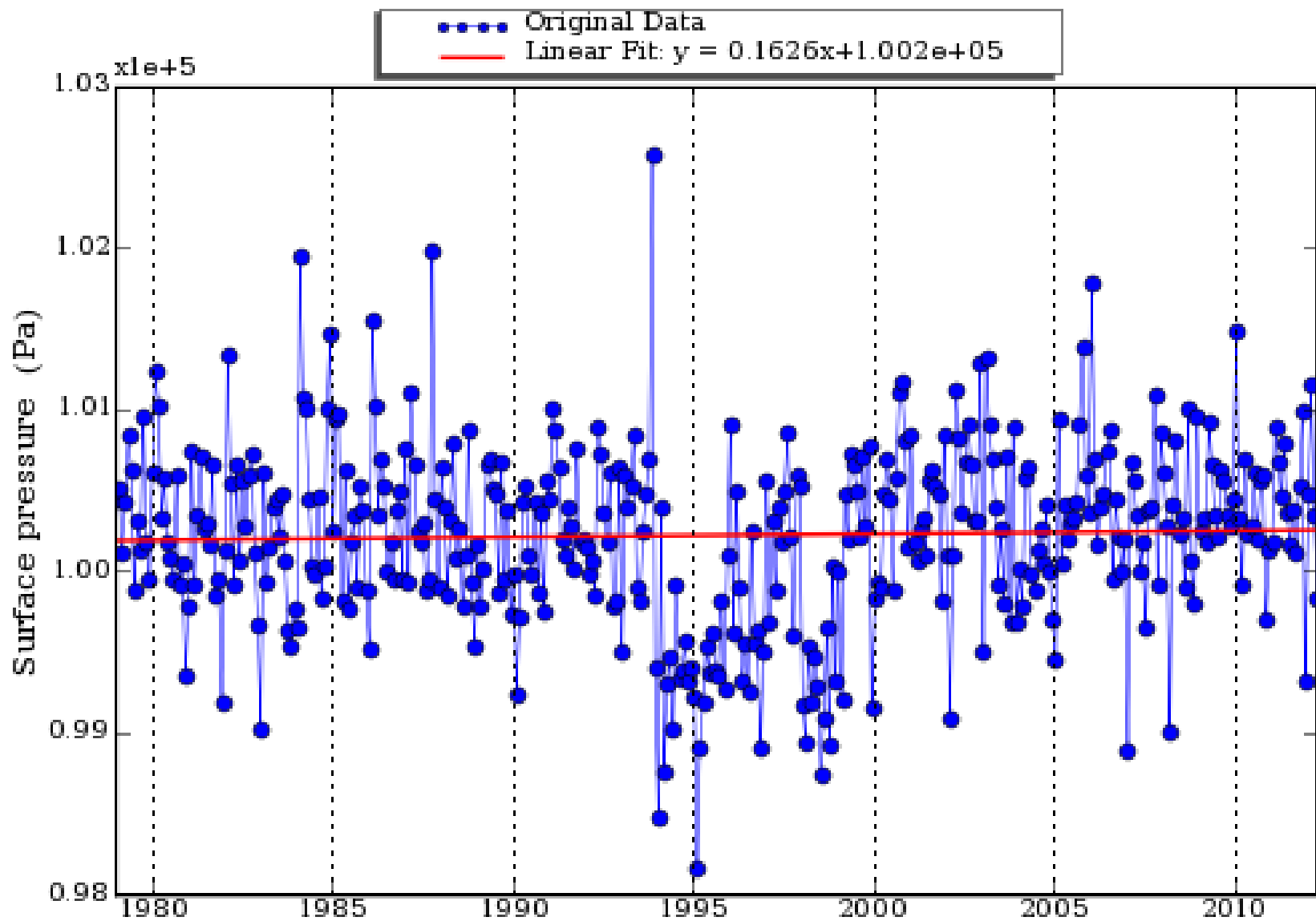
Area-Averaged Time Series (GLDAS_NOAH10_M.001)
(Region: 27E-28E, 58N-59N)



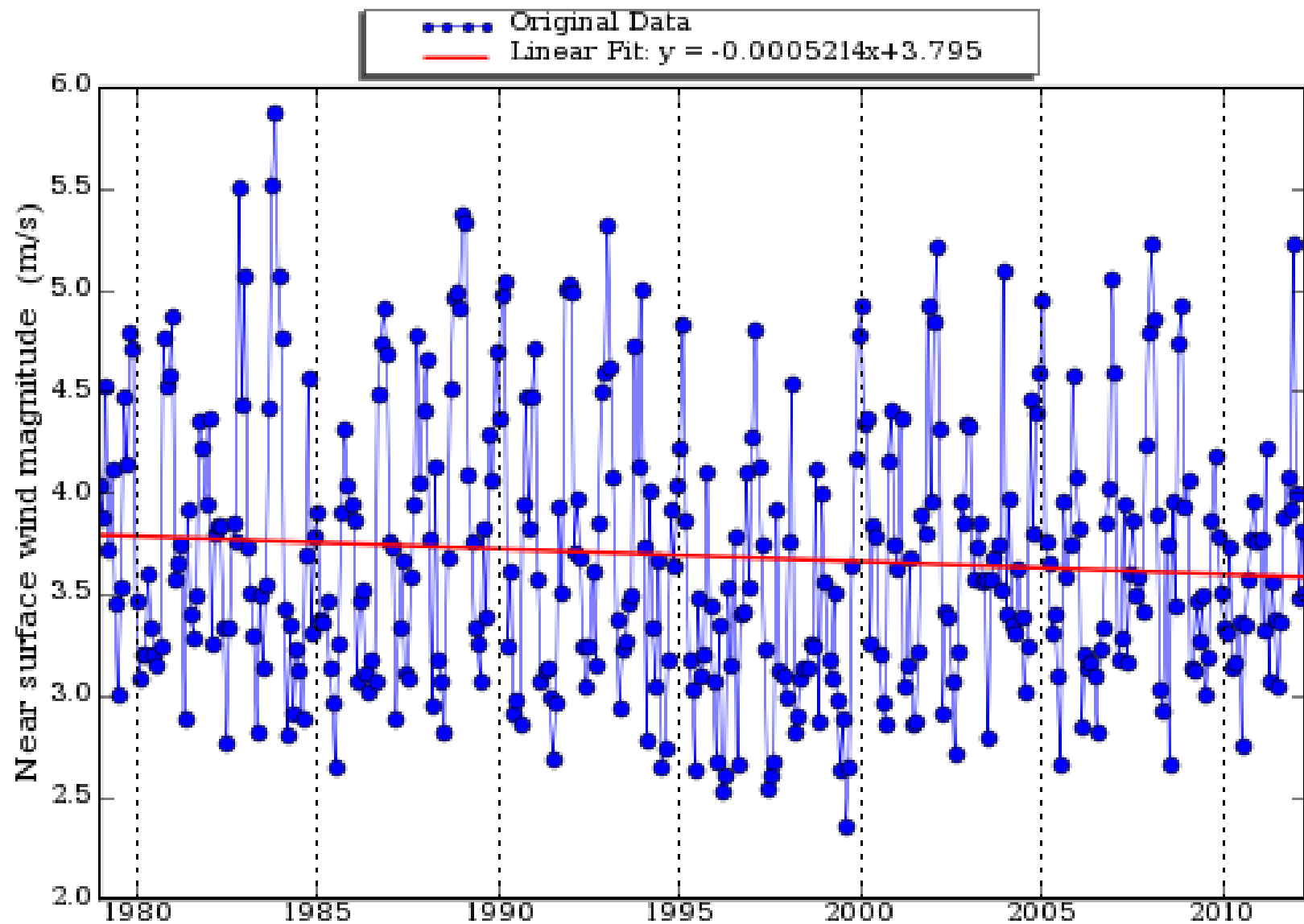
Area-Averaged Time Series (GLDAS_NOAH10_M.001)
(Region: 27E-28E, 58N-59N)



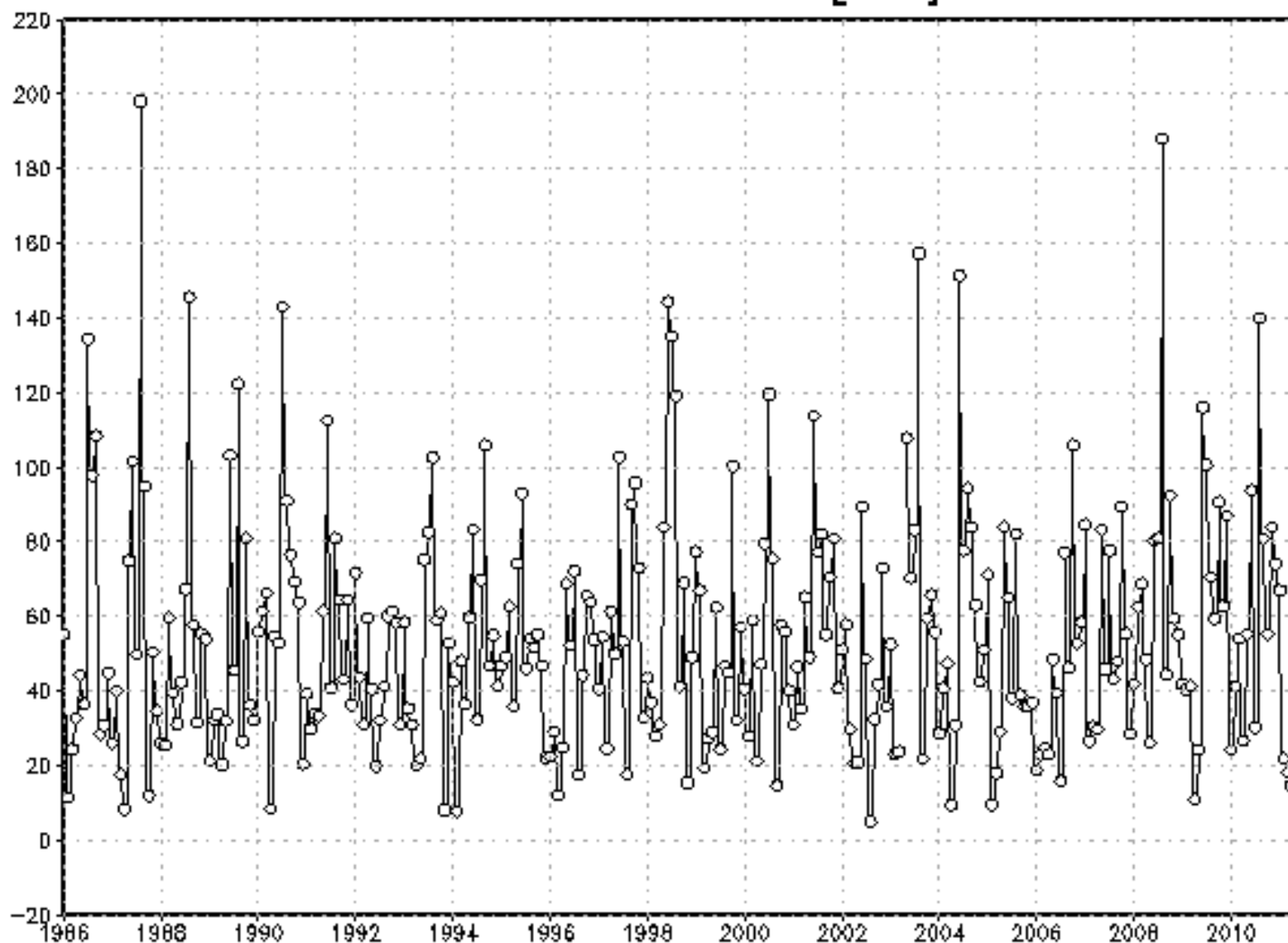
Area-Averaged Time Series (GLDAS_NOAH10_M.001)
(Region: 27E-28E, 58N-59N)



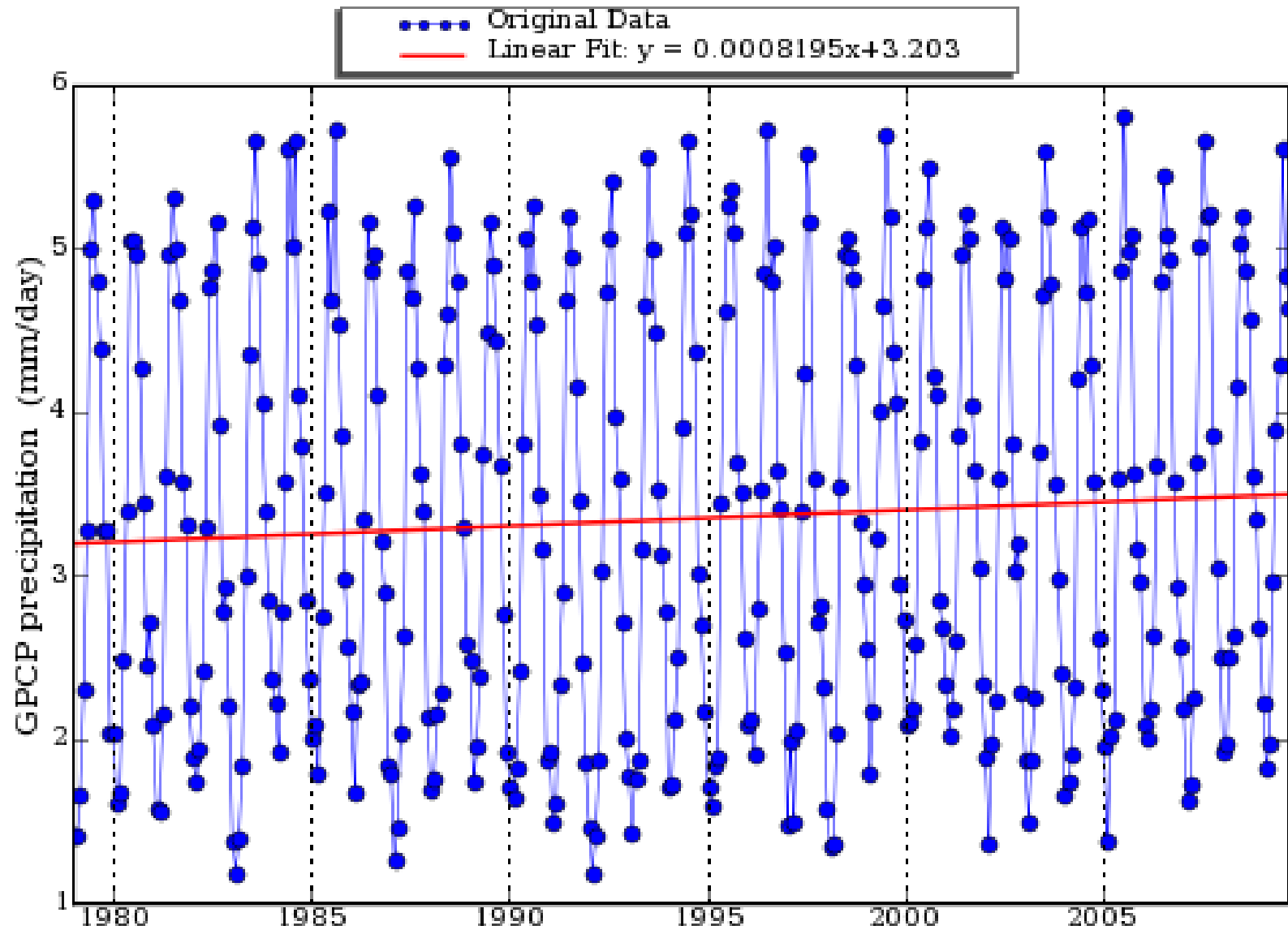
Area-Averaged Time Series (GLDAS_NOAH10_M.001)
(Region: 27E-28E, 58N-59N)



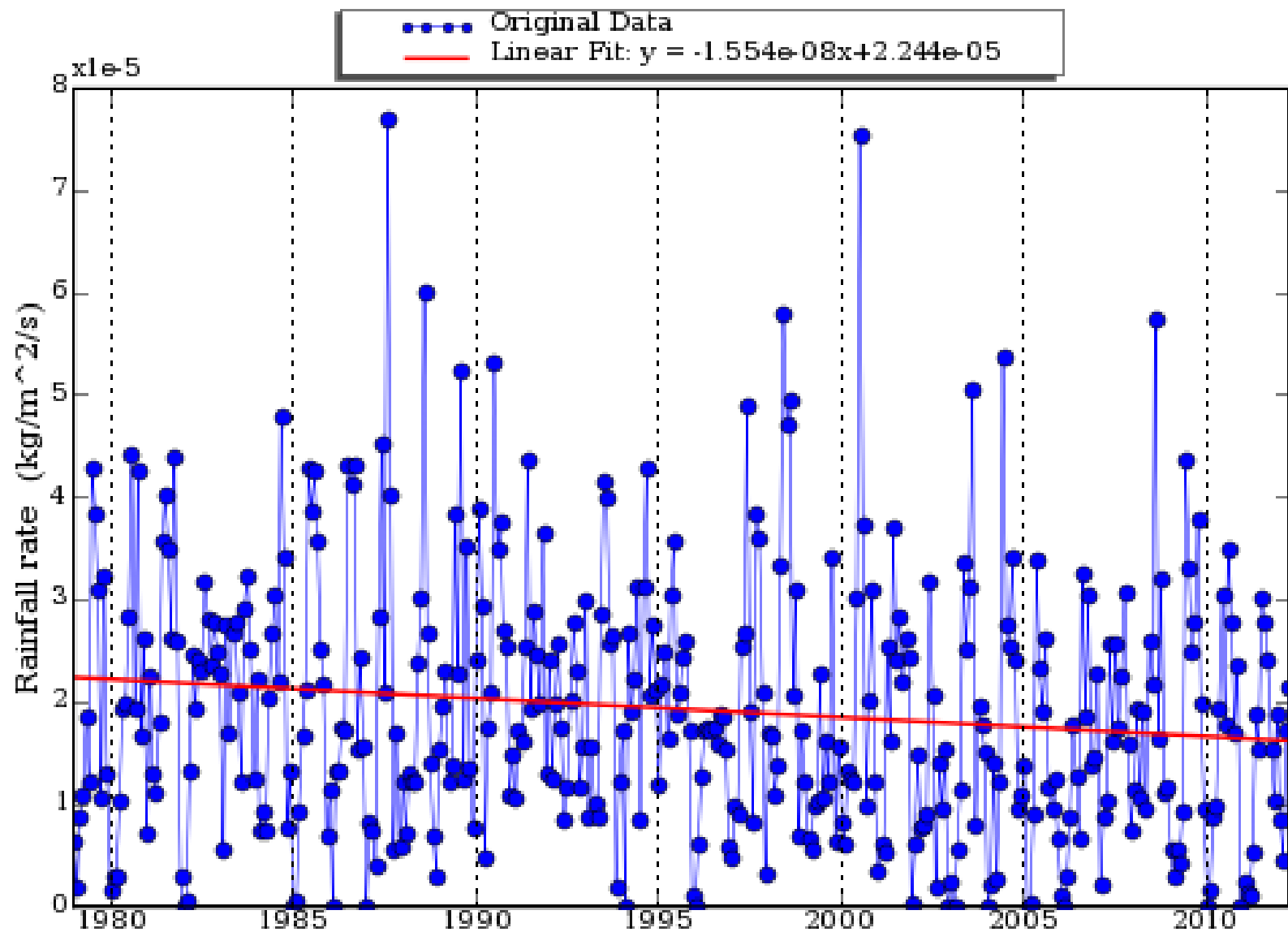
Monthly GPCC (Lat: 58N–59N, Lon: 27E–28E) Accumulated Rainfall [mm]



