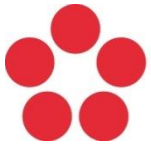

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T A
Č R

RemoteGuard: Tool for Analysis of Water Quality in Shallow Waters Using Remotely Sensed Data

Jakub Brom

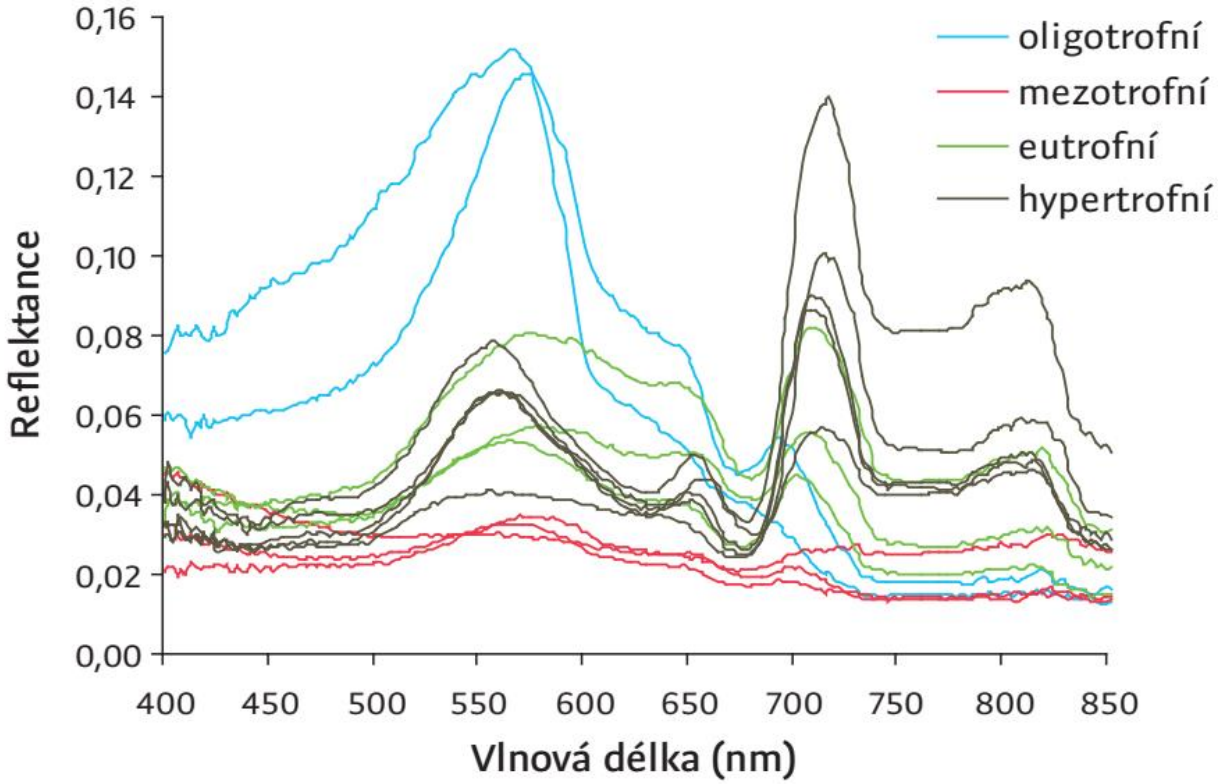
Mohammadmehdi Saberioon, Petr Císař, Pavel Souček,
Václav Nedbal, Libor Pechar, Martina Kobesová, Martin Musil

