Application of Hyperspectral Airborne Remote Sensing for Marine Ecosystem Monitoring

Dainis Jakovels
Institute for Environmental Solutions
E: dainis.jakovels@videsinstituts.lv

Airborne Surveillance and Environmental Monitoring System (ARSENAL)

INSTITUTE FOR ENVIRONMENTAL SOLUTIONS

High resolution RGB sensor

LIDAR

UVC sensor
280-375 nm

VIS-NIR sensor
380-1050 nm

SWIR sensor
950-2450 nm

MWIR sensor
3000-5000 nm

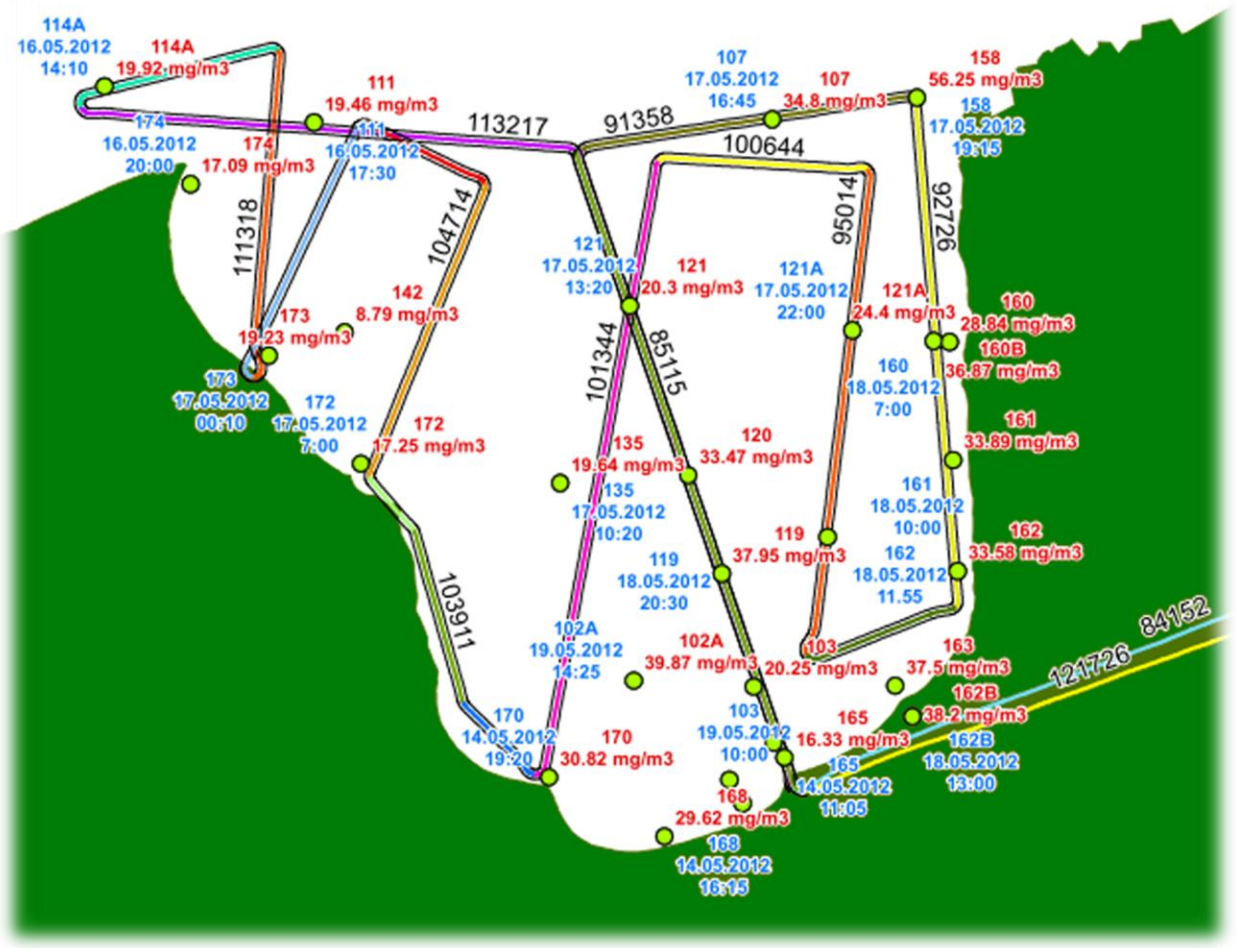
- 18 spectral bands out of 288 possible were used in the spectral range 432-797 nm
- Spatial resolution was 1 m/px