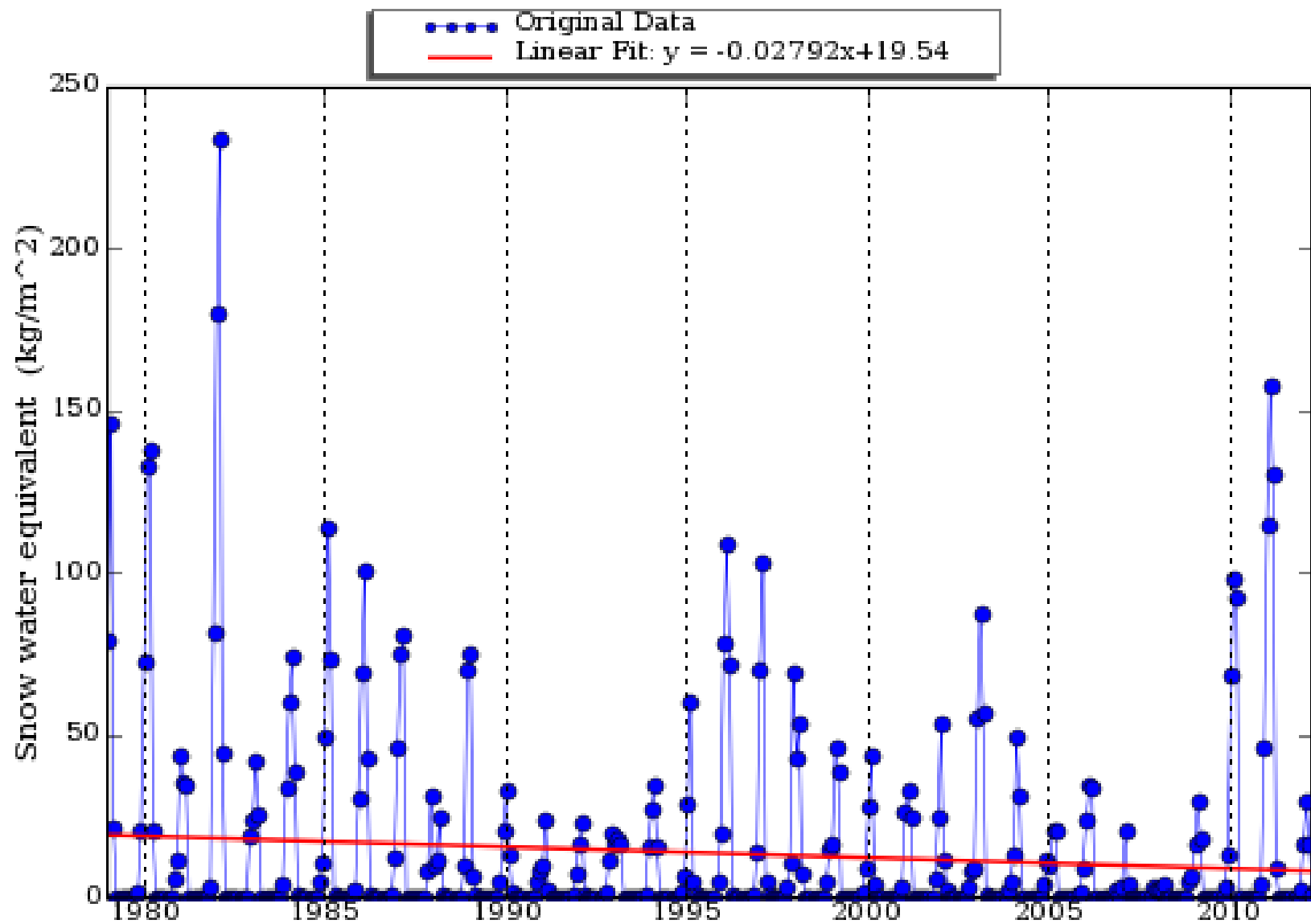
Area-Averaged Time Series (GPCP_1DMO.2.1)
(Region: 60E-150E, 0N-60N)



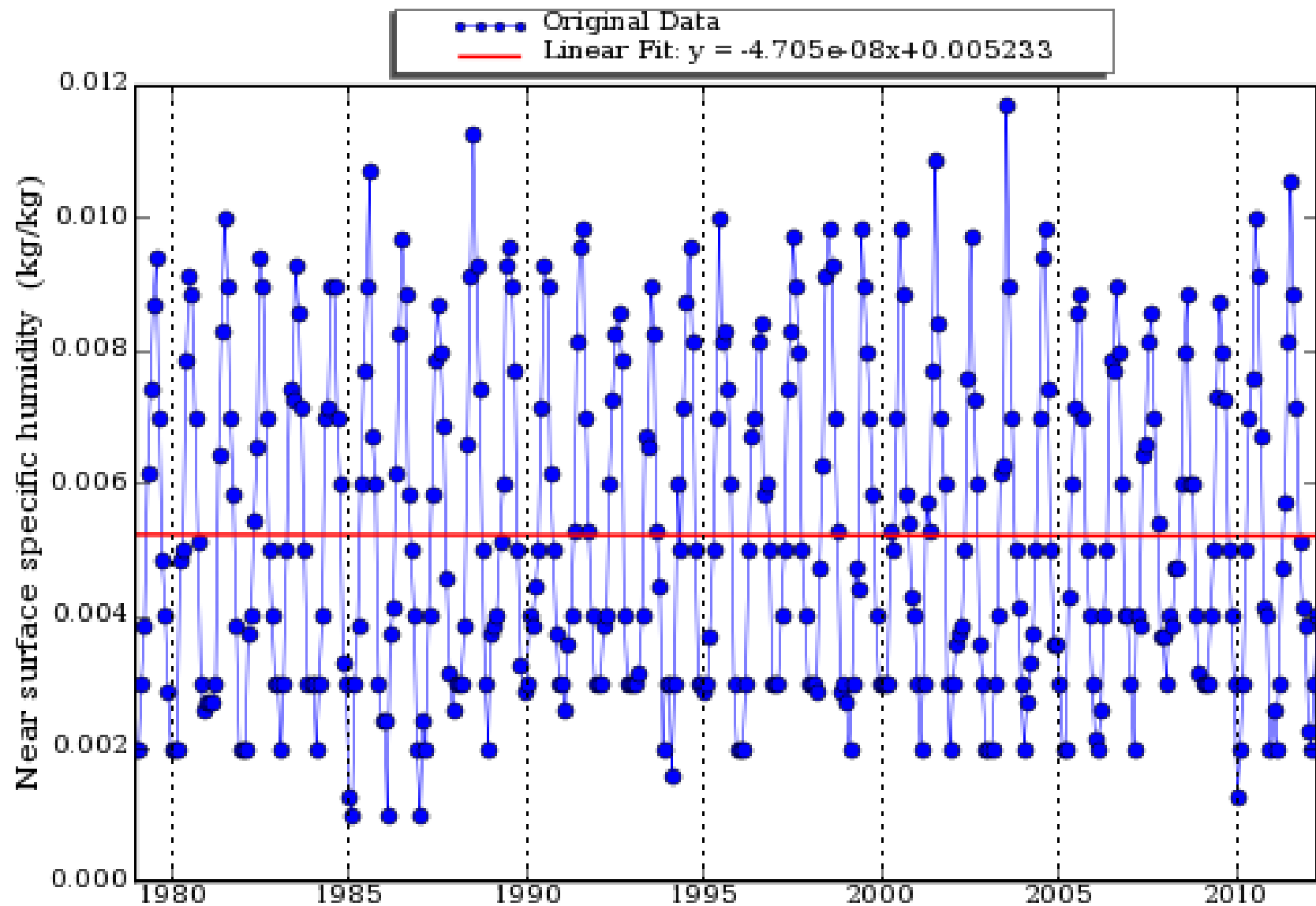
Area-Averaged Time Series (GLDAS_NOAH10_M.001)
(Region: 27E-28E, 58N-59N)



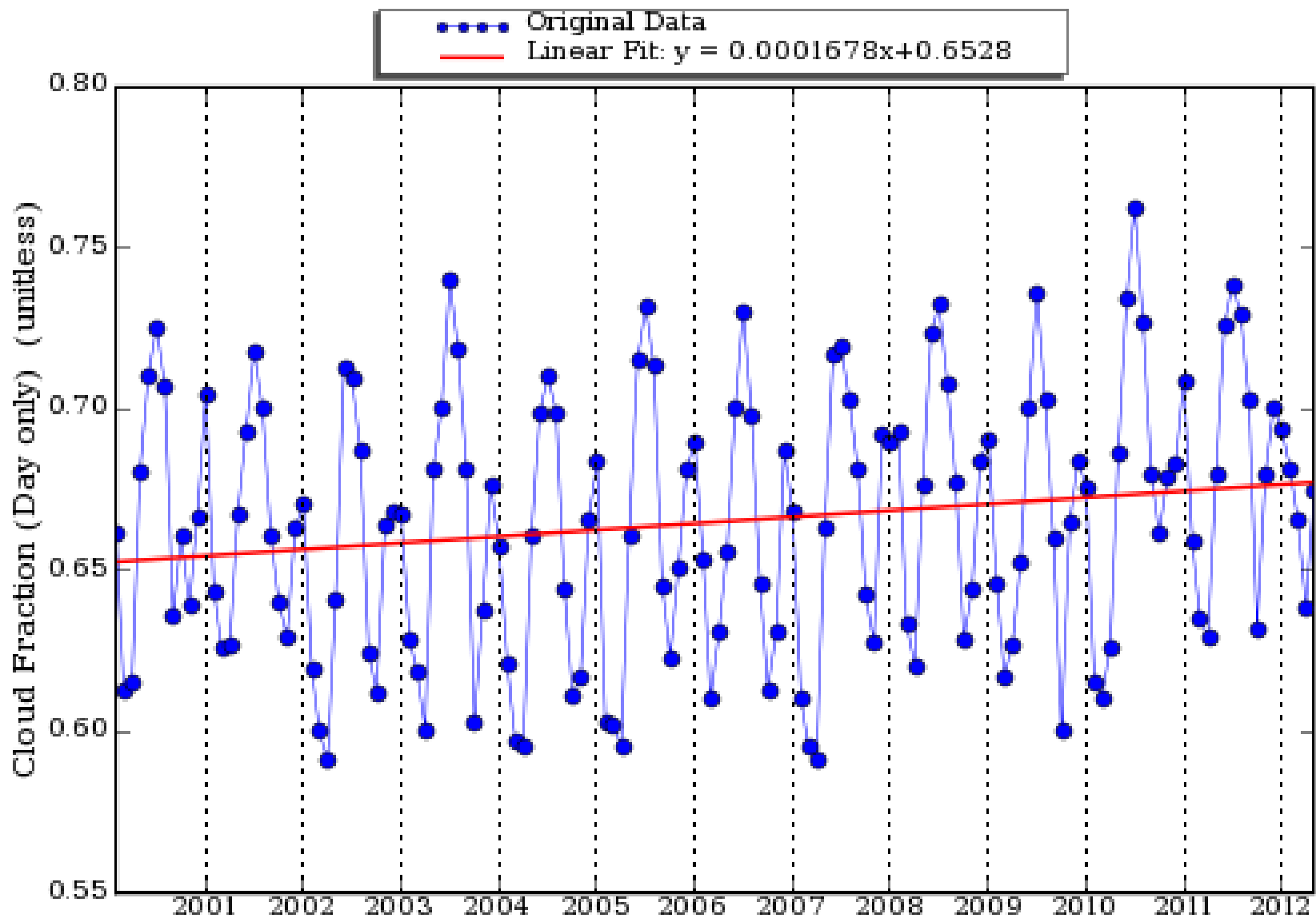
Area-Averaged Time Series (GLDAS_NOAH10_M.001)
(Region: 27E-28E, 58N-59N)



Area-Averaged Time Series (GLDAS_NOAH10_M.001)
(Region: 27E-28E, 58N-59N)



Area-Averaged Time Series (MOD08_M3.051)
(Region: 60E-150E, 0N-60N)



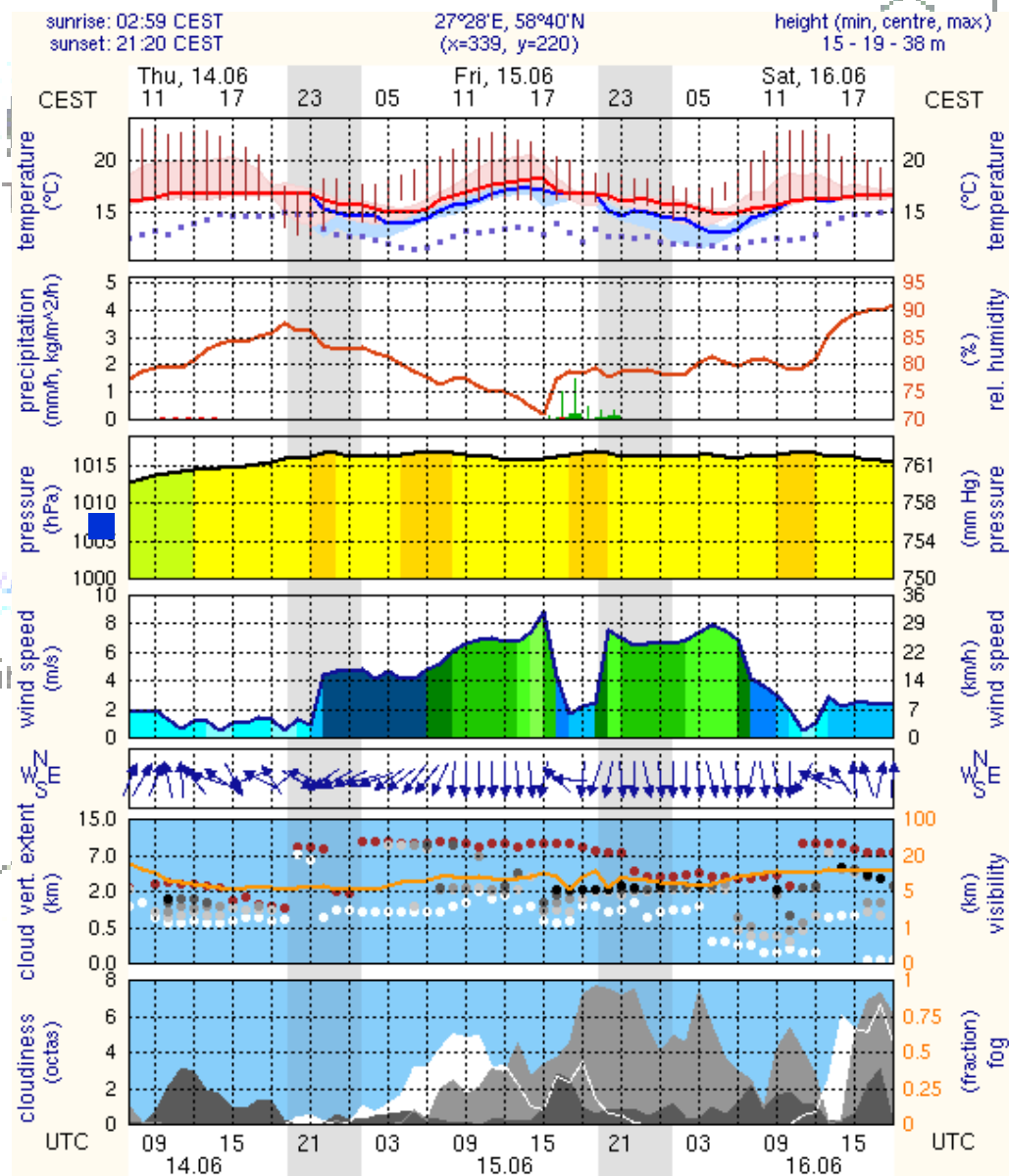
3. Operational weather and forecast

Grid: 4 km

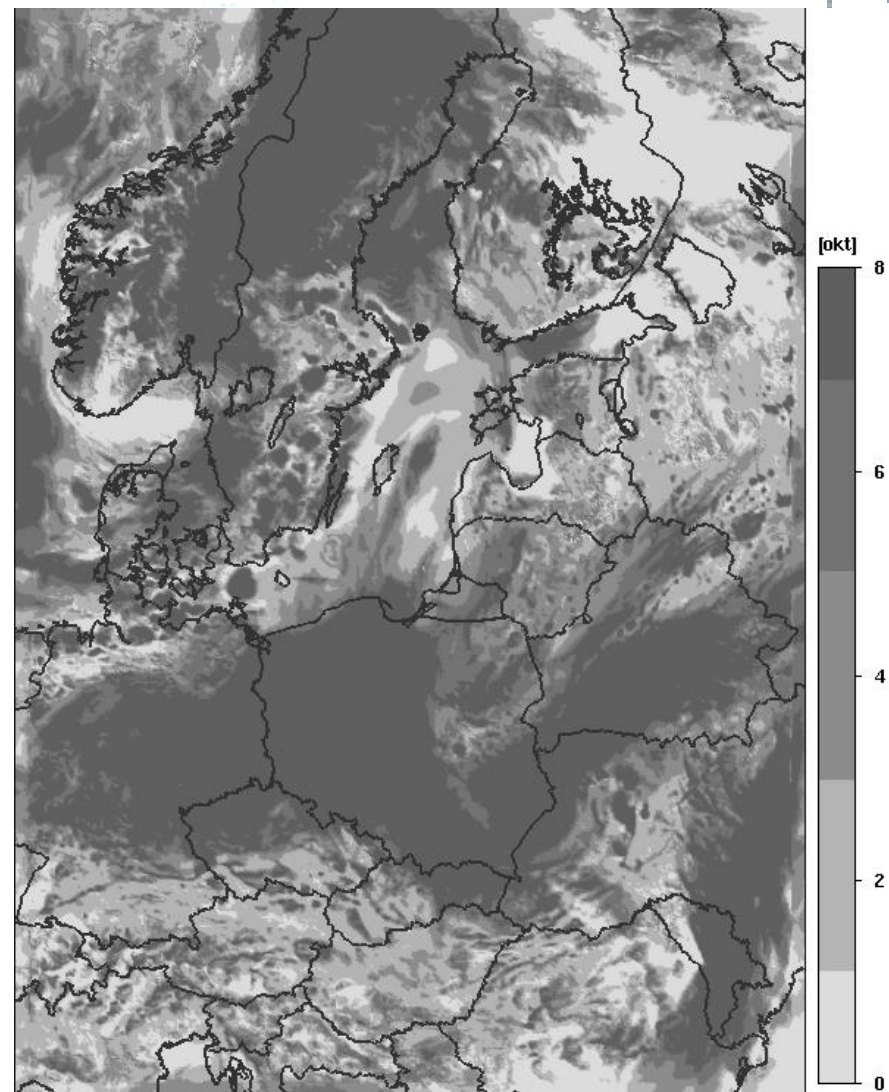
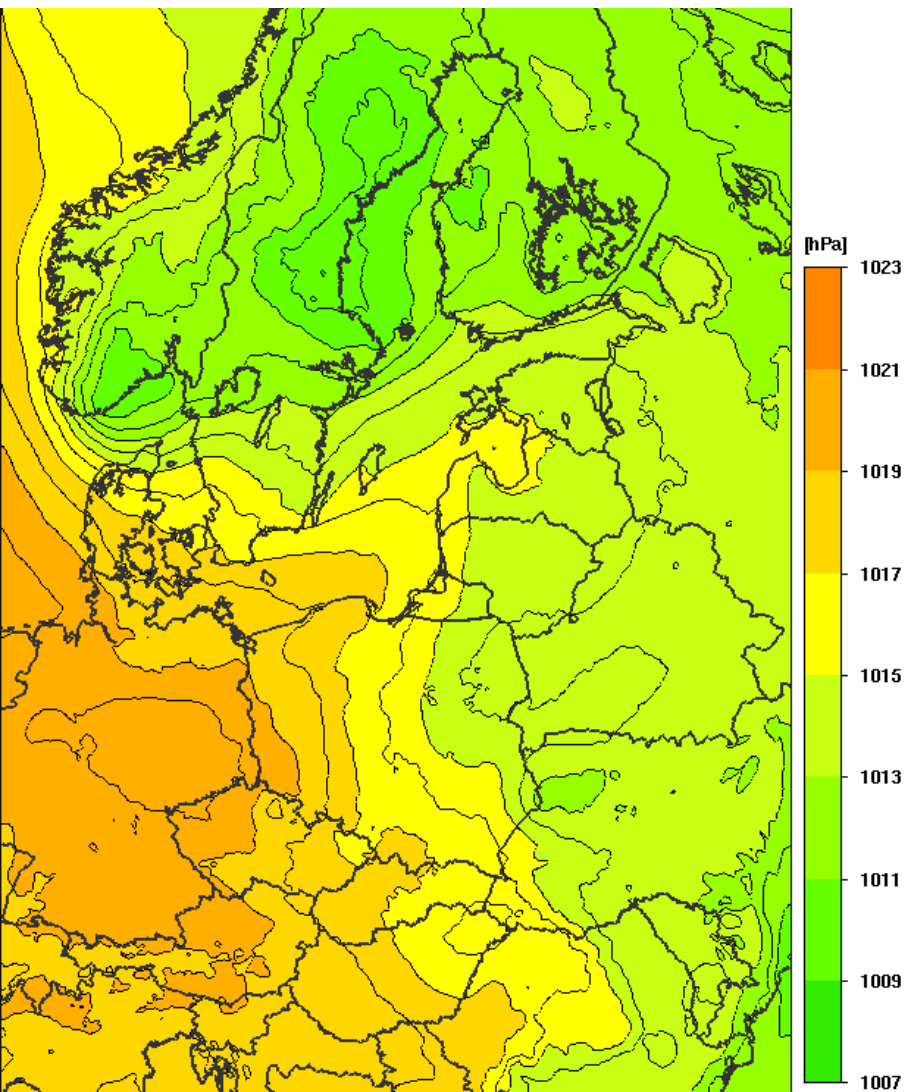
Forecast: 60 hours