7th Czech National Copernicus User Forum, Prague, 7. June 2018

TAČR Gama TG03010027 Posílení aktivit proof-of-concept na Jihočeské univerzitě

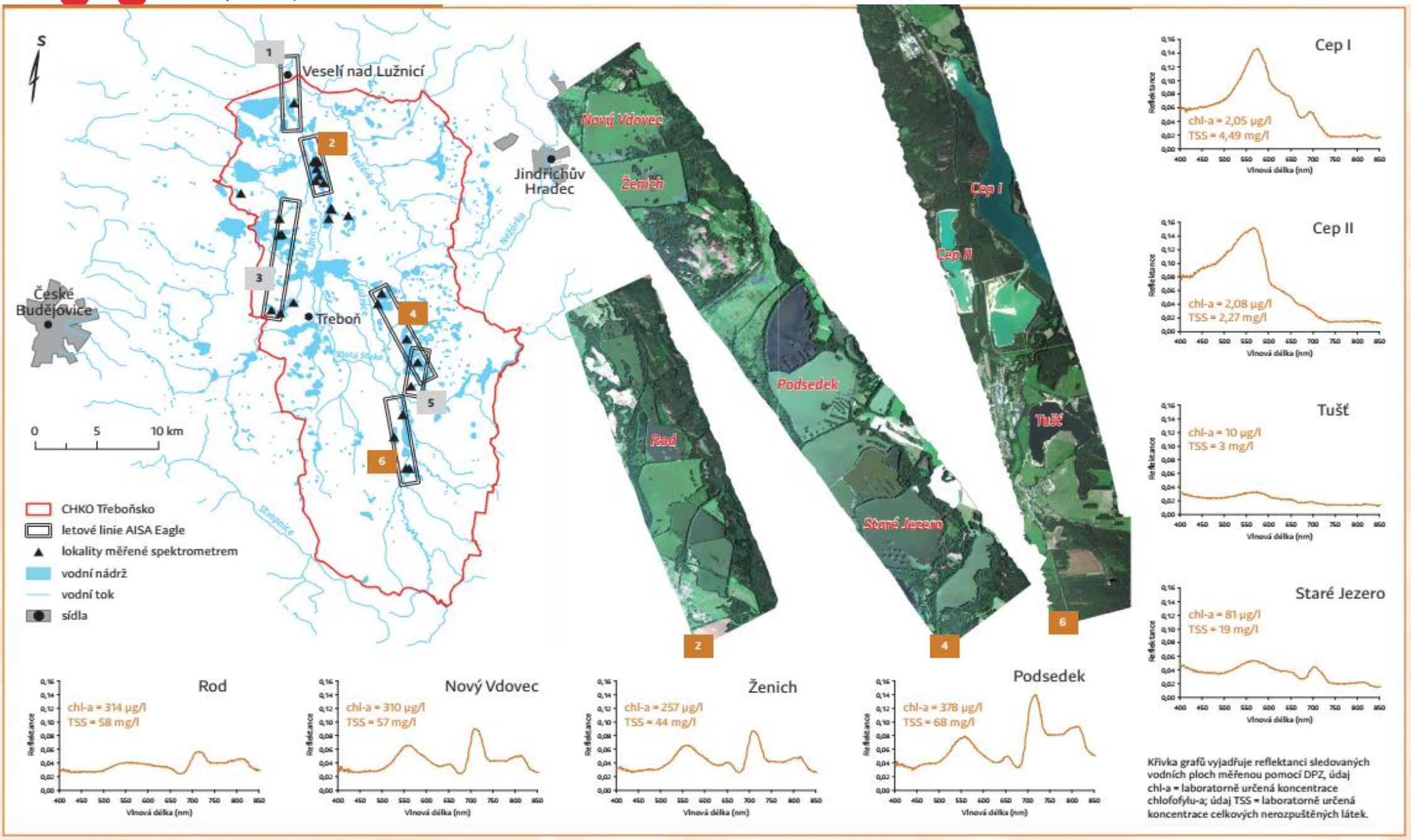
Remote sensing and water quality

- Spectral sensitivity to water quality features



Graf 1 — Reflektance vodních ploch dle rozdílné míry eutrofizace

Source: Vinciková and Pechar (2014)



Source: Vinciková and Pechar (2014)