Evaluation of chlorophyll distribution in the Gulf of Riga

INSTITUTE FOR ENVIRONMENTAL SOLUTIONS

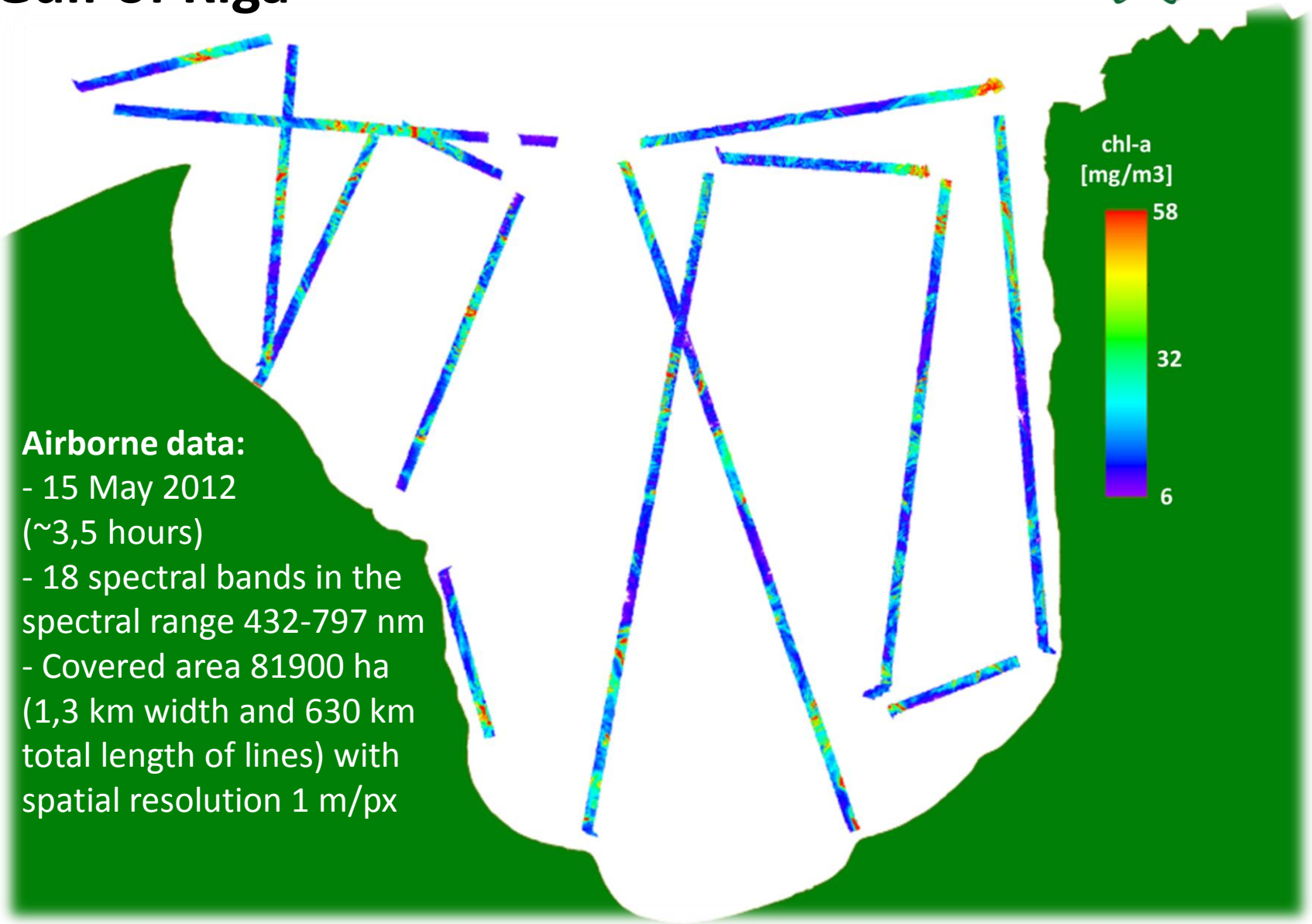
Airborne data:
- 15 May 2012 (~3,5 hours)
- 18 spectral bands in the spectral range 432-797 nm
- Covered area 81900 ha (1,3 km width and 630 km total length of lines) with spatial resolution 1 m/px