Time step: 3 hours

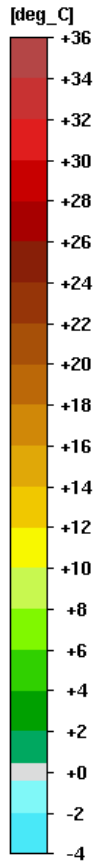
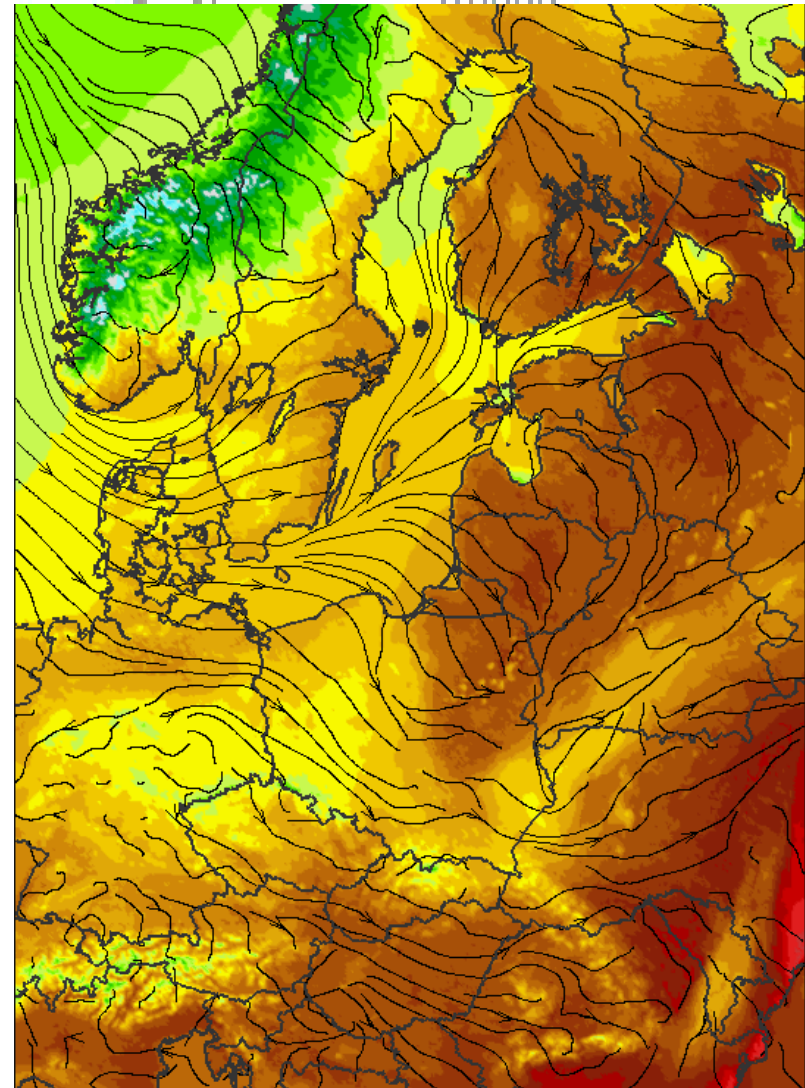
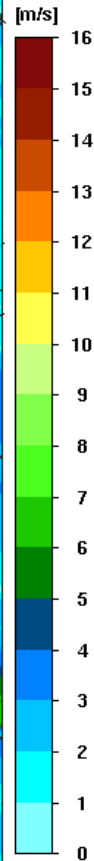
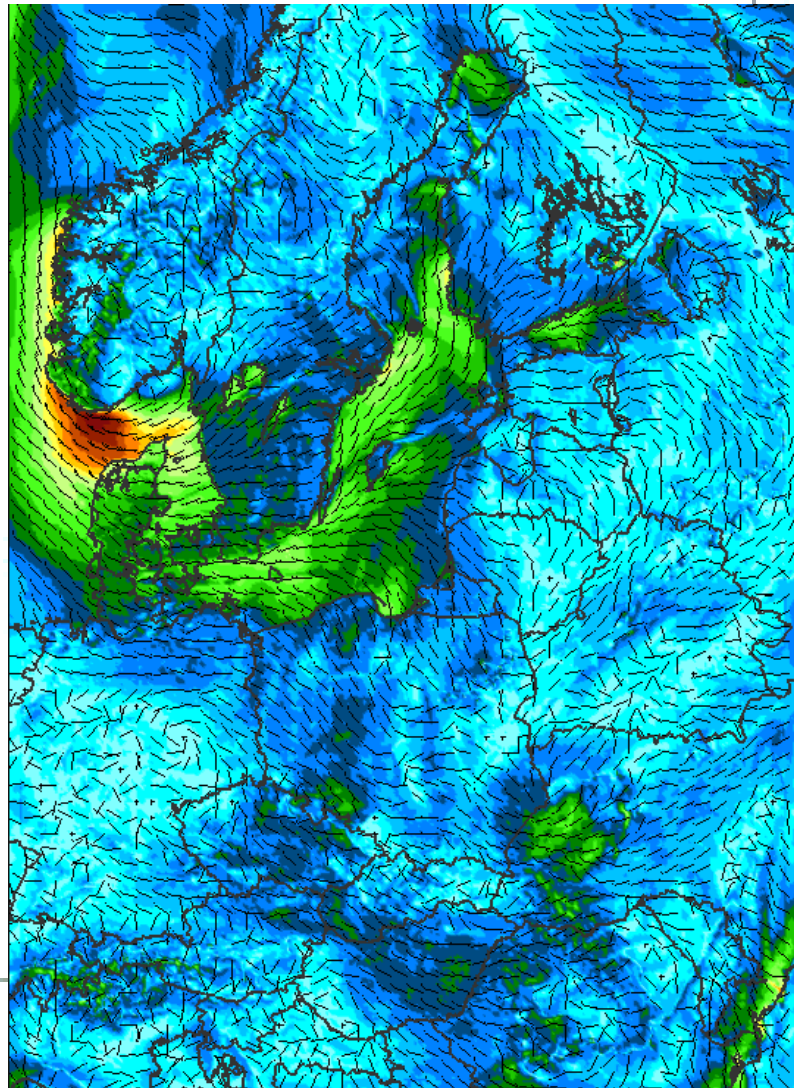
Figure shows forecast for the main meteo parameters for the central point of the lake for 14-16 June 2012



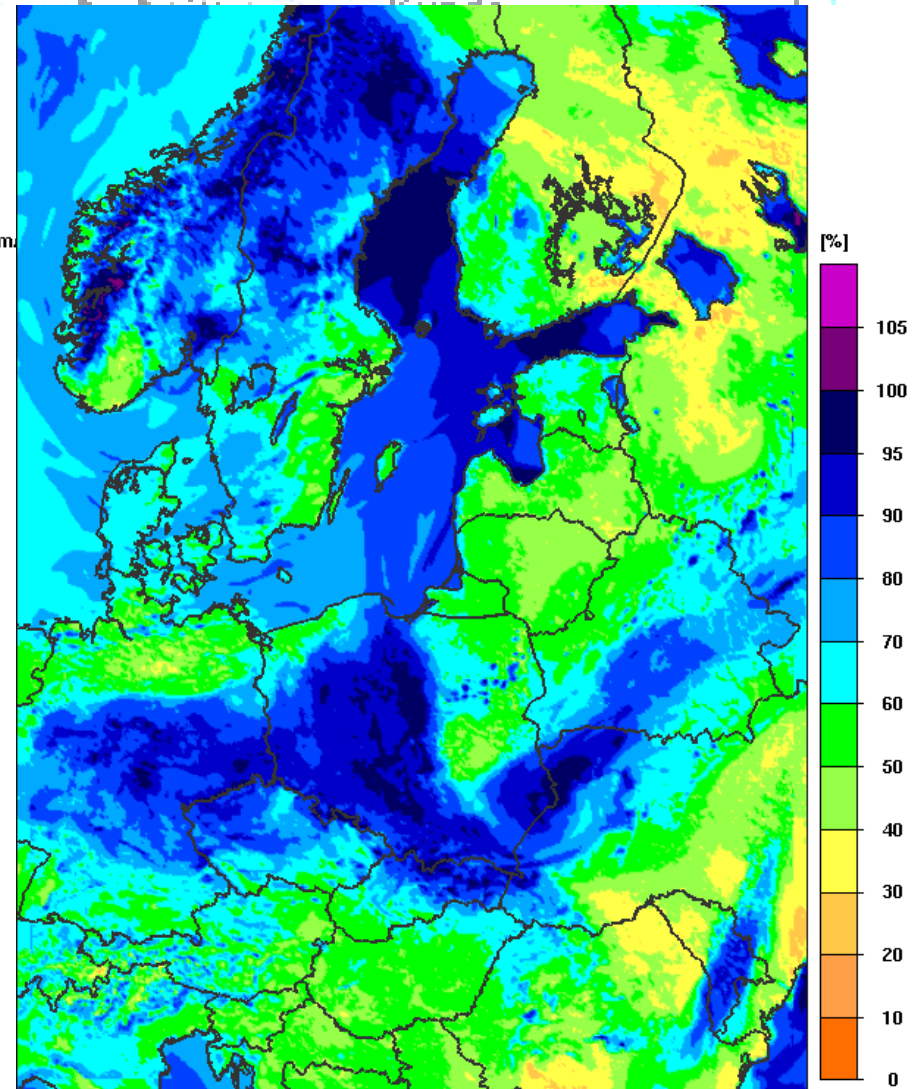
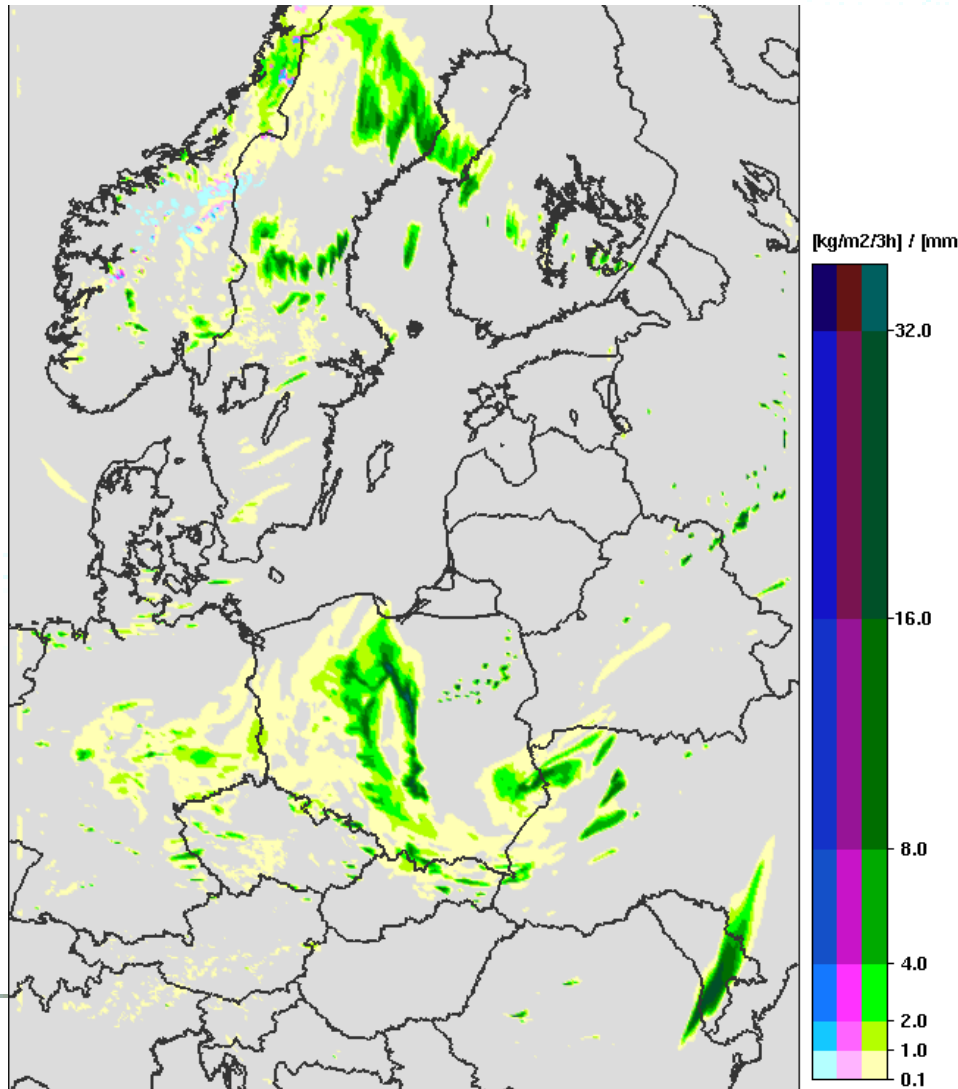
Atmosphere pressure and cloudiness on 14 June 2012, 12-00 UTC



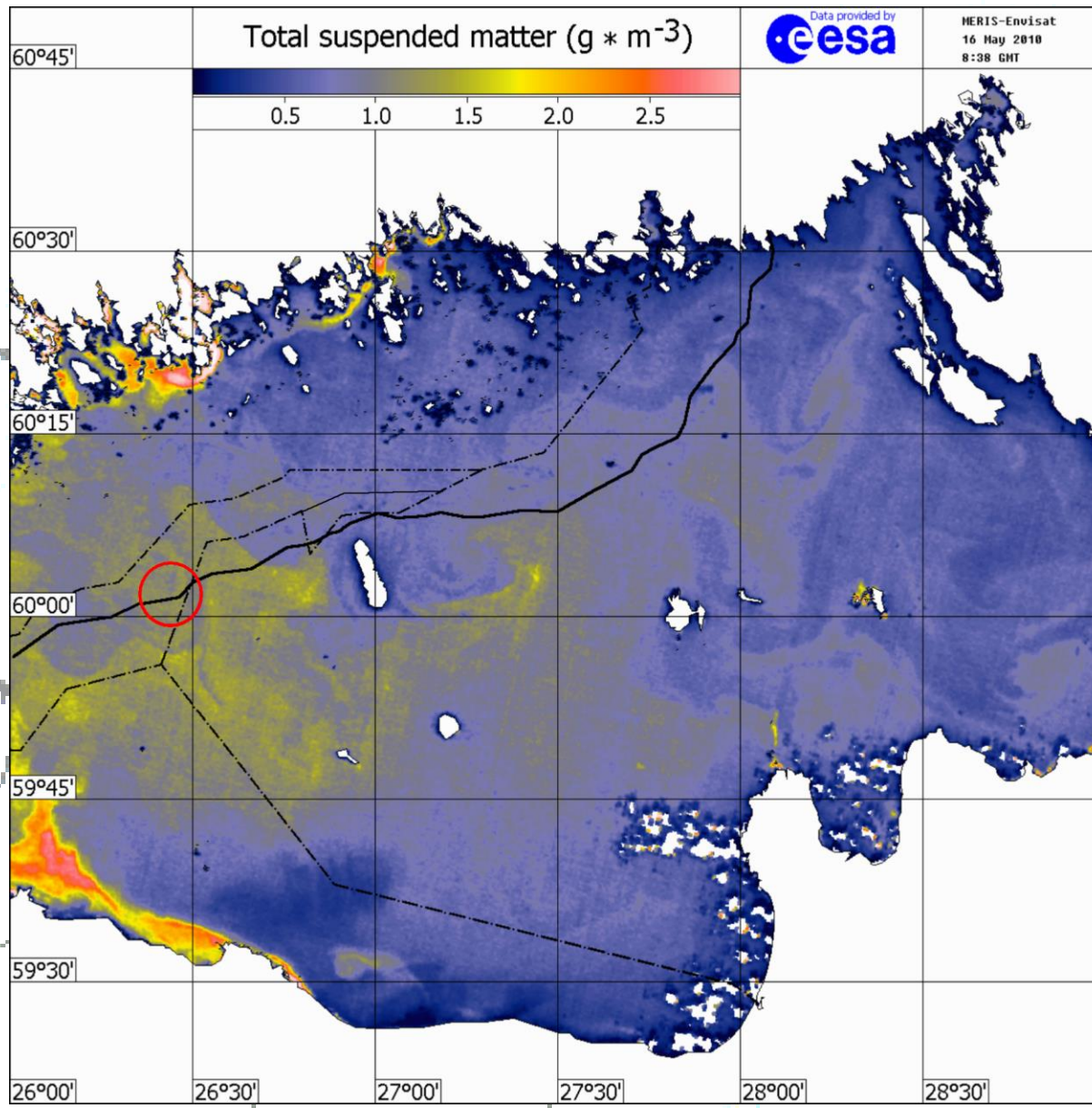
Wind and air temperature on 14 June 2012, 12-00 UTC