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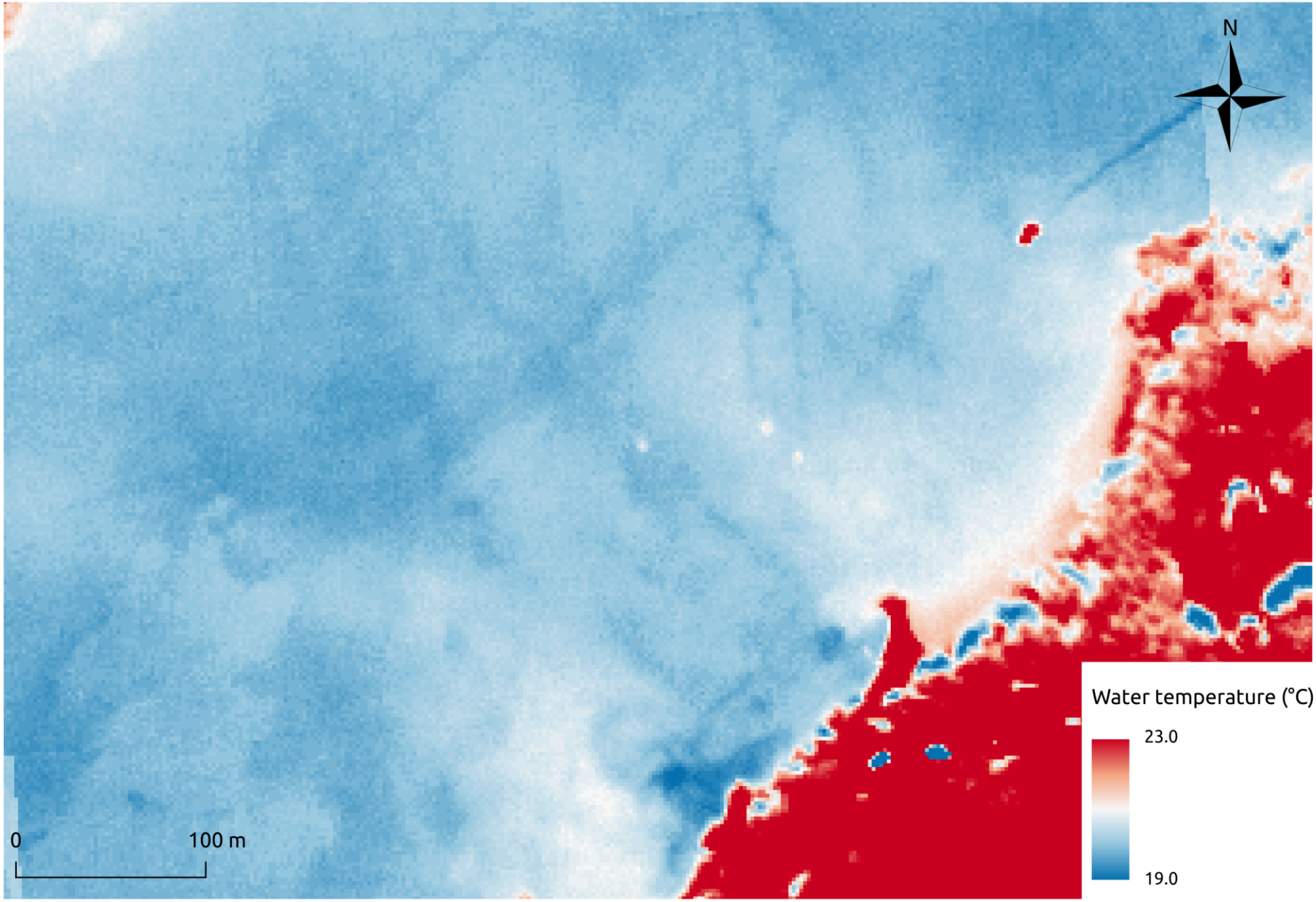

Oportunity of RS

- Direct estimation
  - Photosynthetic pigments
  - Undisolved solids and particles
  - Another pigments (humine and folvo acids)
  - Temperature
- Secondary relations
  - Nutrients content (phosphorus, nitrates)
  - Transparency
  - Conductivity
  - pH
  - Etc.

https://i.pinimg.com/736x/73/ee/05/73ee05790da4e92c5363660507af3d5d--lake-hillier-westerns.jpg

https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSbYehT2bG7KvYth3B6ZBl_HU-ZdTS7FXGH-7bWqOB9gHVstJz8

https://upload.wikimedia.org/wikipedia/commons/thumb/5/53/Callitriche_cophocarpa.jpg/258px-Callitriche_cophocarpa.jpg

Chlora

- Our first tool for coupling of remote sensing and water quality analysis
  - Based on regression methods
  - GIS based
  - Estimation of chl a content
  - Automatic selection of best fitted model
  - Universally usable for another parameters