Field measurements:
- 14-19 May 2012
- 30 measurement points



Evaluation of chlorophyll distribution in the Gulf of Riga

INSTITUTE FOR ENVIRONMENTAL SOLUTIONS



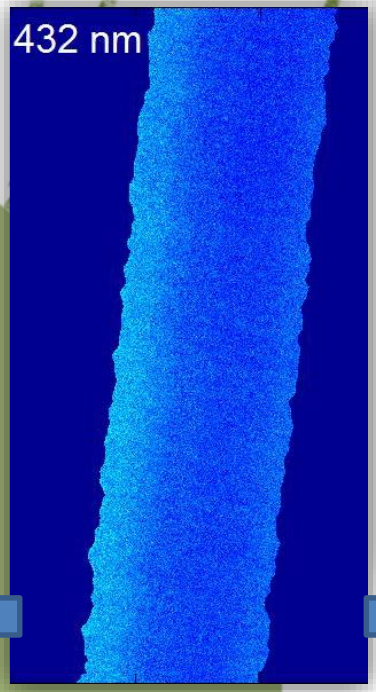
Airborne data:
- 15 May 2012 (~3,5 hours)
- 18 spectral bands in the spectral range 432-797 nm
- Covered area 81900 ha (1,3 km width and 630 km total length of lines) with spatial resolution 1 m/px

Evaluation of chlorophyll distribution in the Gulf of Riga

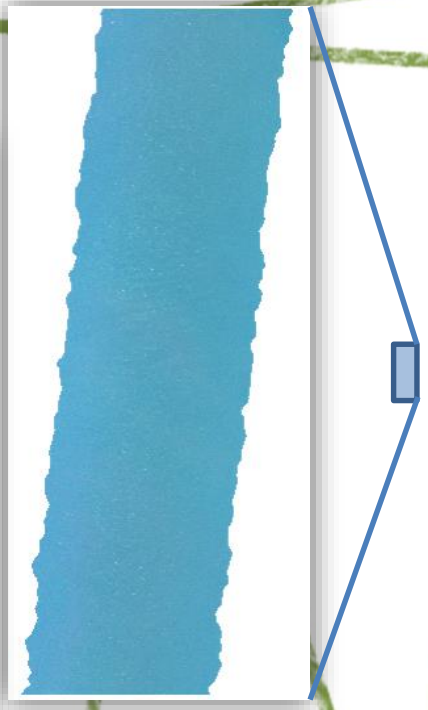
INSTITUTE FOR ENVIRONMENTAL SOLUTIONS

False color image
RGB(666, 712,744 nm)