Precipitation and relative humidity on 14 June 2012, 12-00 UTC

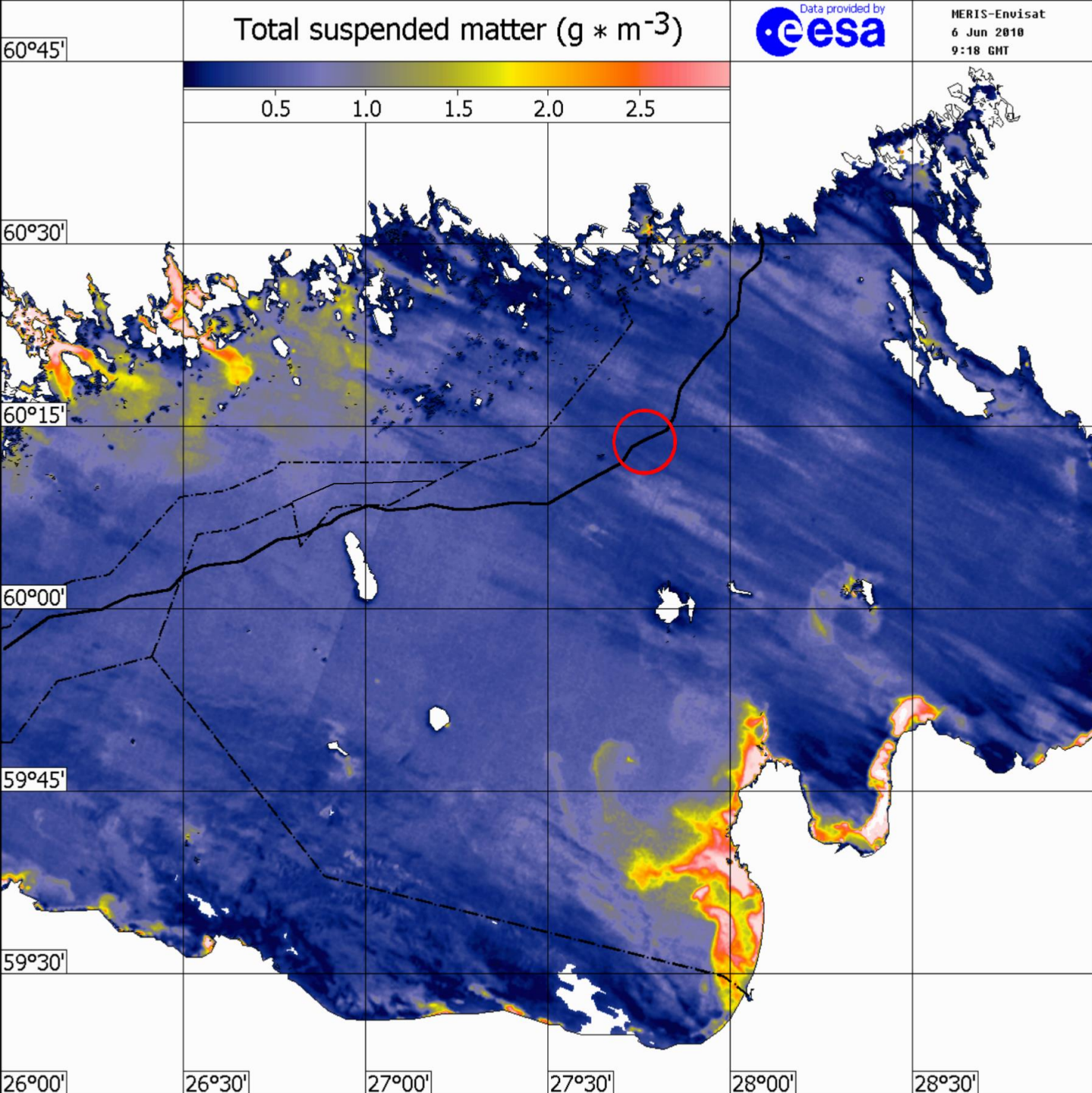


4. Satellite monitoring of the Gulf of Finland



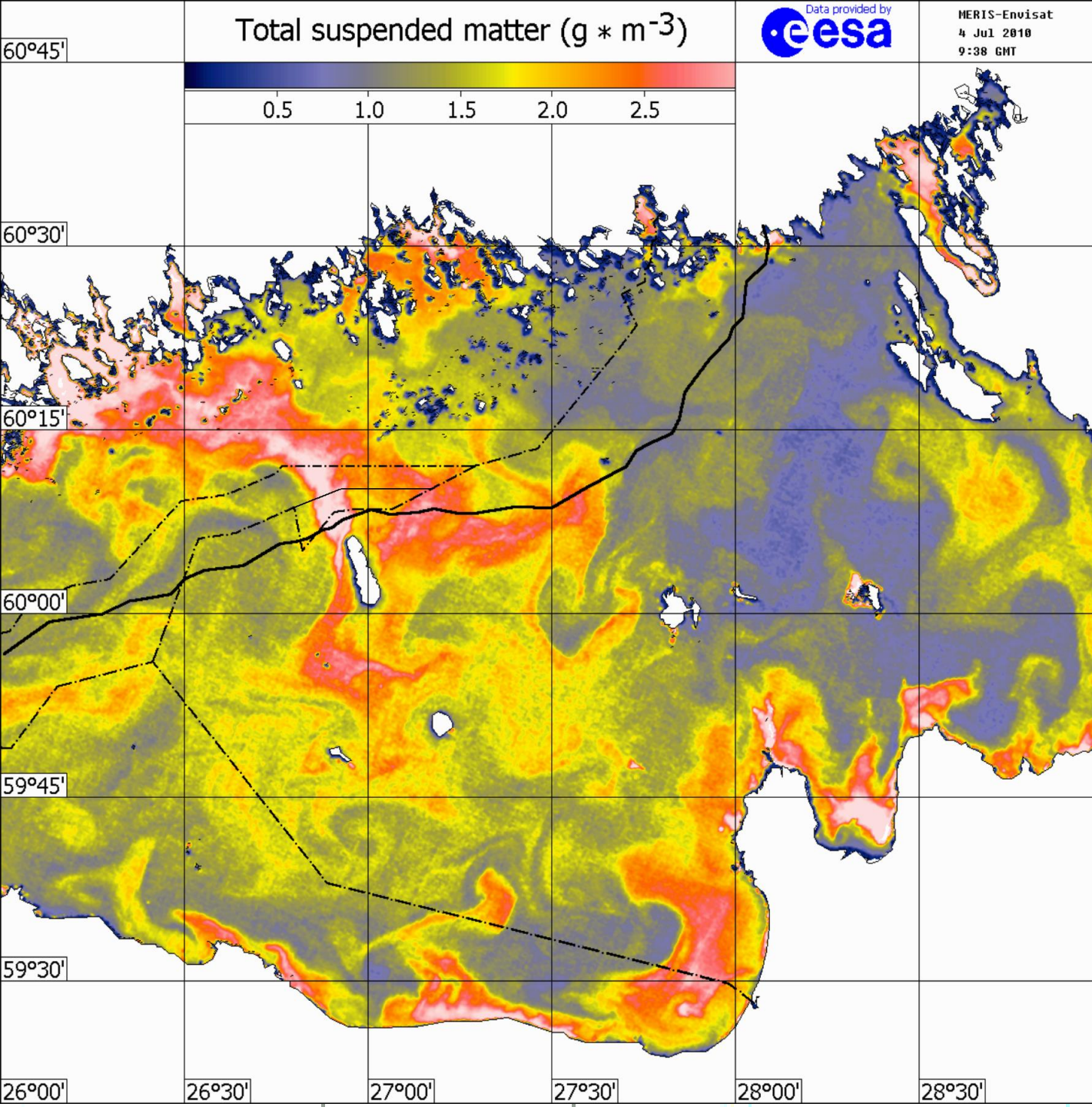
16 May 2010
MERIS
ENVISAT
250 m resolution



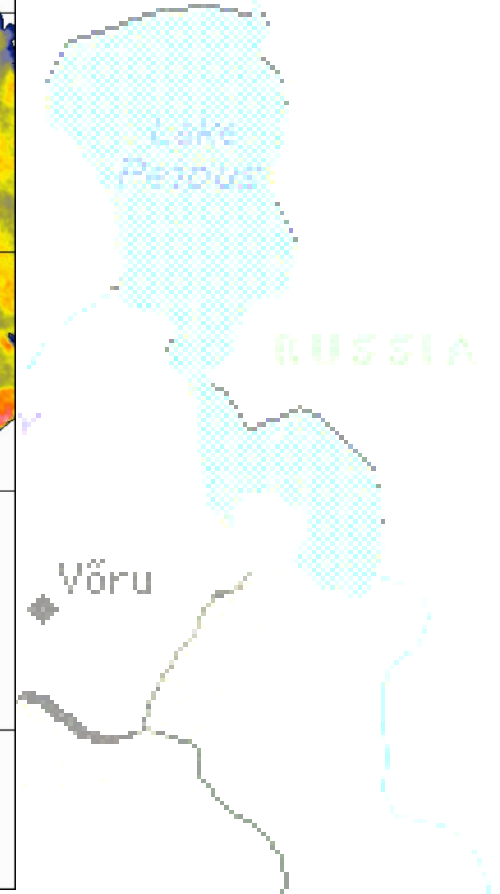


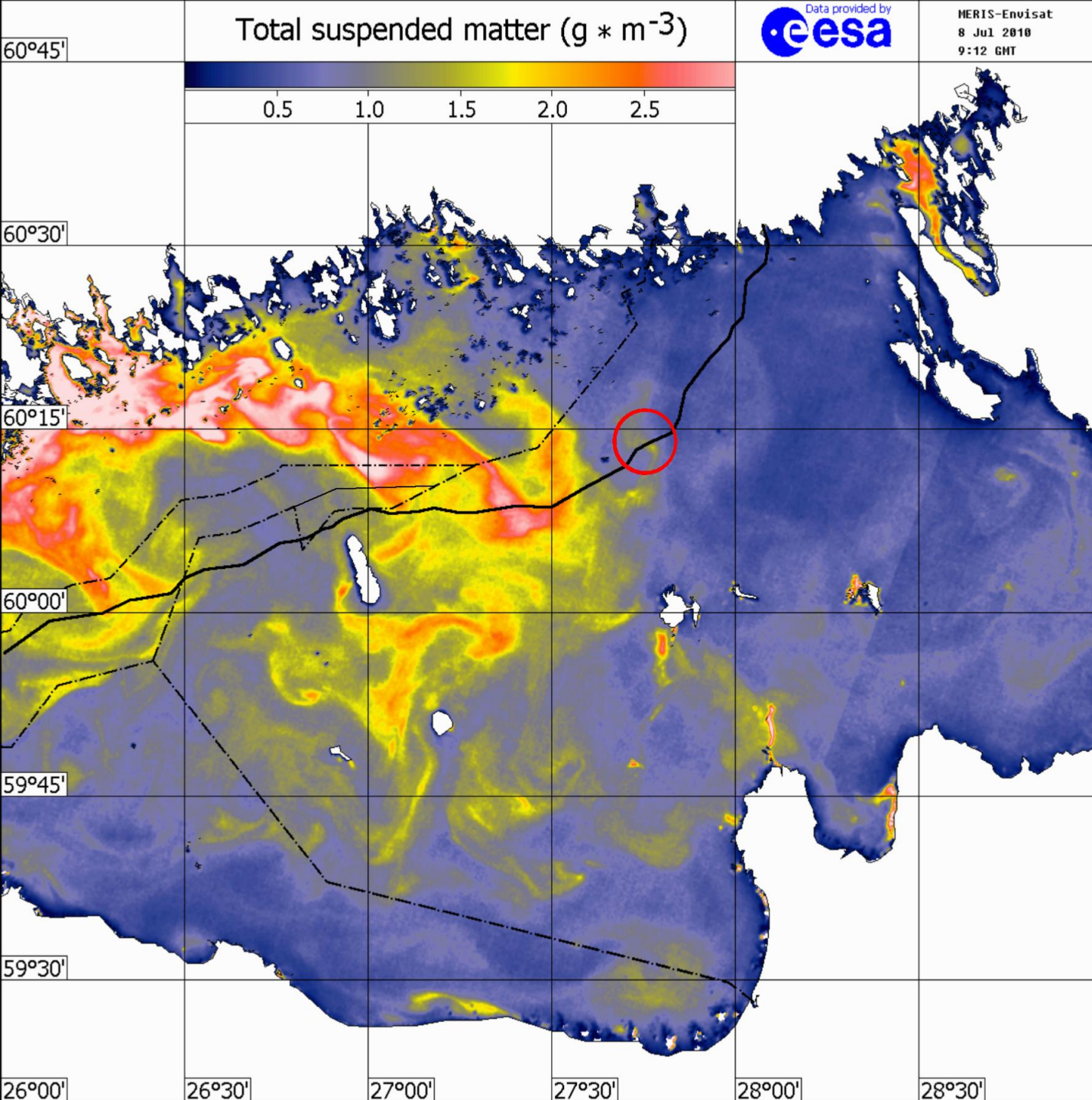
**6 June 2010
MERIS
ENVISAT
250 m resolution**



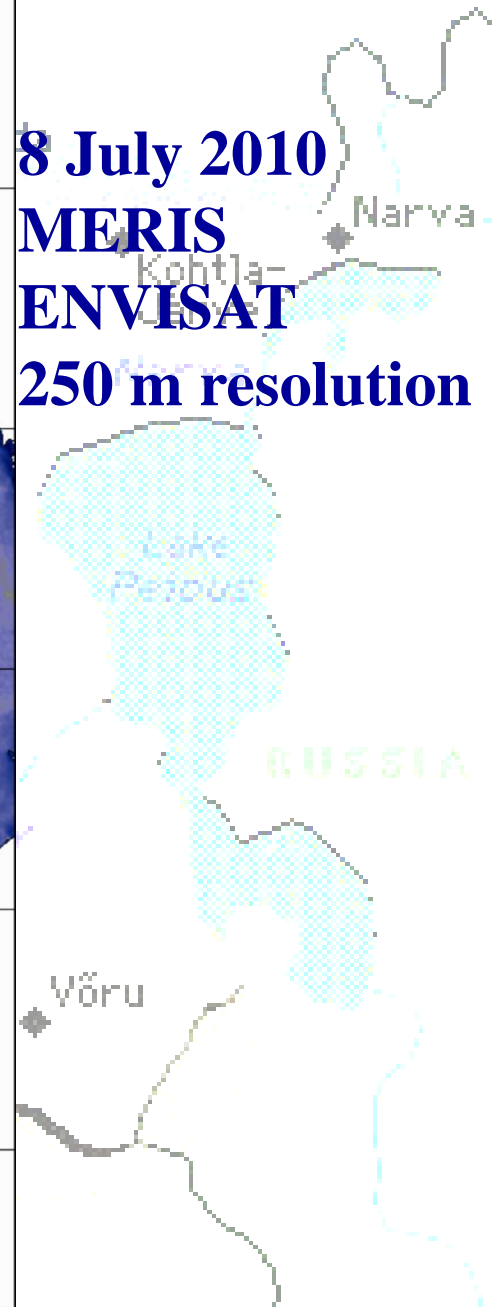


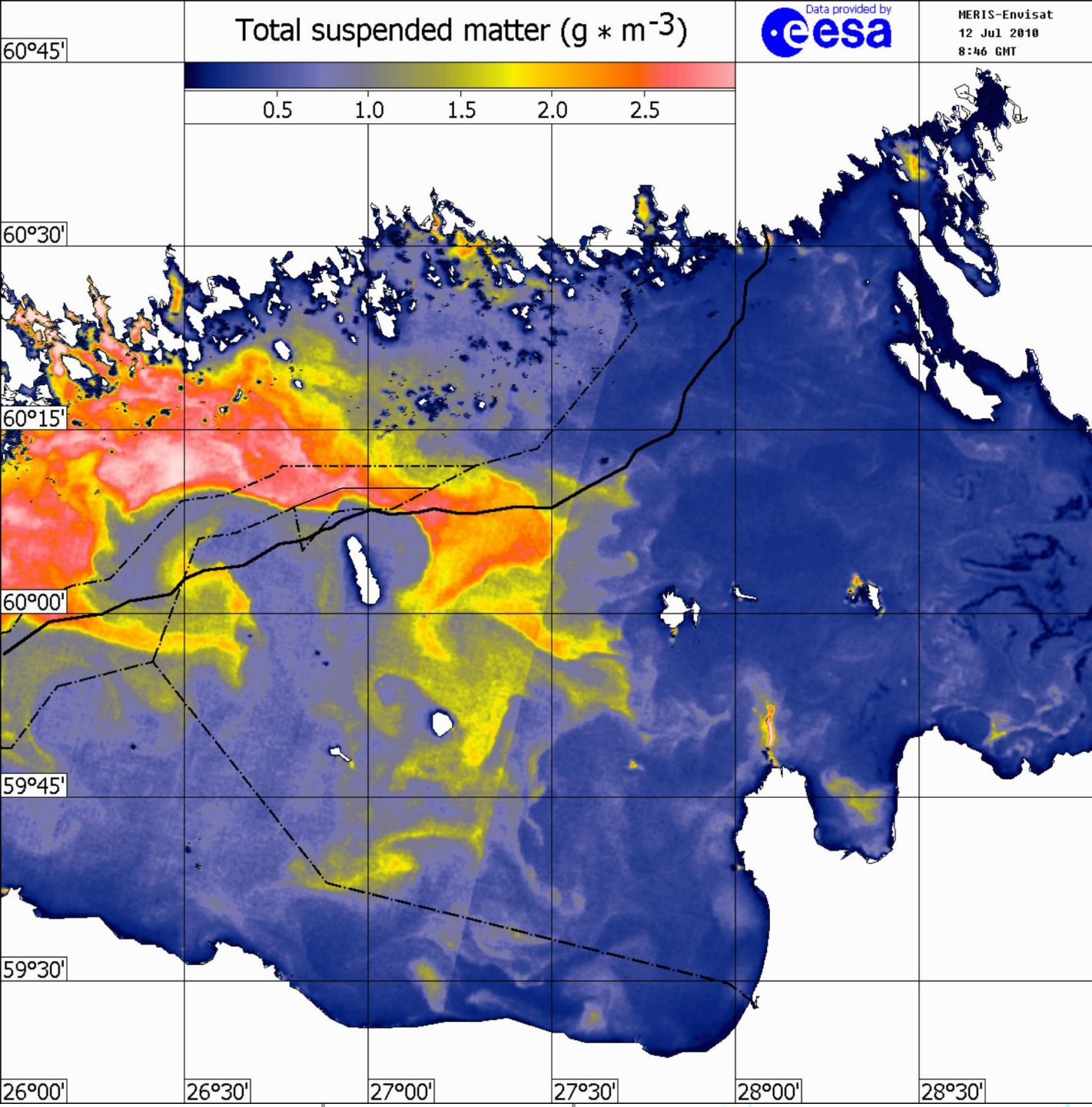
4 July 2010
MERIS
ENVISAT
250 m resolution





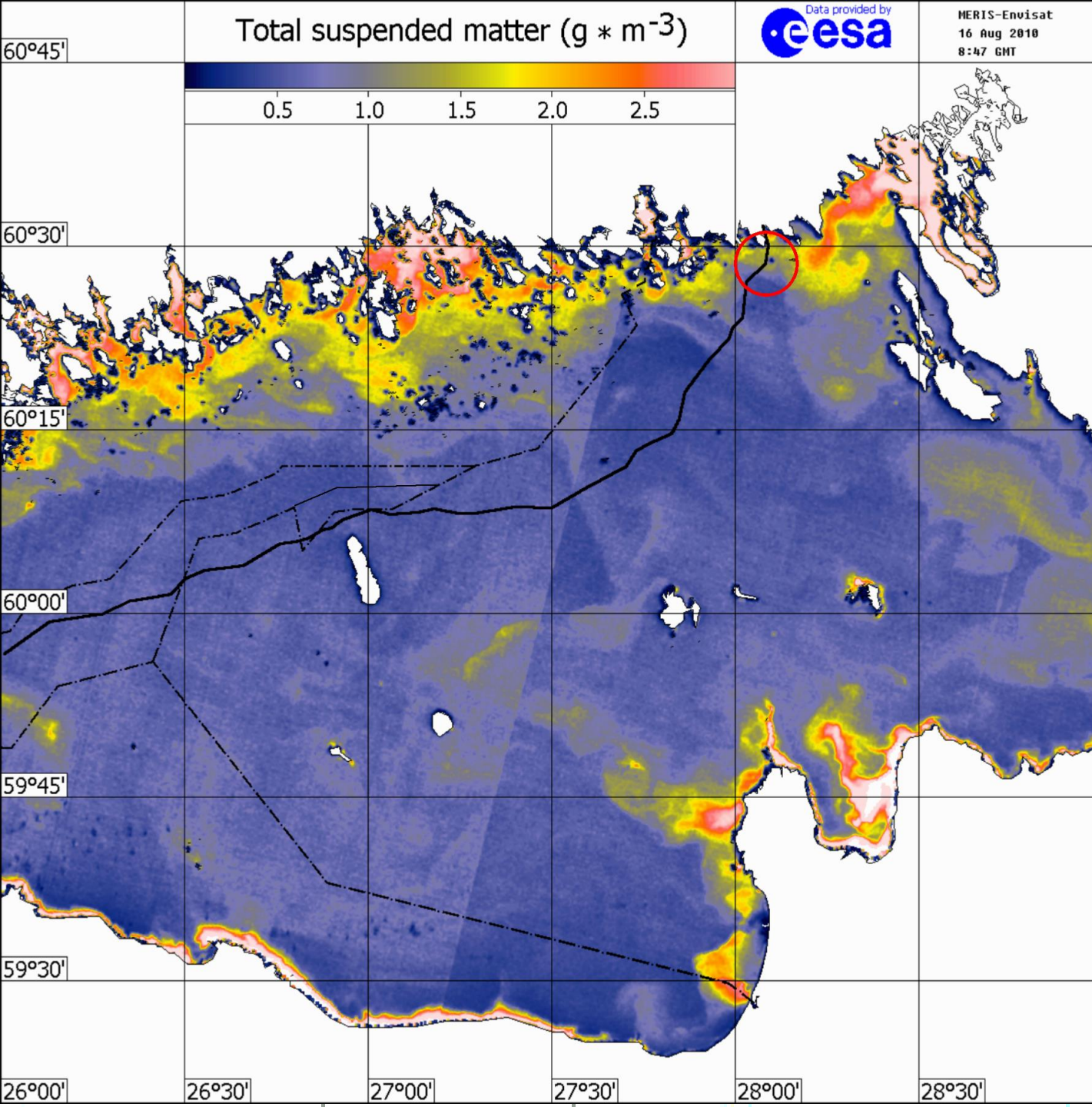
8 July 2010
MERIS
ENVISAT
250 m resolution