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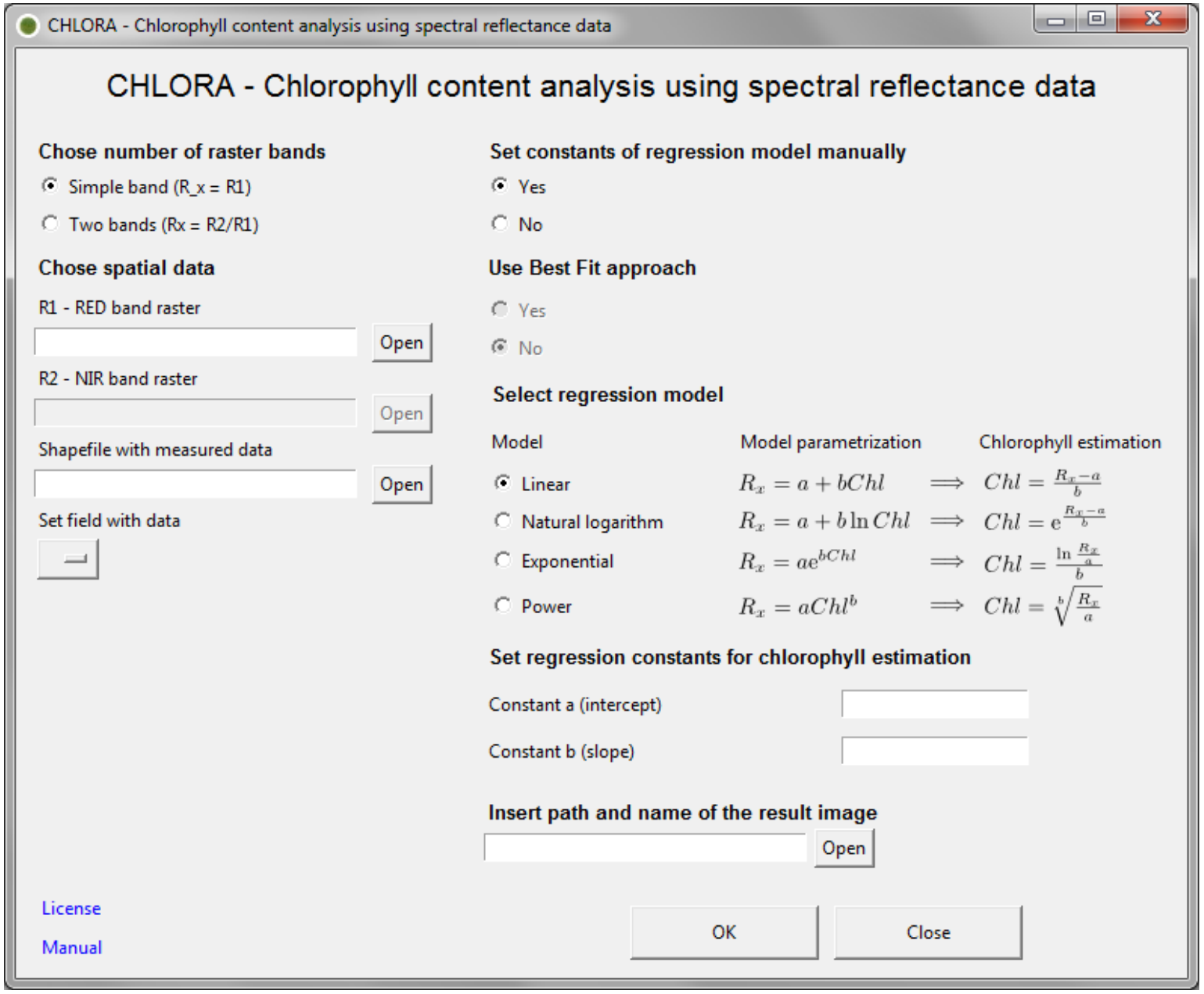
Chlora



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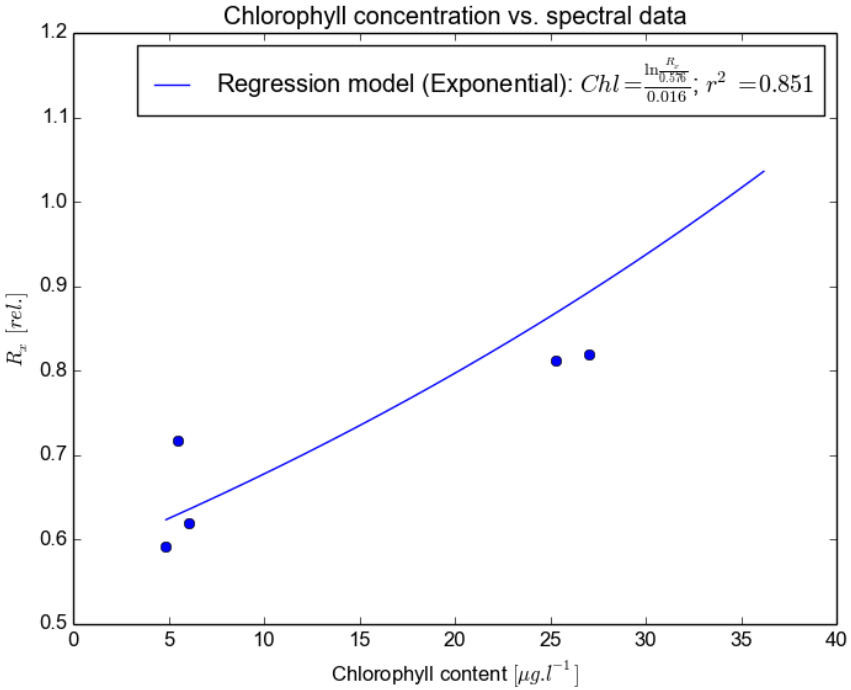