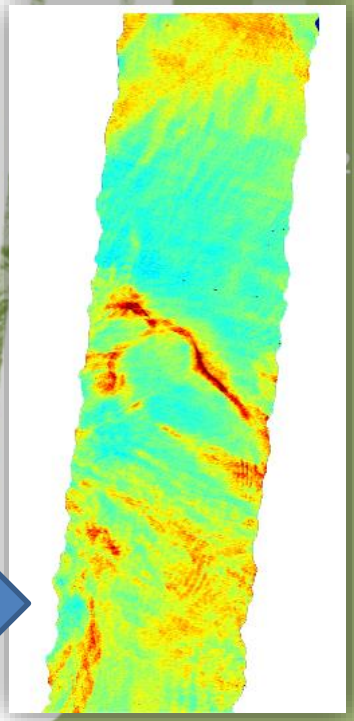
Spectral bands



Color image

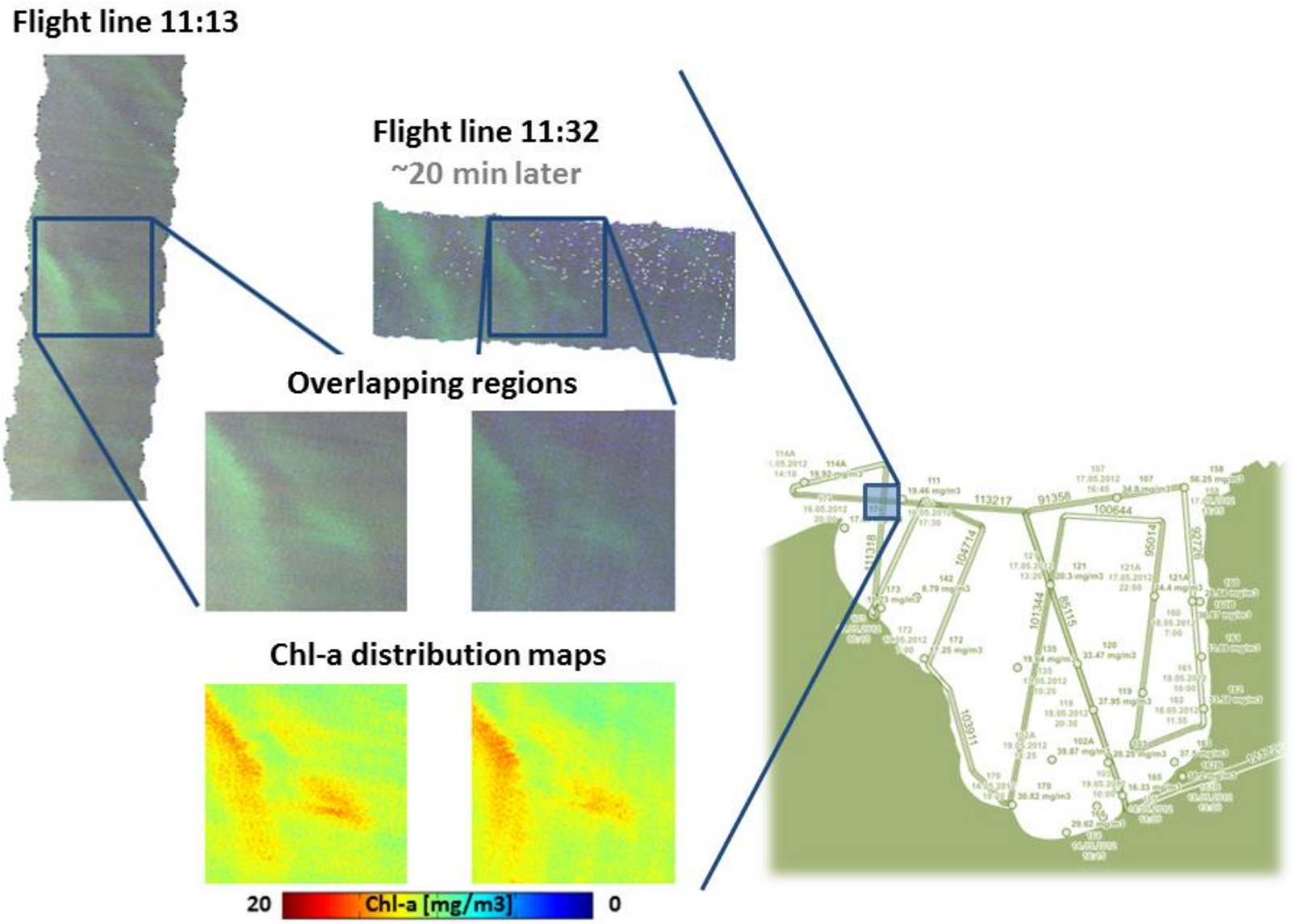


Chlorophyll a map
chl-a ~ 744nm/712nm



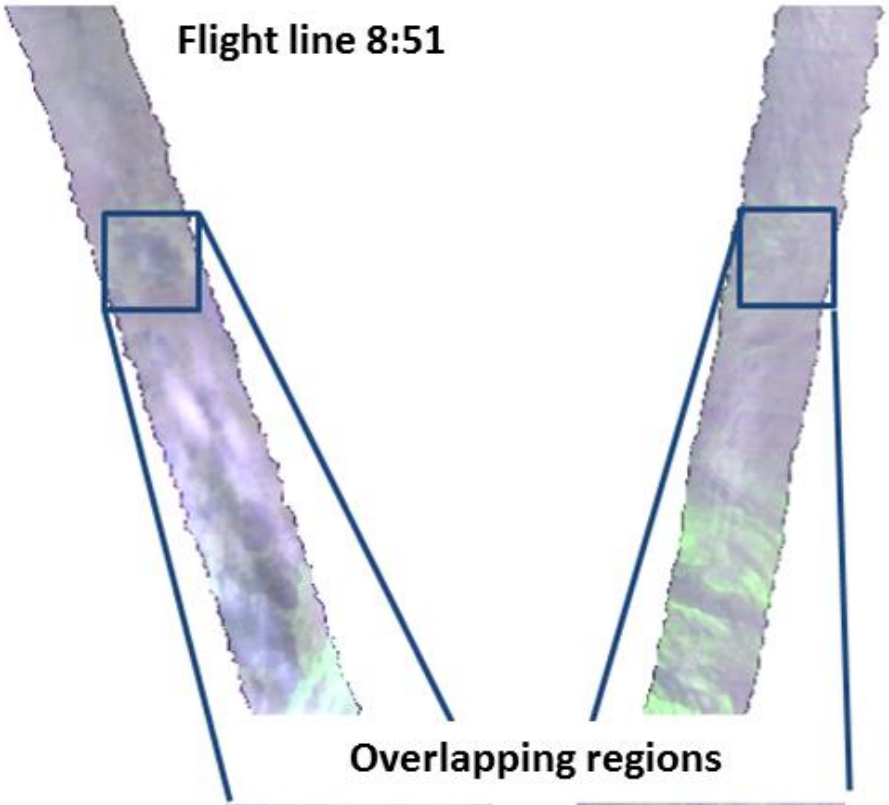
Evaluation of chlorophyll distribution in the Gulf of Riga