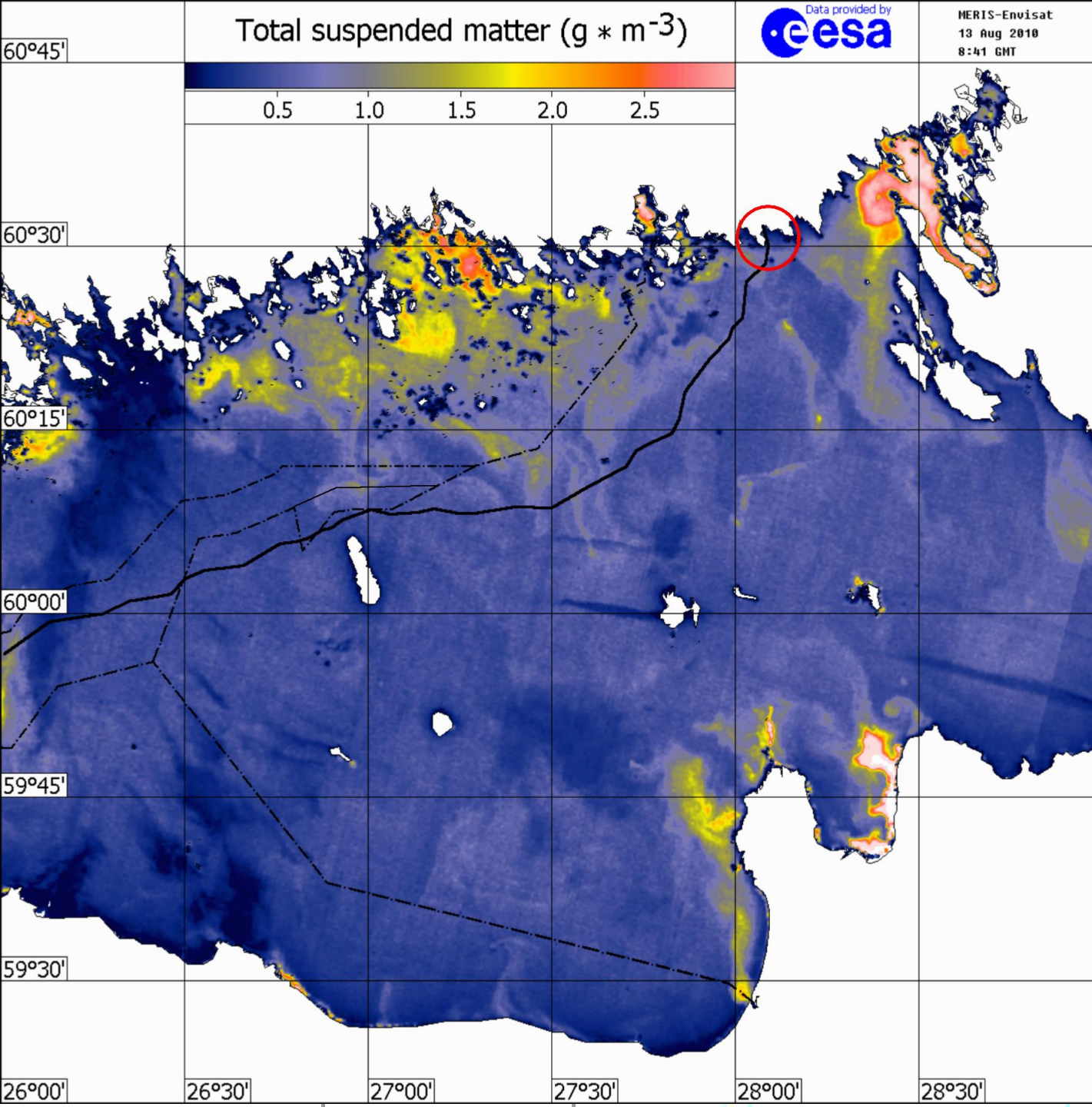
12 July 2010
MERIS
ENVISAT
250 m resolution





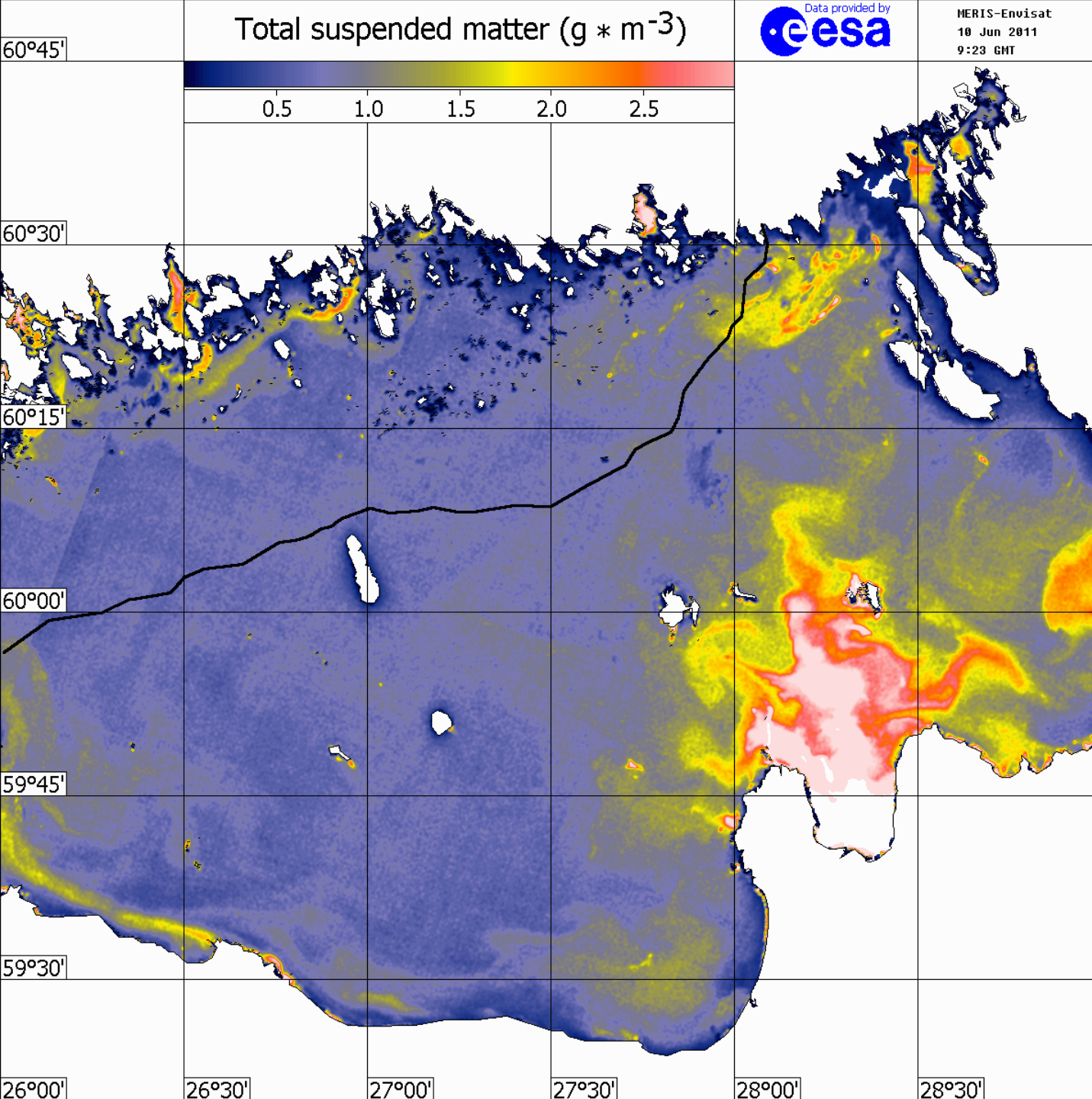
16 August 2010
MERIS
ENVISAT
250 m resolution





13 August 2010
MERIS
ENVISAT
250 m resolution

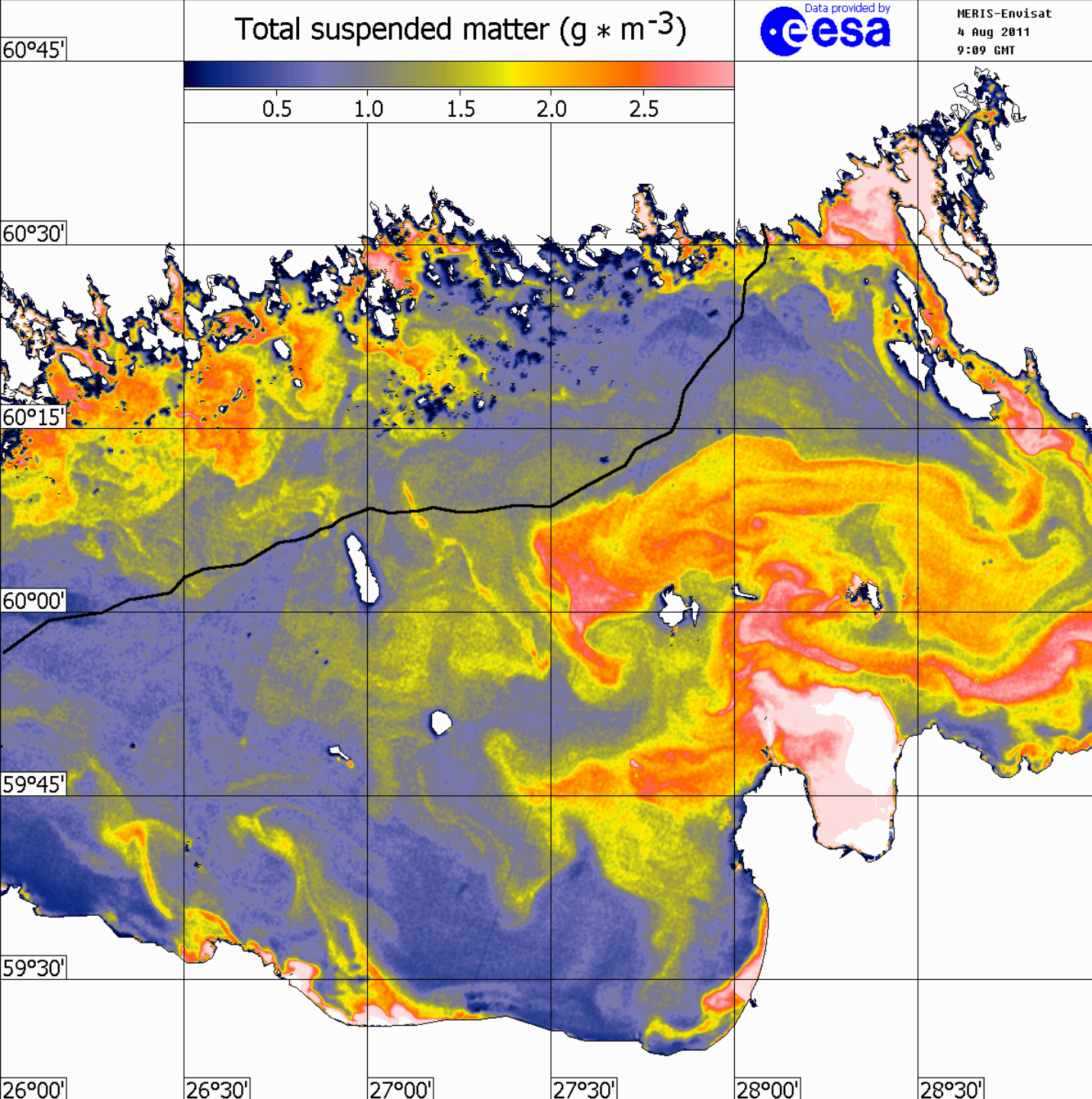




10 June 2011
MERIS
ENVISAT
250 m resolution

**Ust-Luga oil
terminal
construction**





4 August 2011
MERIS
ENVISAT
250 m resolution

Ust-Luga oil
terminal
construction



Landsat-5 5 Sep
2011

59°50'

59°45'

59°40'

28°10'

28°20'

28°30'

5 September 2011

**Landsat 5
30 m resolution**

**Ust-Luga oil
terminal
construction**



Algal bloom 6 August 2004

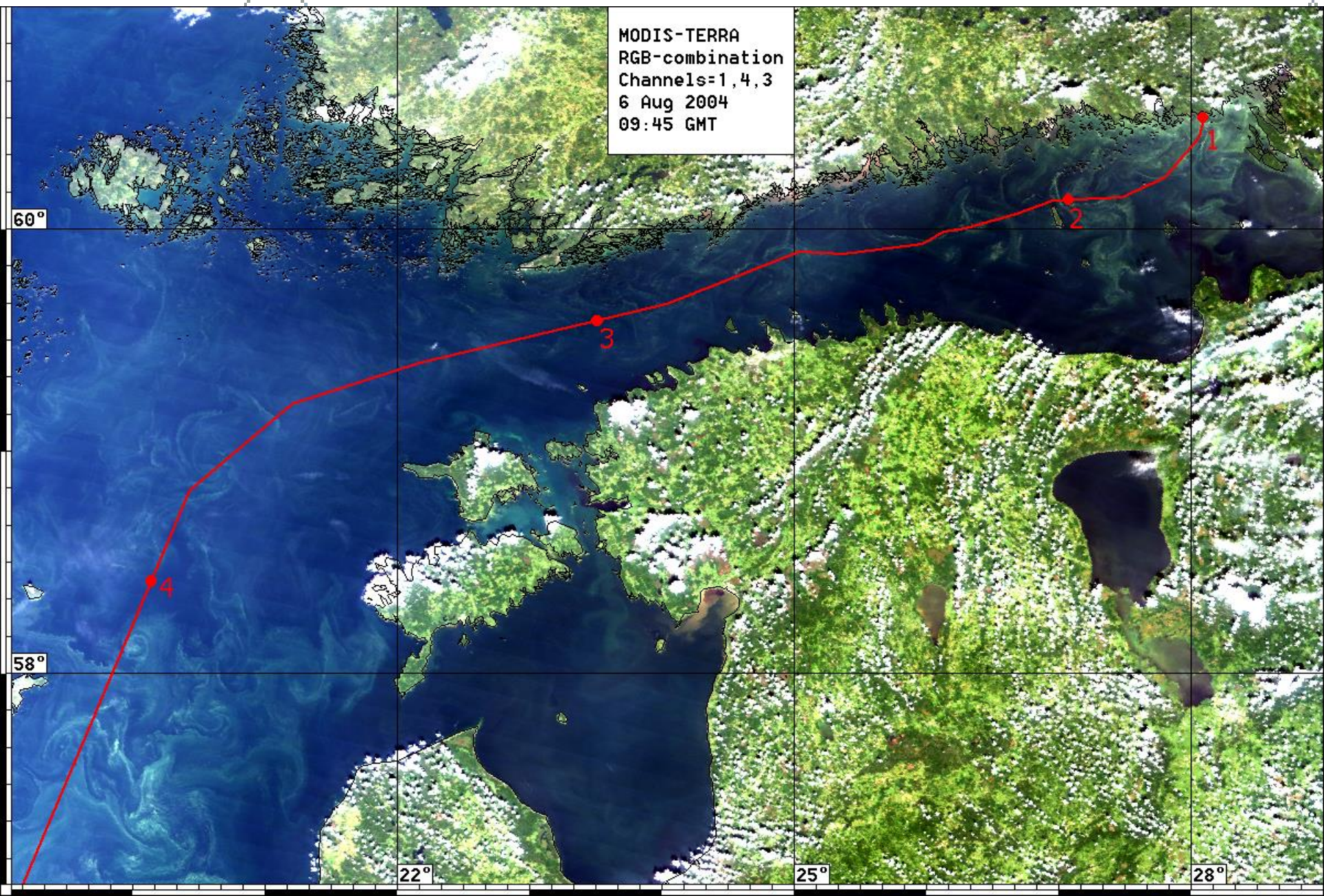
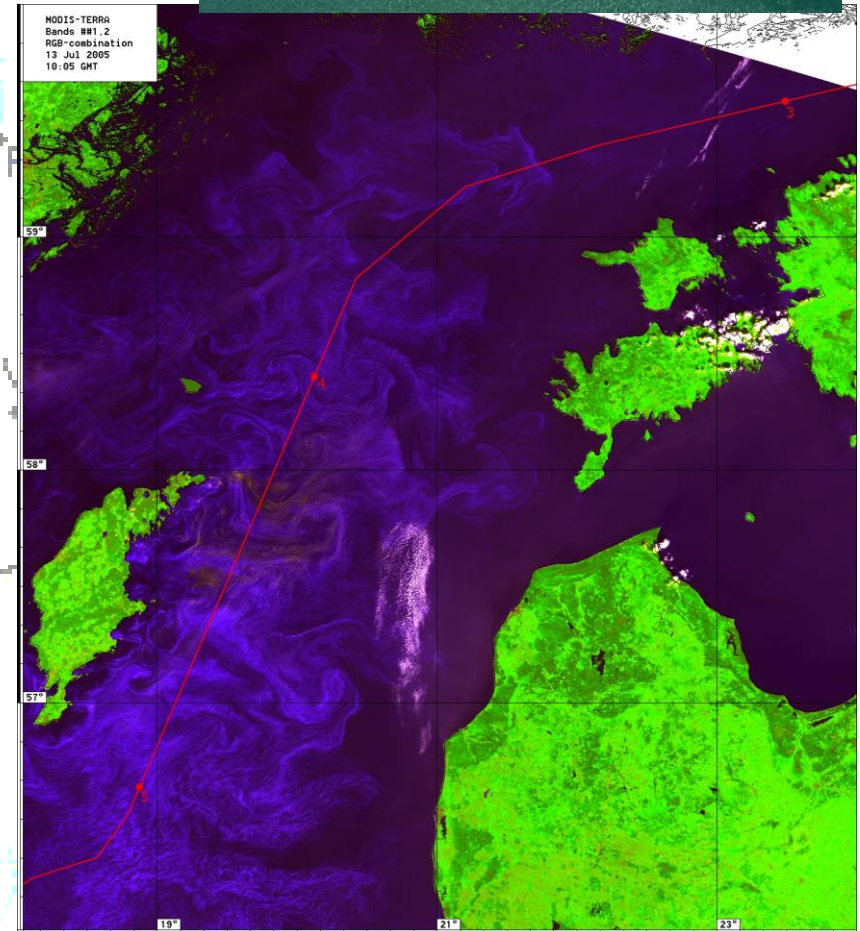
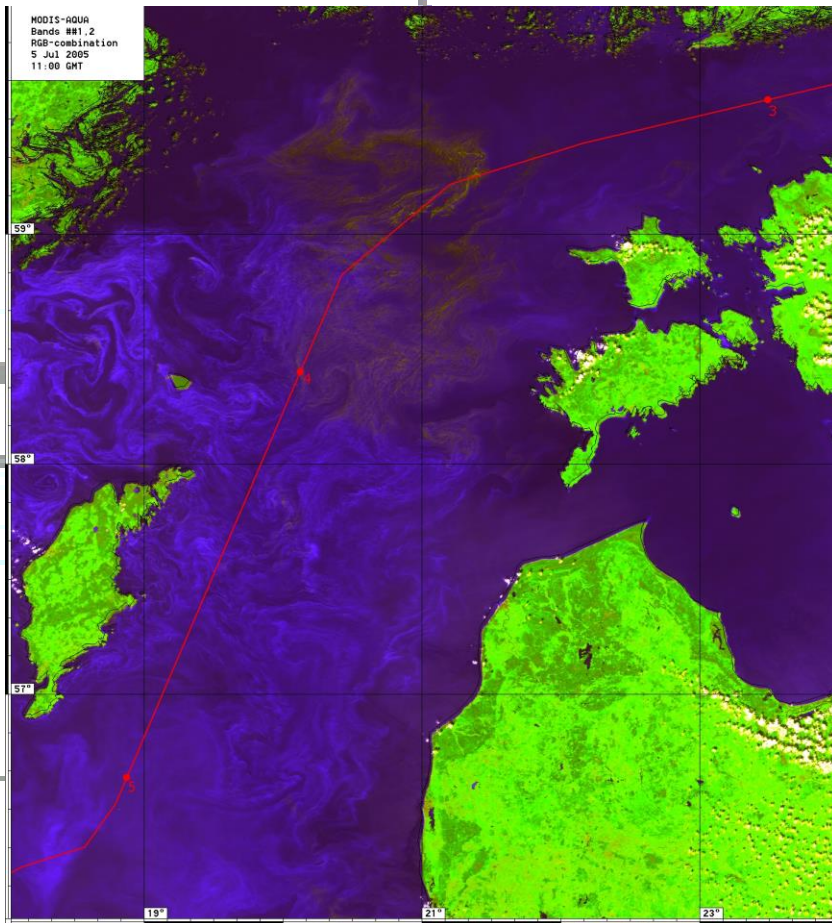
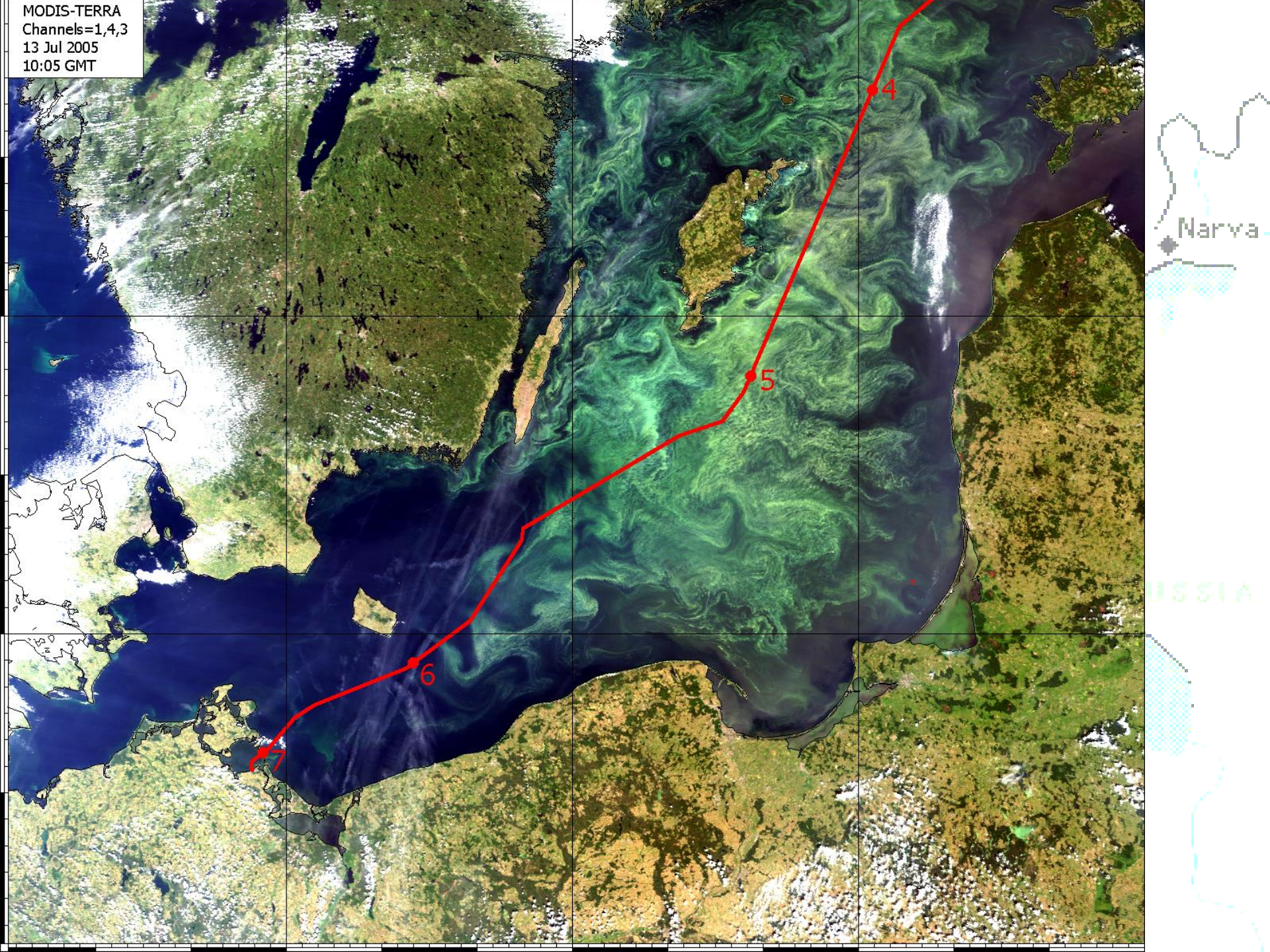