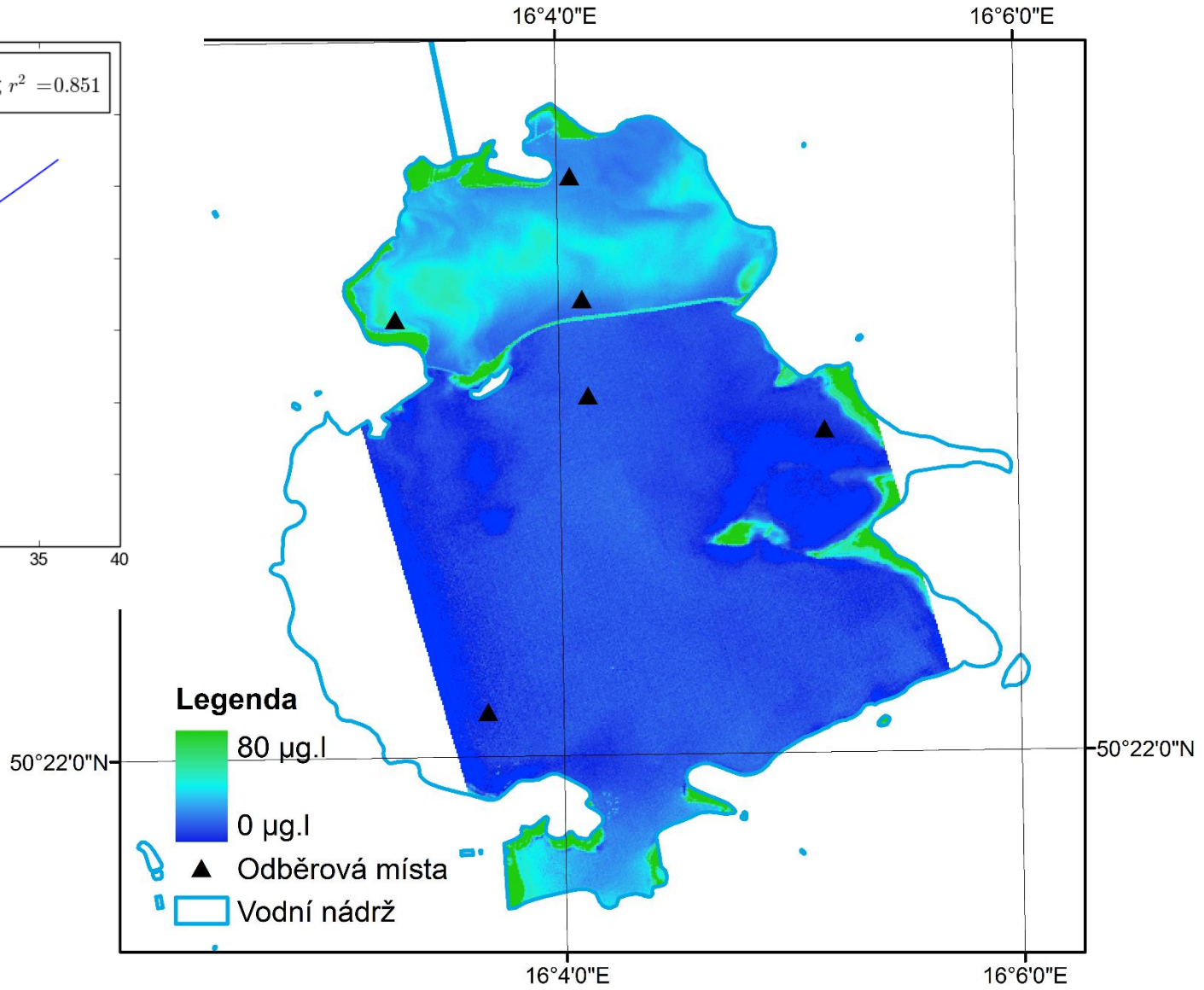