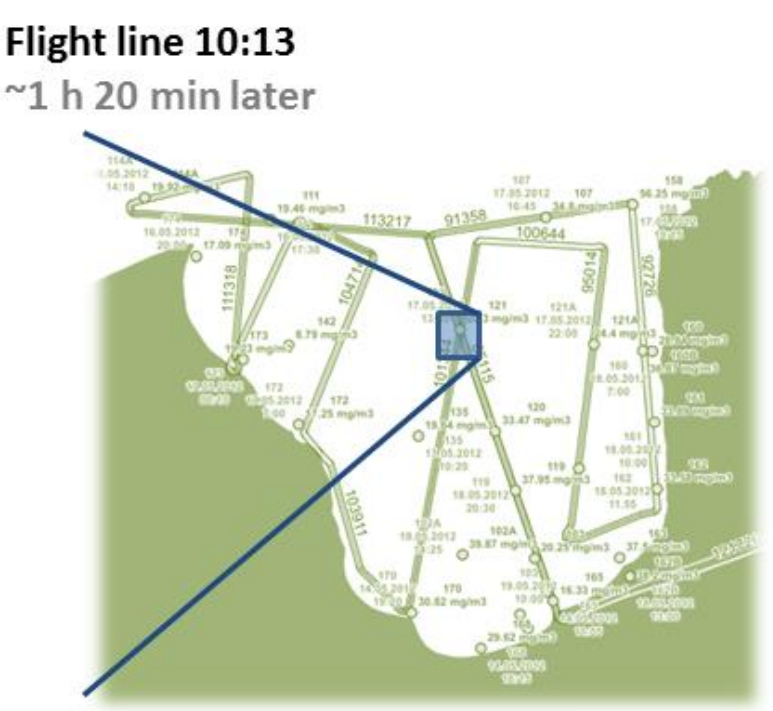
INSTITUTE FOR ENVIRONMENTAL SOLUTIONS



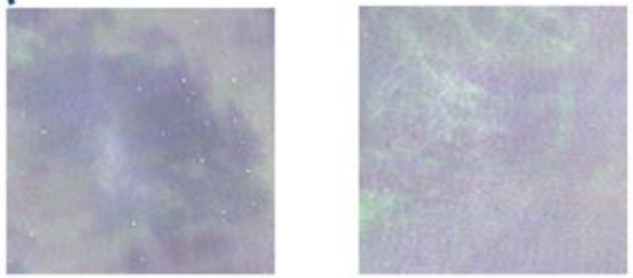
Evaluation of chlorophyll distribution in the Gulf of Riga