Photo of algal bloom in the Baltic Sea on 28 May 2005

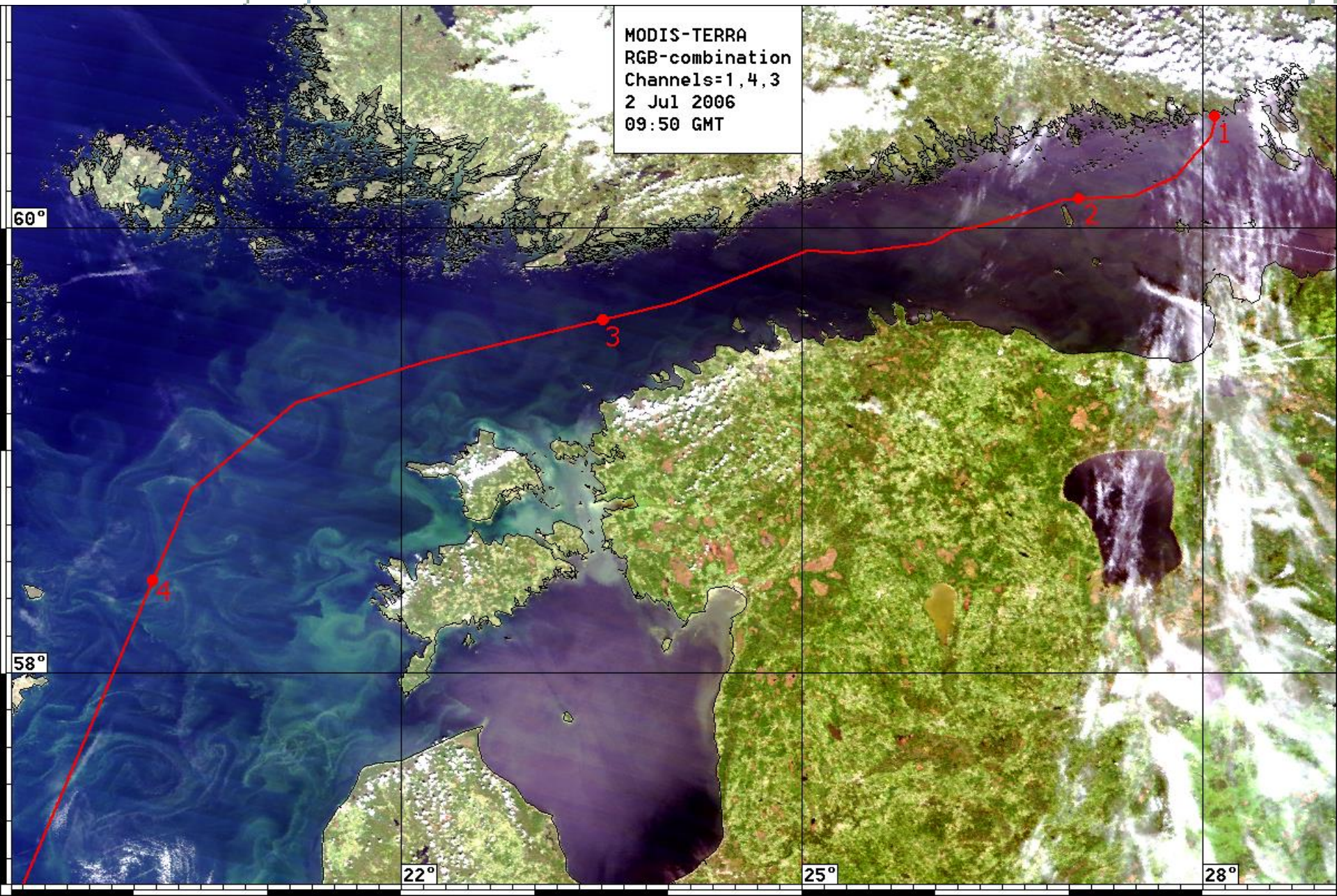
Algal bloom 5 and 13 July 2005



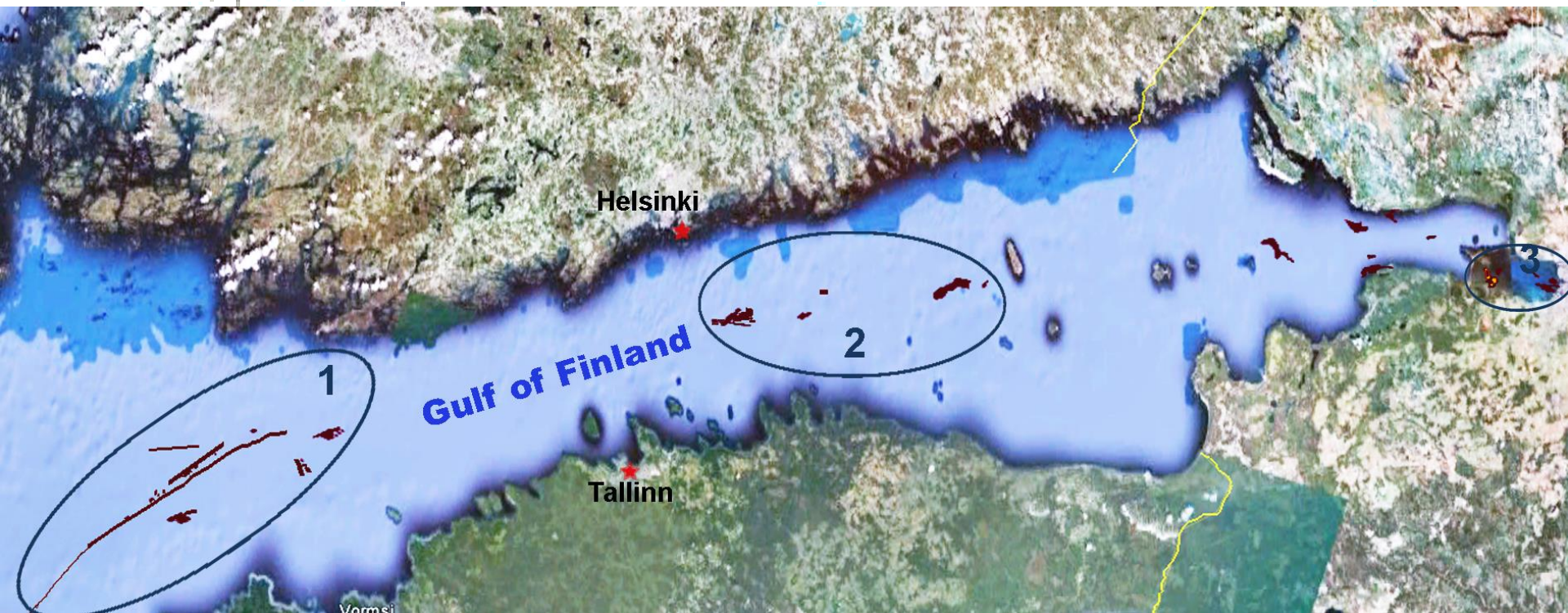
MODIS-TERRA
Channels=1,4,3
13 Jul 2005
10:05 GMT



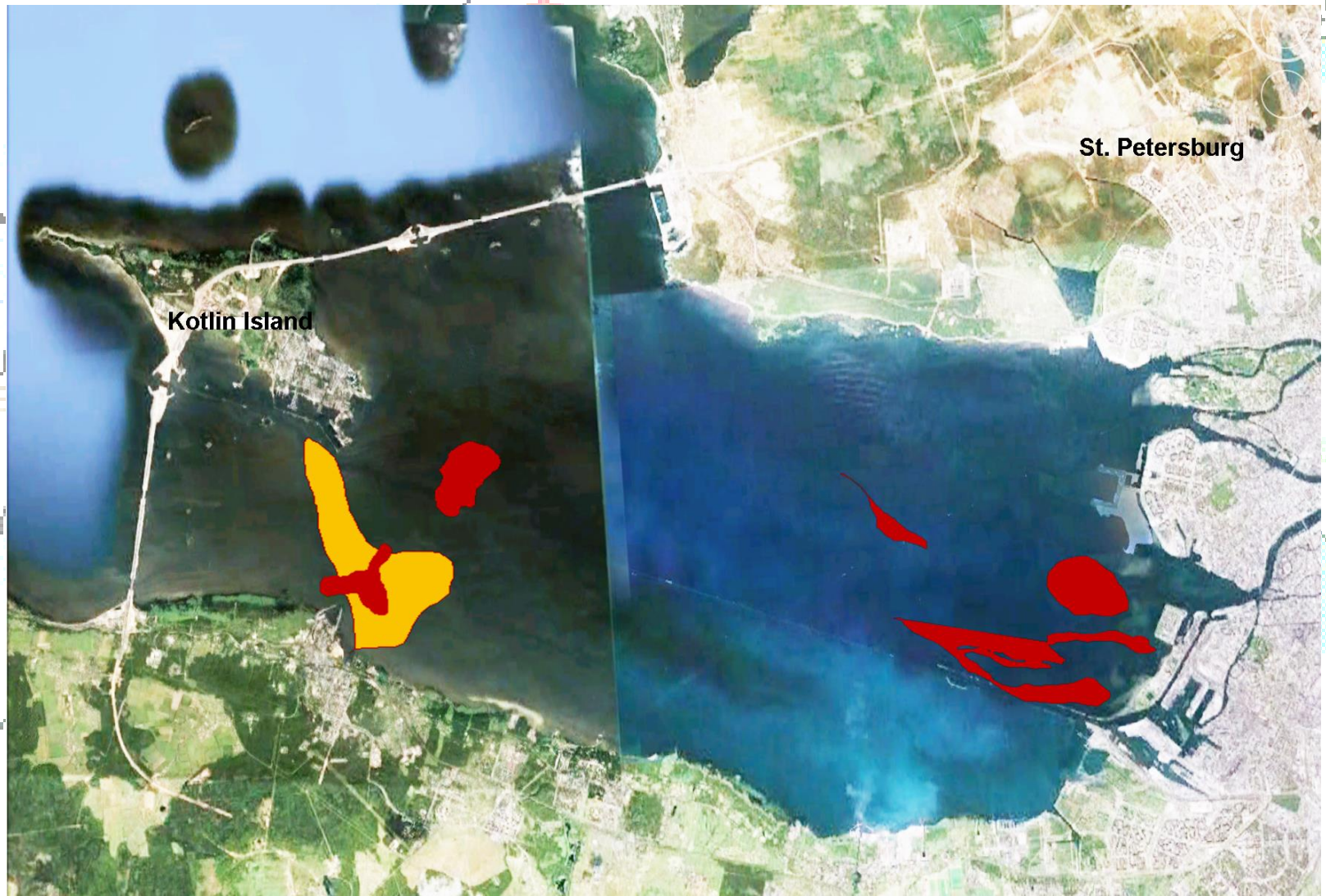
Algal bloom 2 July 2006



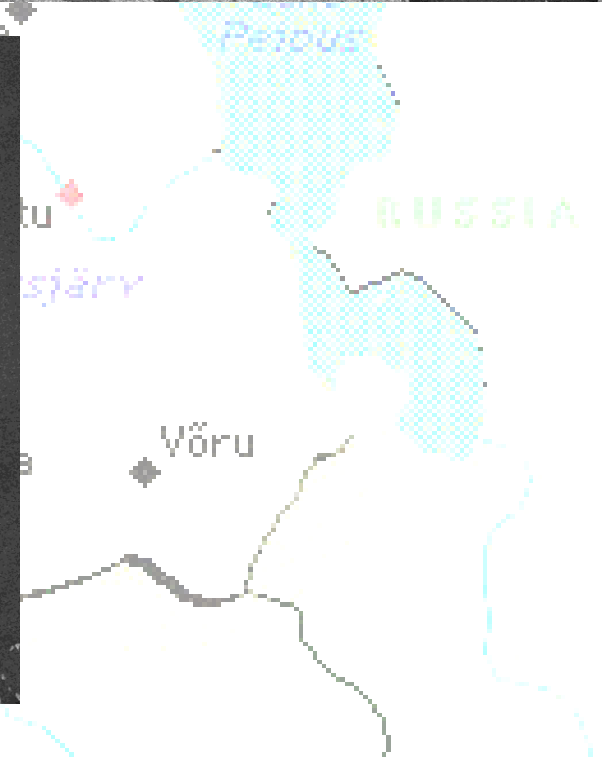
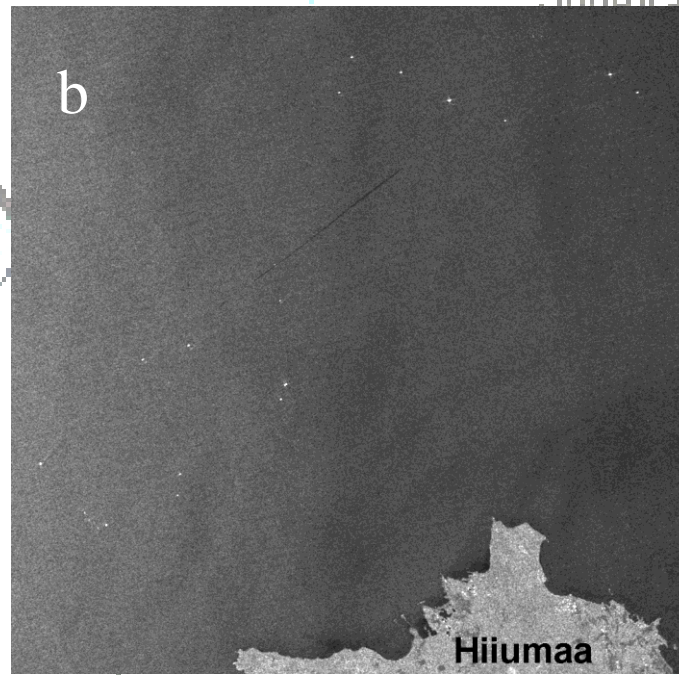
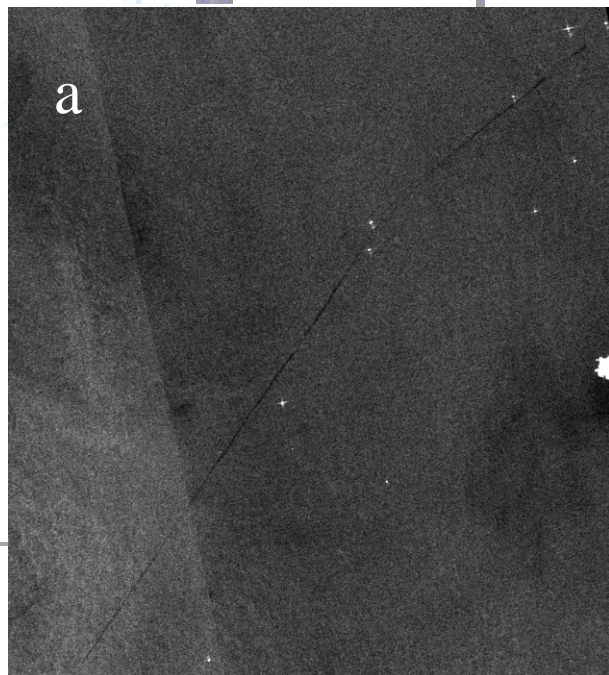
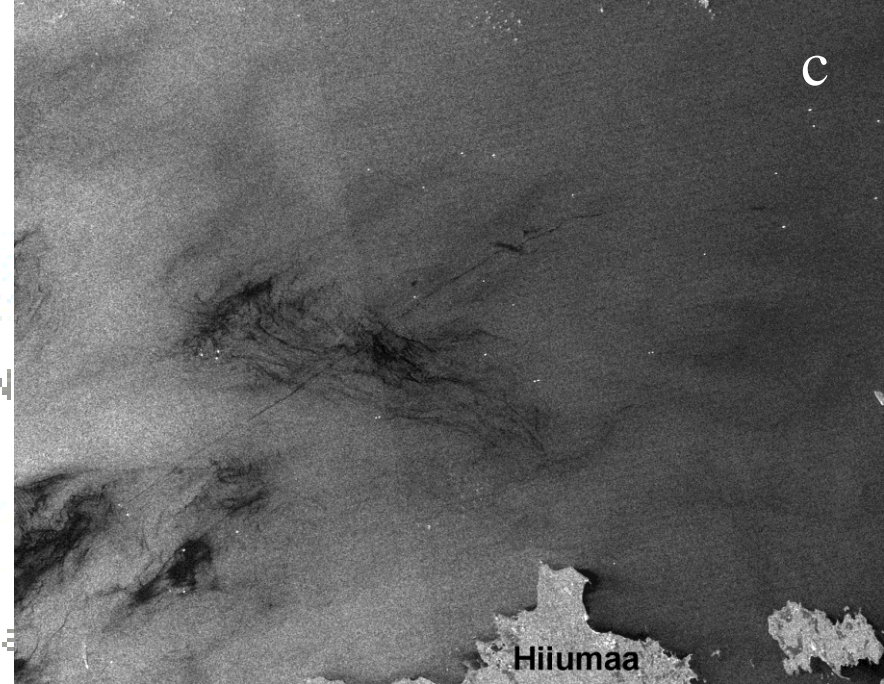
Map of oil spills revealed from satellite radar imagery in the Gulf of Finland in January 2009 – 8 April 2012