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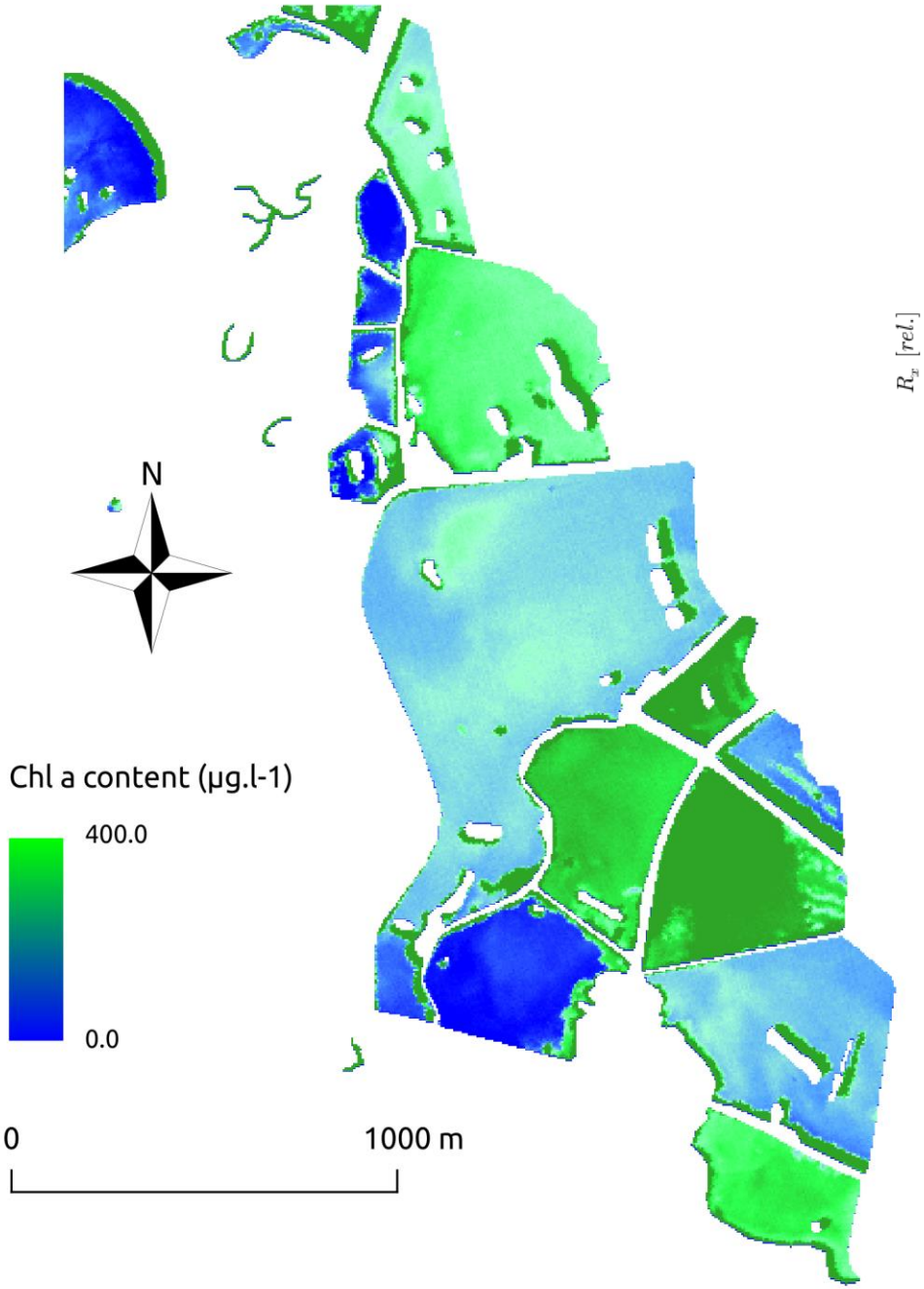