INSTITUTE FOR ENVIRONMENTAL SOLUTIONS

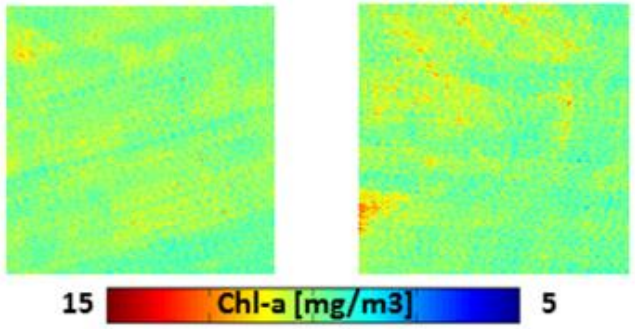




Overlapping regions

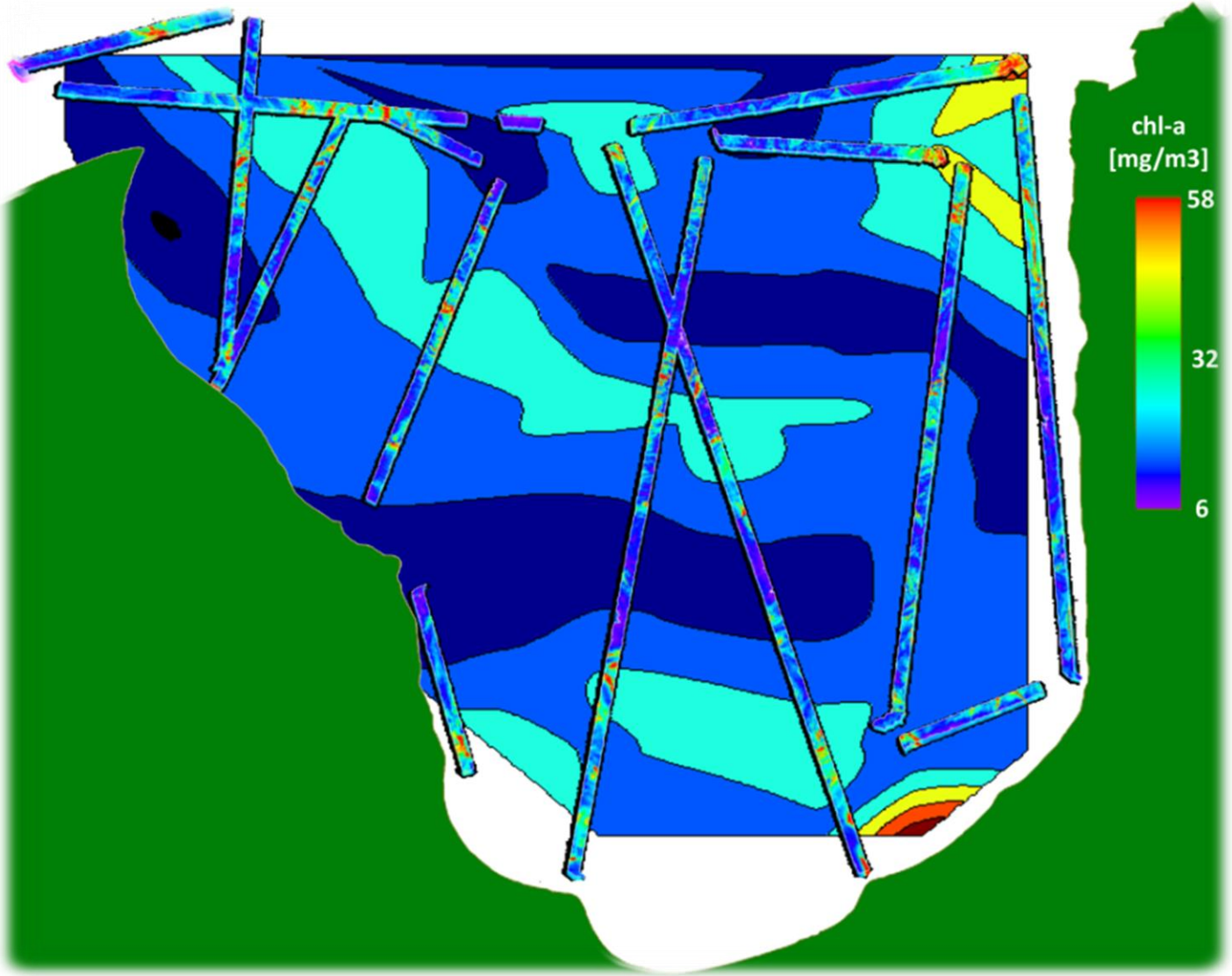


Chl-a distribution maps



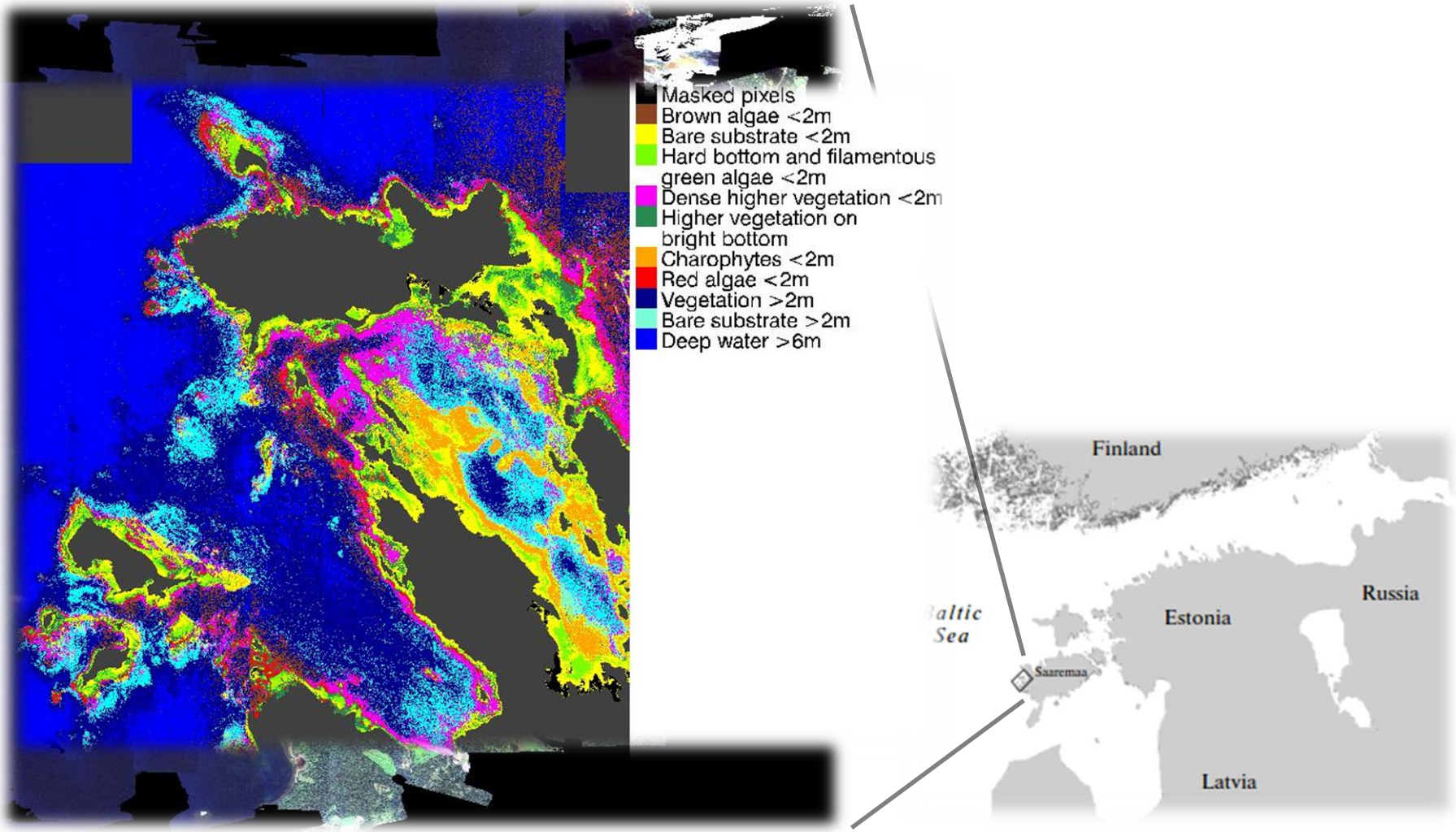
Evaluation of chlorophyll distribution in the Gulf of Riga

INSTITUTE FOR ENVIRONMENTAL SOLUTIONS



Mapping shallow water environment in Baltic Sea near Saaremaa

INSTITUTE FOR ENVIRONMENTAL SOLUTIONS



E.Vahtmäe, T.Kutser, J.Kotta, et al. «Mapping Baltic Sea shallow water environments with airborne remote sensing,» Oceanology 52(6), 803-809 (2012)

Conclusions

INSTITUTE FOR ENVIRONMENTAL SOLUTIONS

- Adaptability and high spectral/spatial resolution are the main advantages of hyperspectral airborne remote sensing data.
- Careful planning of the campaign is critical for further interpretation of the data.
- Fusion of airborne, field and also satellite data would reduce the number of necessary field samples, and lead to more complete and accurate assessment of marine ecosystem.

Dainis Jakovels
Institute for Environmental Solutions
E: dainis.jakovels@videsinstituts.lv