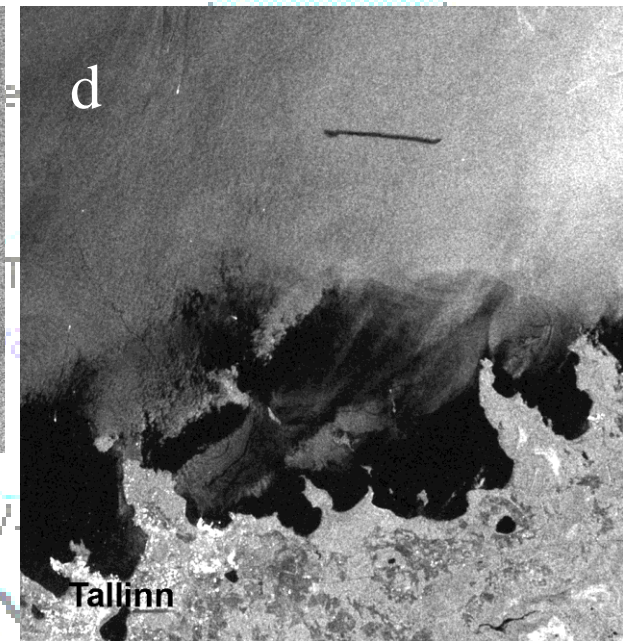
**Map of oil spills revealed from satellite radar imagery in the Neva Bay (the easternmost part of the Gulf of Finland) in January 2009 –
8 April 2012**

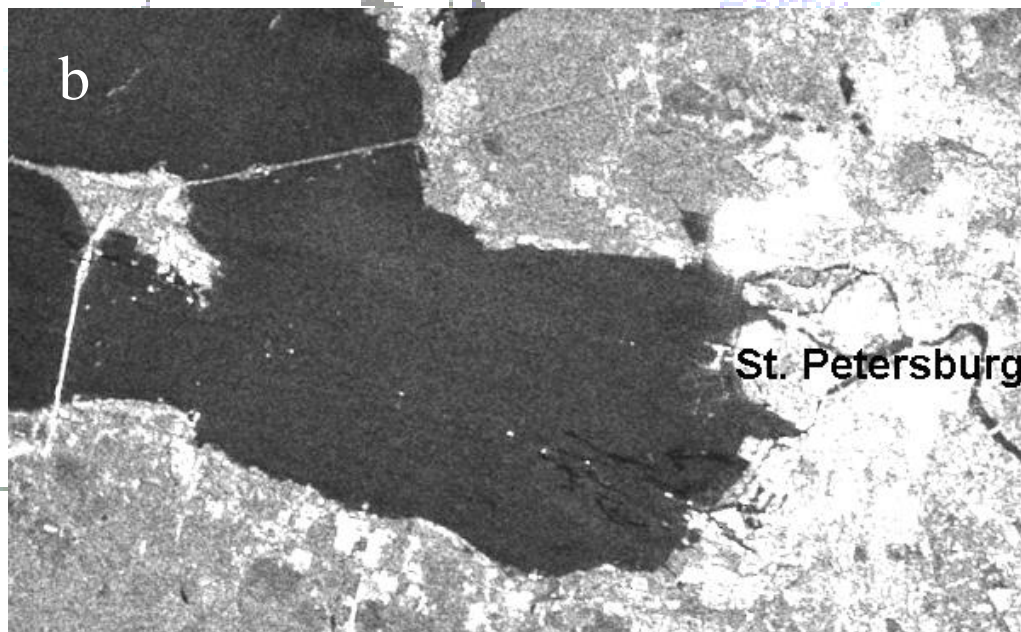
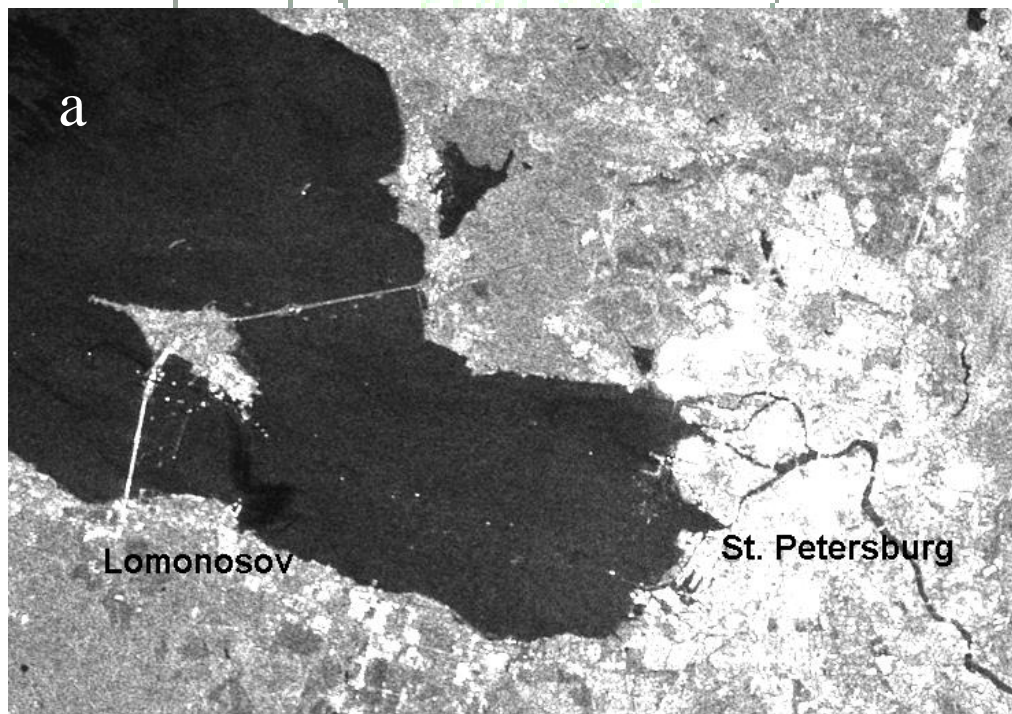


Oil spills (black straight lines) as seen in the satellite radar images of the westernmost part of the Gulf of Finland (© ESA): a) ASAR Envisat, 06.06.2009, 20:16 UTC. Two fresh oil spills from moving vessels. Total length – 88.6 km; b) ASAR Envisat, 17.06.2010, 19:59 UTC. Fresh oil spill from the moving vessel. Length – 3.5 km; c) SAR ERS-2, 25.06.2011, 19:58 UTC. Fresh oil spill from the moving vessel. Length – 6.24 km. Ships in the sea are visible as bright white dots.



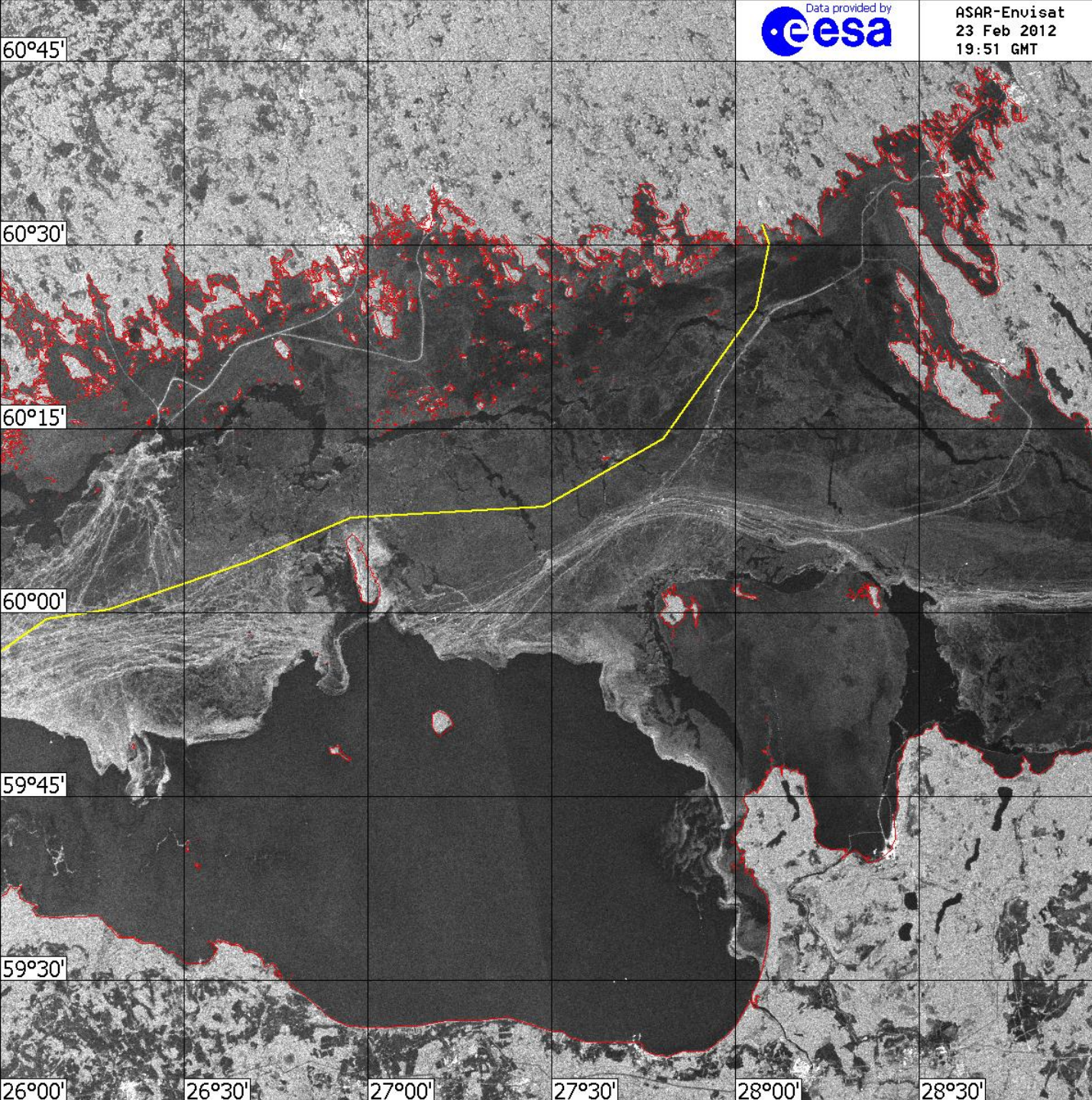
Oil spills (black patches) as seen in the satellite radar images of the central part of the Gulf of Finland (© ESA): a) ASAR Envisat, 22.07.2010, 20:06 UTC. The release of oil-containing waters from the motionless vessel. Surface – 6.27 km²; b) ASAR Envisat, 09.10.2011, 08:50 UTC. Weathered oil spill – «comb-like» structure. Surface – 28.5 km²; c) zoom on oil spill shown in Fig. 11b; d) ERS-2, 03.08.2010, 09:26 UTC. An elongated comb-like spill. Length – 12.7 km, surface - 8.4 km².





Surface slicks (black patches) seen in the satellite radar images of the the Neva Bay (the easternmost part of the Gulf of Finland) (© ESA):

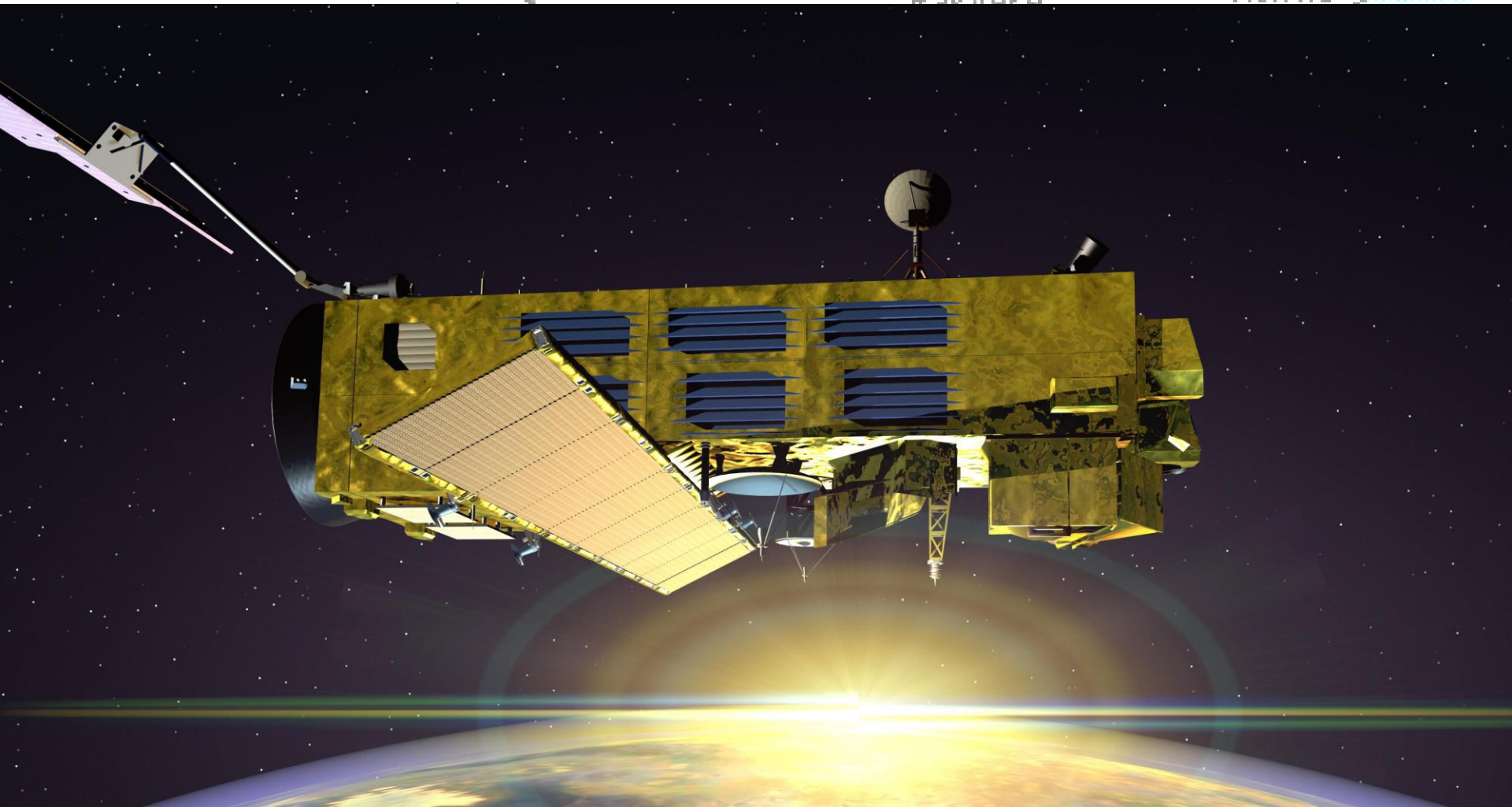
a) ASAR Envisat, 03.11.2010, 08:33 UTC. Widespread slick area near the Lomonosov town. Surface – 13.1 km²; b) ASAR Envisat, 24.08.2011, 08:37 UTC. Anthropogenic slicks in direct proximity to the Neva River mouth. Surface – 3.5 km².