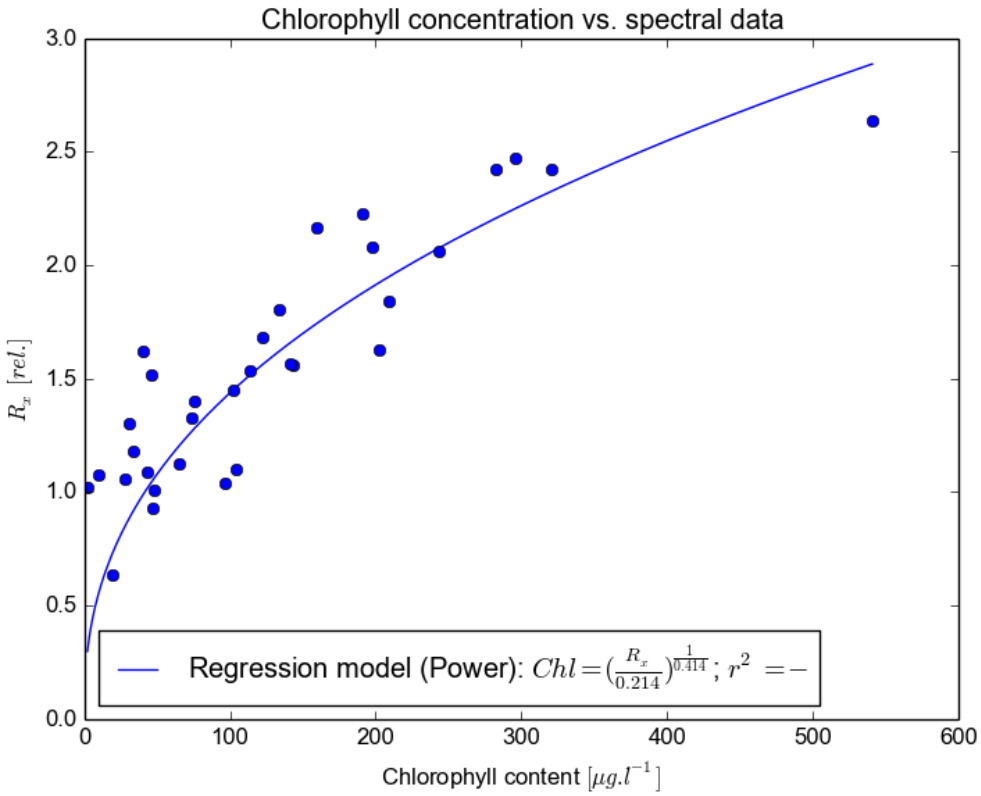

RemoteGuard

- Tool for analysis of water quality in shallow waters (fishponds, rivers)
  - Quantitative assessment of water quality features
  - Qualitative analysis of water quality features
  - Spatial distribution of water quality features
- Tool for detection of changes
  - Seasonal changes
  - Possibly prediction of water quality chracteristics
- Warning system
  - Detection of sudden changes of water

RemoteGuard - features

- Spectrally active characteristics of water can be measured/evaluated
  - Chlorophyll content
  - Undisolved solids (particles)
  - Ratio between algae and cyanobacteria
  - Possibly content of diatoms
  - Identification of macrophytes
- Corresponding characteristics
  - Nutrition content

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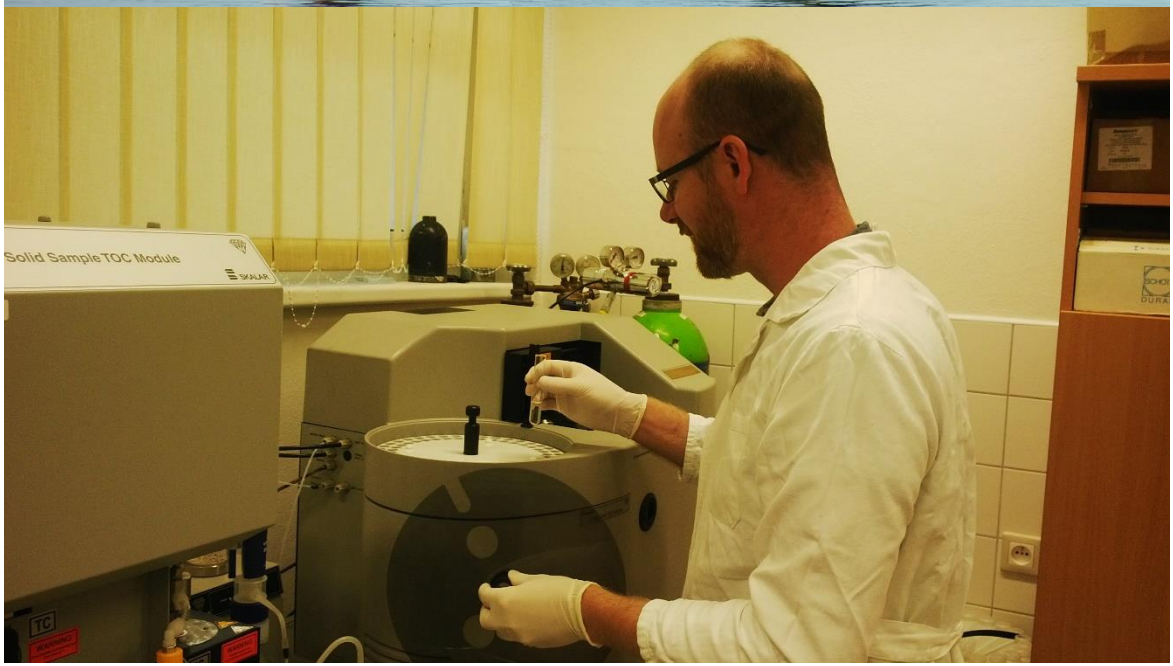
RemoteGuard - applications

- Spatial analysis of water quality
- Fishpond management
- Environmental protection
- Health care - bathing lakes, drinking water
- Management of small ponds
- Warning system
- Etc.