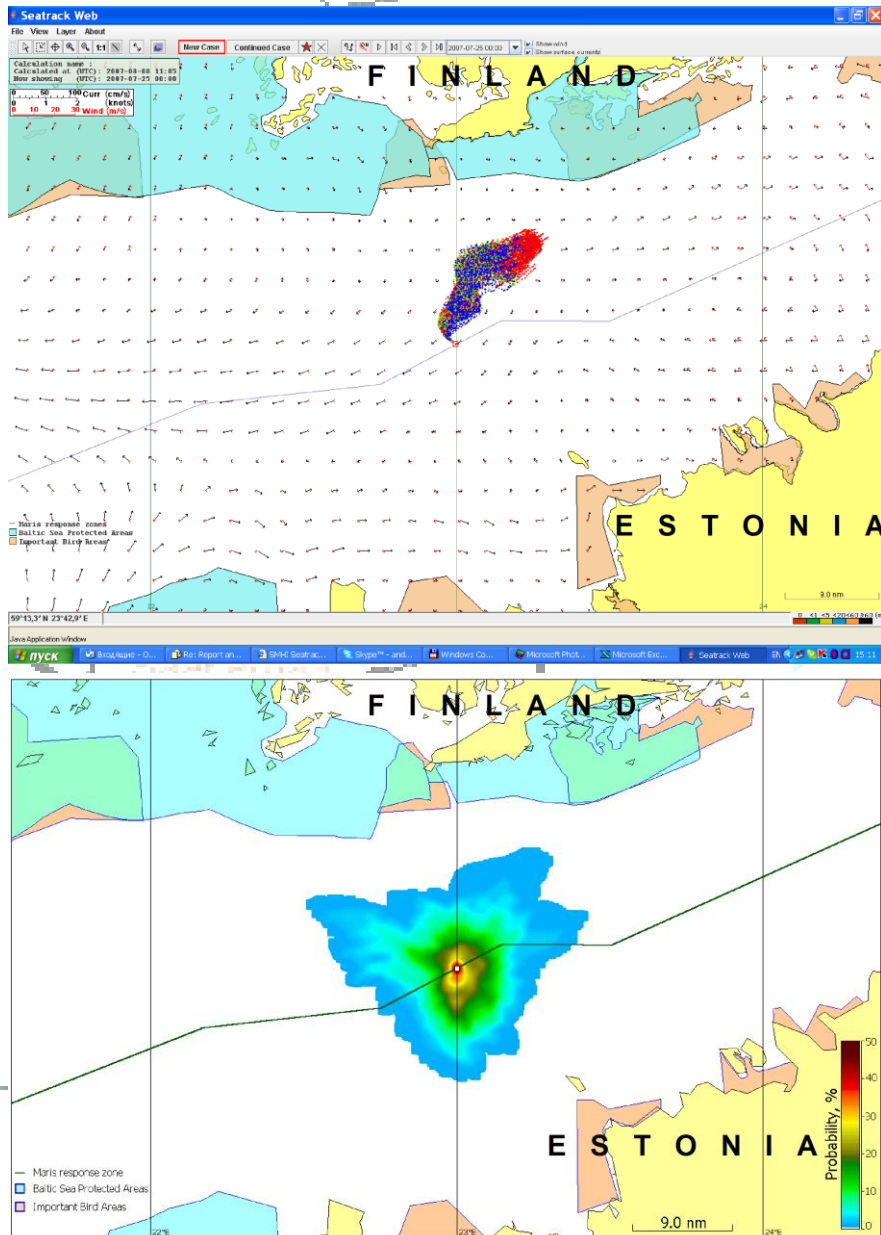
Ice cover
23 Feb 2012
ASAR
Envisat



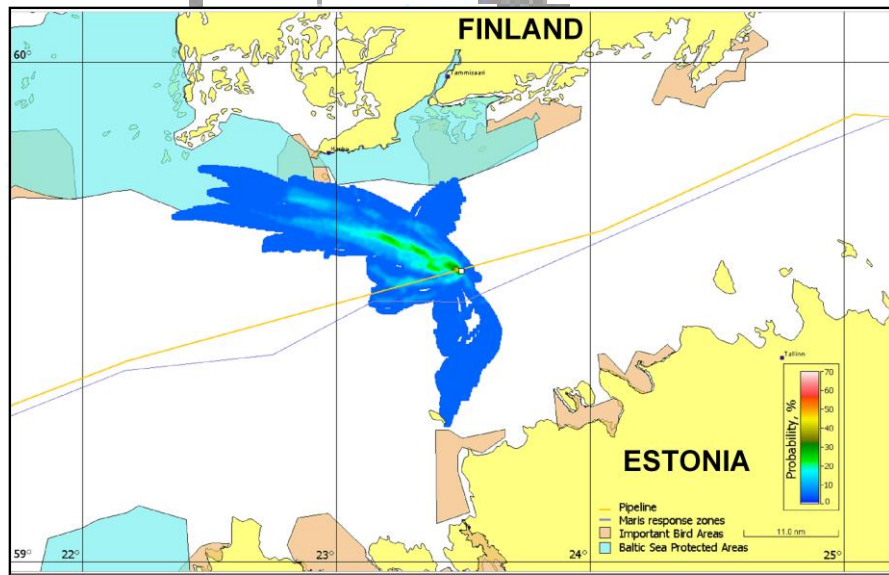
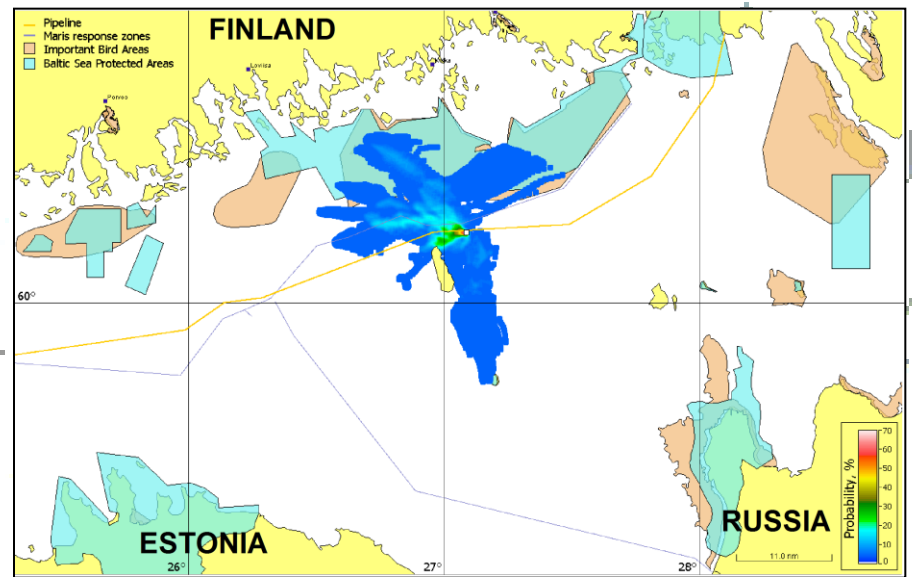
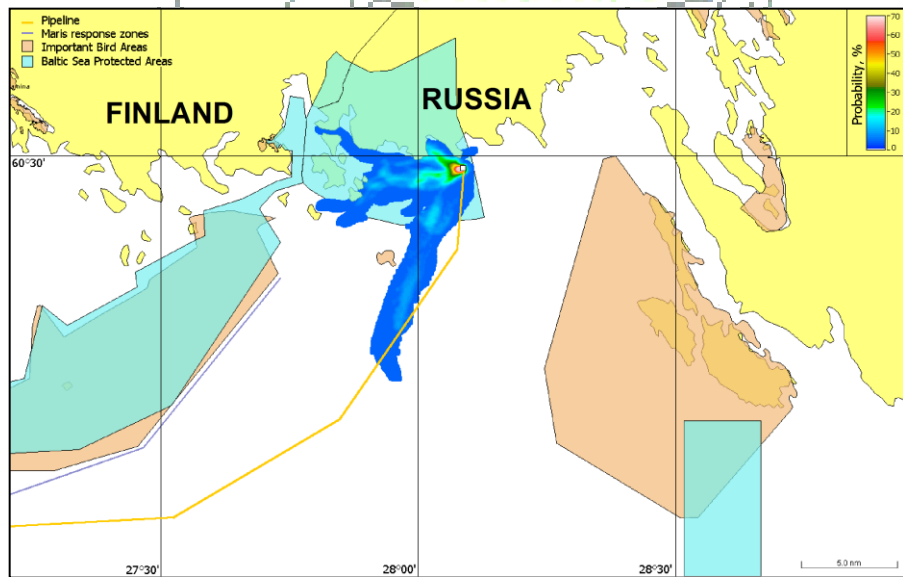
8 April 2012 a connection was lost with ENVISAT satellite
No more MERIS (total suspended matter, 250 m) and
ASAR data (oil pollution and ice, 75 m)



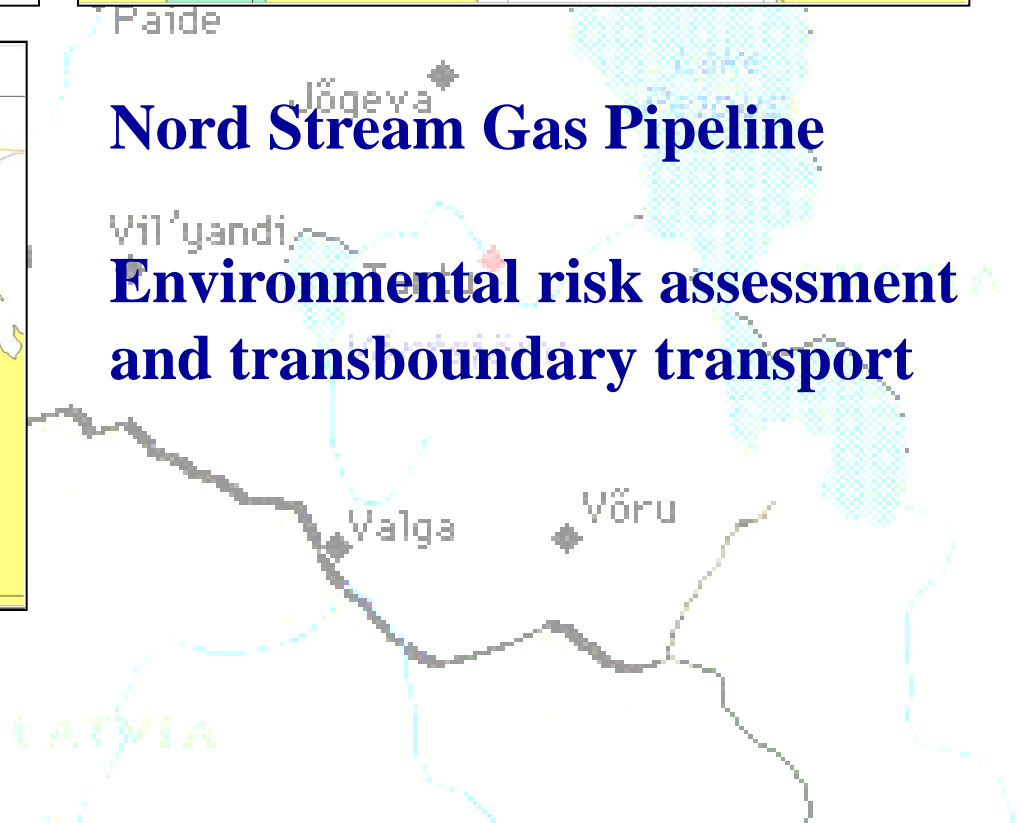
5. Numerical modelling (Seatrack Web Model)



Modelling of oil spill drift in the Gulf of Finland: (a) shows oil spill drift on 23 July 2007; (b) shows probability (%) of oil spill drift calculated on the base of daily modelling at this point for real wind and currents conditions in July-August 2007. BSPAs are shown in blue, Important Bird Areas – in light-brown colors, coastal zones of Finland and Estonia are colored by yellow, blue line shows delimitation of the MARIS response zones.



Nord Stream Gas Pipeline **Environmental risk assessment** **and transboundary transport**



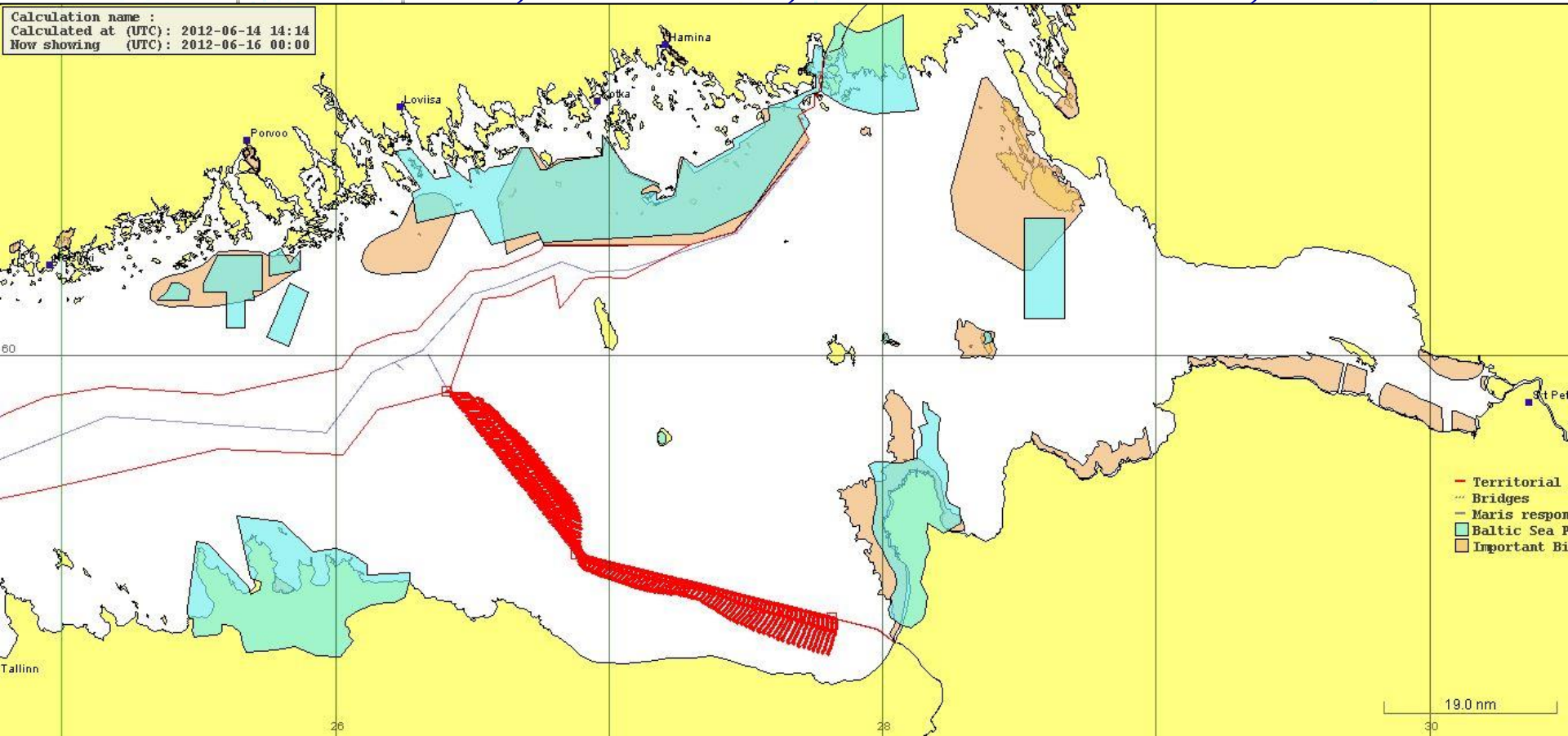
Estonia/Russia sea border - Environmental risk assessment and transboundary transport

Seatrack Web model

Oil pollution at Estonia-Russia sea border (modelling)

Volume – 100 cub m in a line along the sea border

Start – 14 June 2012, 00-00 UTC, End – 16 June 2012, 00-00 UTC



Seatrack Web model

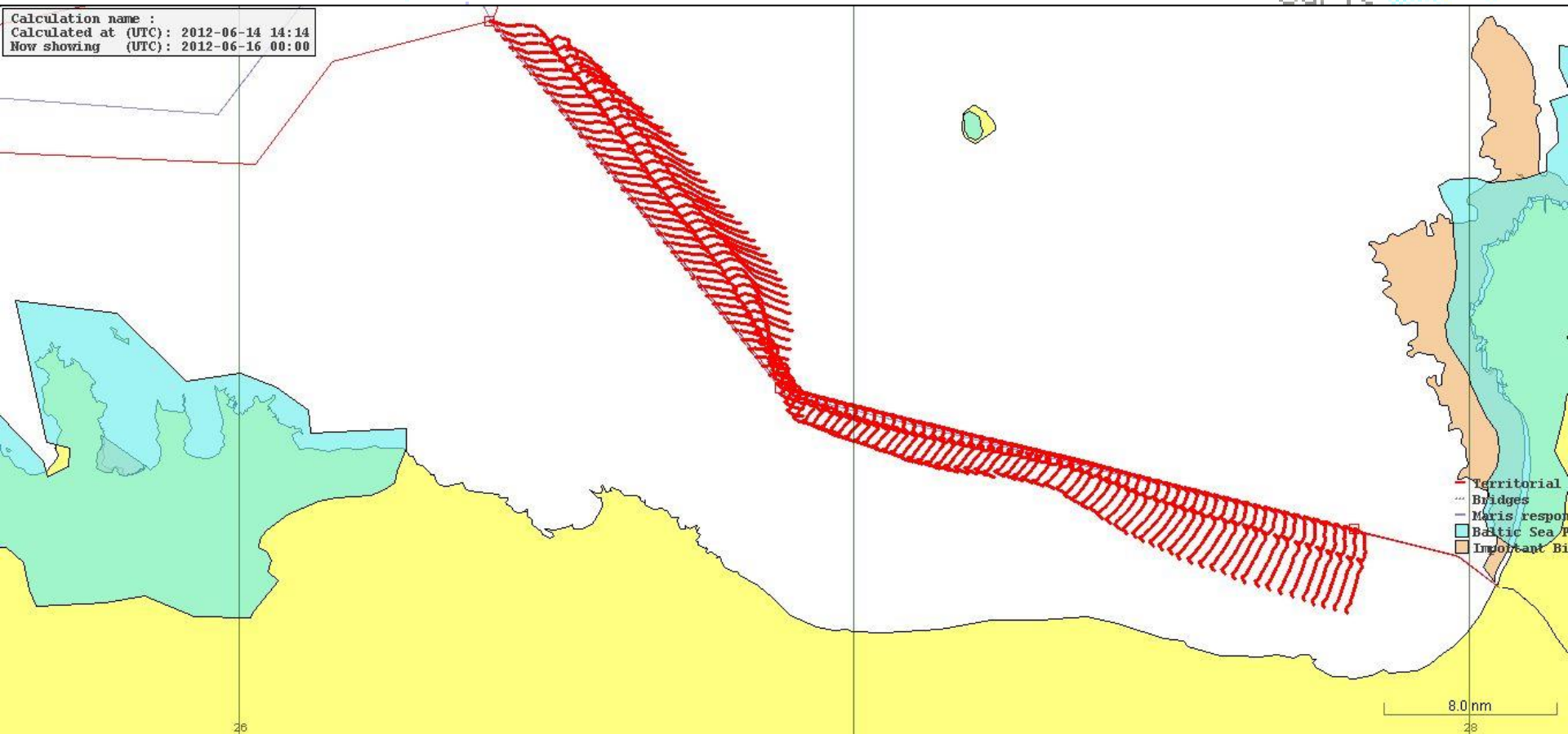
Oil pollution at Estonia-Russia sea border (modelling, zoom)

Volume – 100 cub m in a line

Start – 14 June 2012, 00-00 UTC

End – 16 June 2012, 00-00 UTC

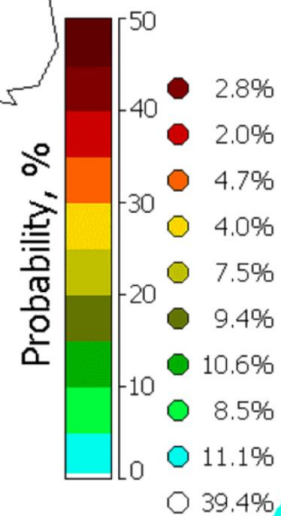
Calculation name :
Calculated at (UTC): 2012-06-14 14:14
Now showing (UTC): 2012-06-16 00:00



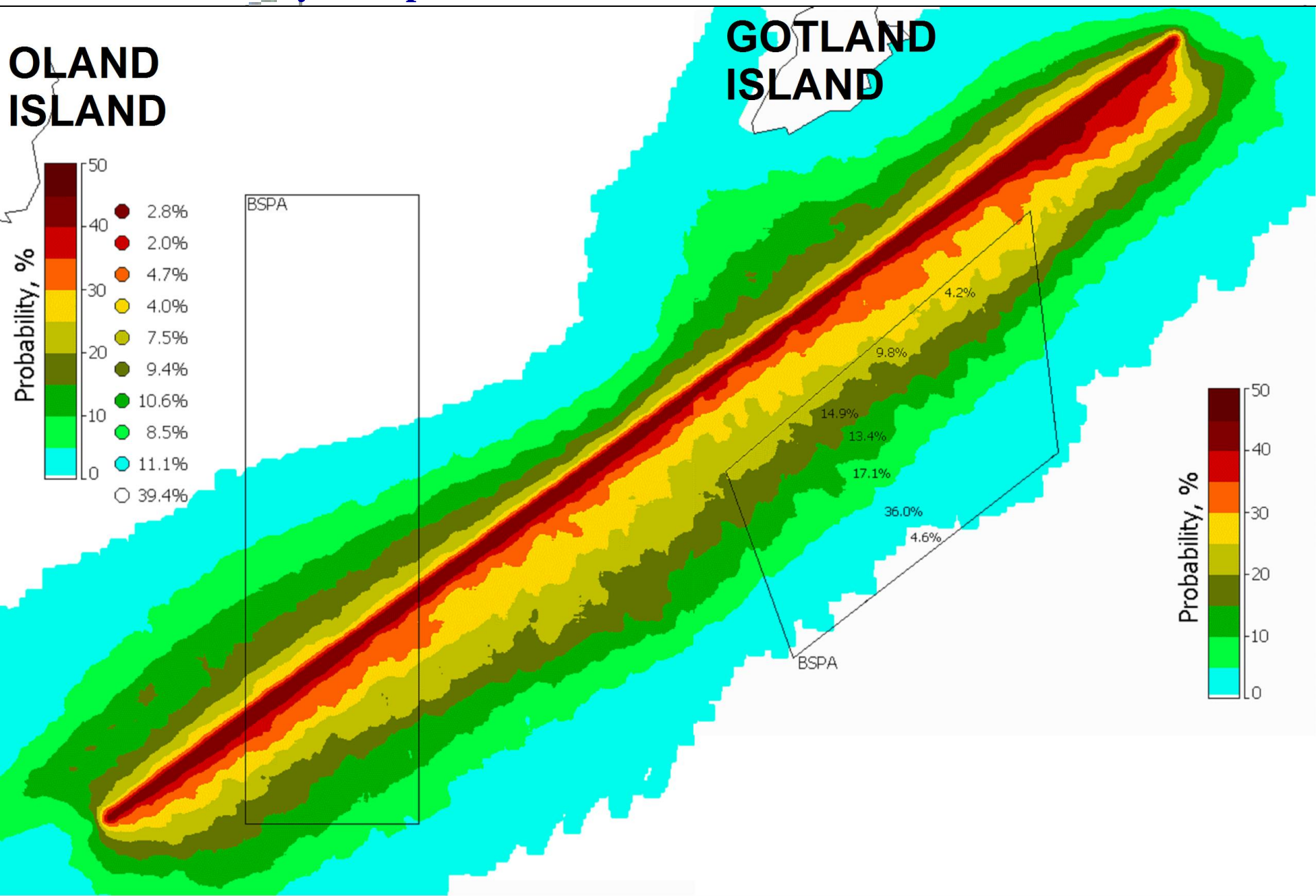
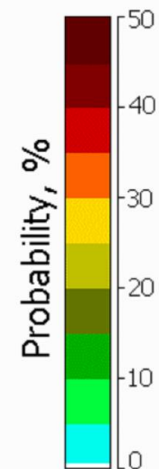
Estonia/Russia sea border - Environmental risk assessment and transboundary transport

OLAND
ISLAND

GOTLAND
ISLAND



BSPA



Tänan teid tähelepanu eest!
Спасибо за внимание!
Thank you for your attention!