RemoteGuard - functioning

- Based on Machine Learning approach (supervised)
  - Support Vector Machine, Multiple Perceptron Layers, Random Forest, Boosted Regression Trees, Memory Based Learning, Artificial Neural Network etc.
- Sentinel 2 spectral bands
  - 13 bands as variant
  - 13 water index as co-variant extracted from each images
  - Data downloaded from Copernicus Open Access Hub

- Field data and laboratory analysis → training dataset for various reservoirs
  - Chl a, nondisolved solids
  - Chemistry
  - Physical features
  - Transparency
  - Spectral data



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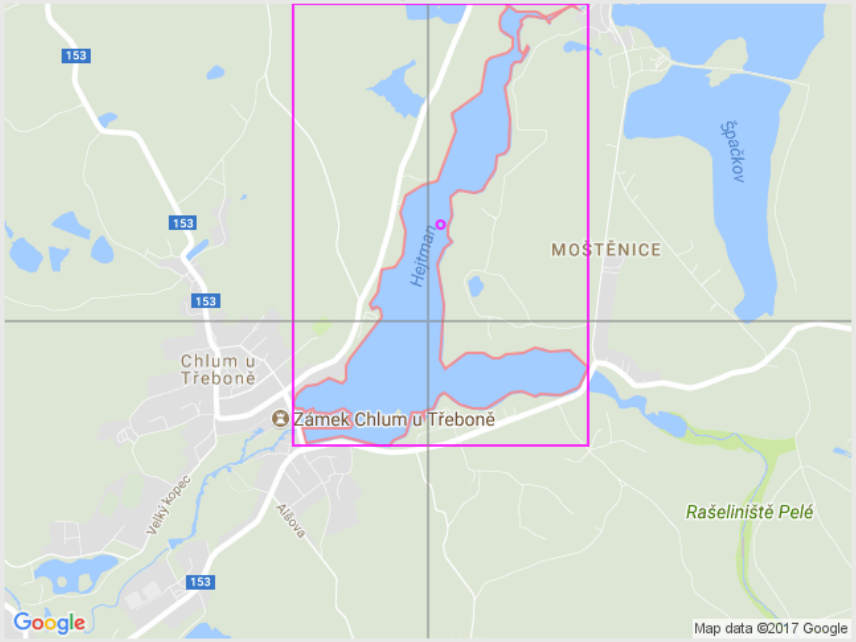
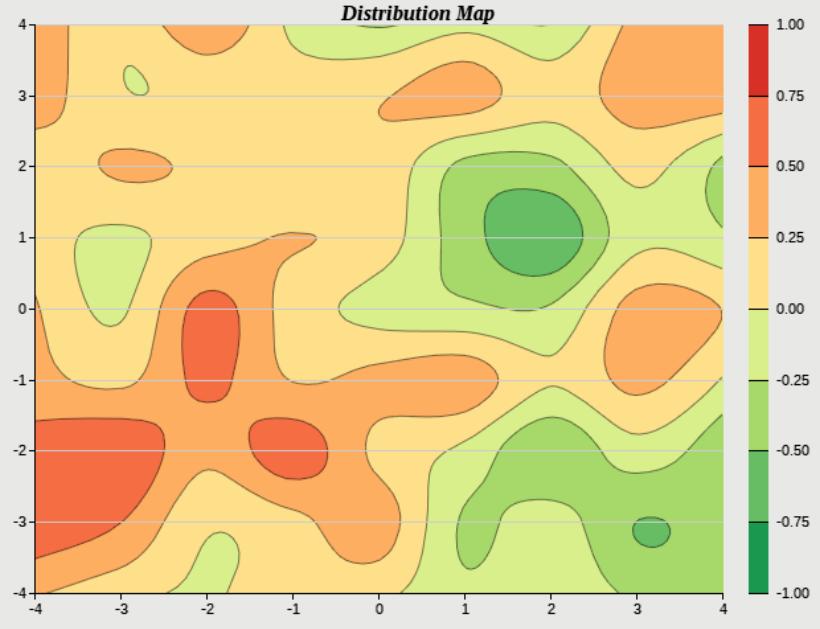
Remote Guard (ver 0.0.4)
Remote Guard based on satellite data

Application Help

Sattelite Roadmap Zoom: 14 Longitude: 14.94166780809107 Latitude: 48.964382529522084 Koštěnický potok Staňkovský r. hráz směsný





Lat.: 48.964383 Long.: 14.941668

Go to

Start Date: 2016-06-01

Stop Date: 2016-06-06

Cloud cover [%]: 80

Search

Download

Cancel downloading

Predicted parameters

ID	pH	TSS	TS	CHLa	TOC
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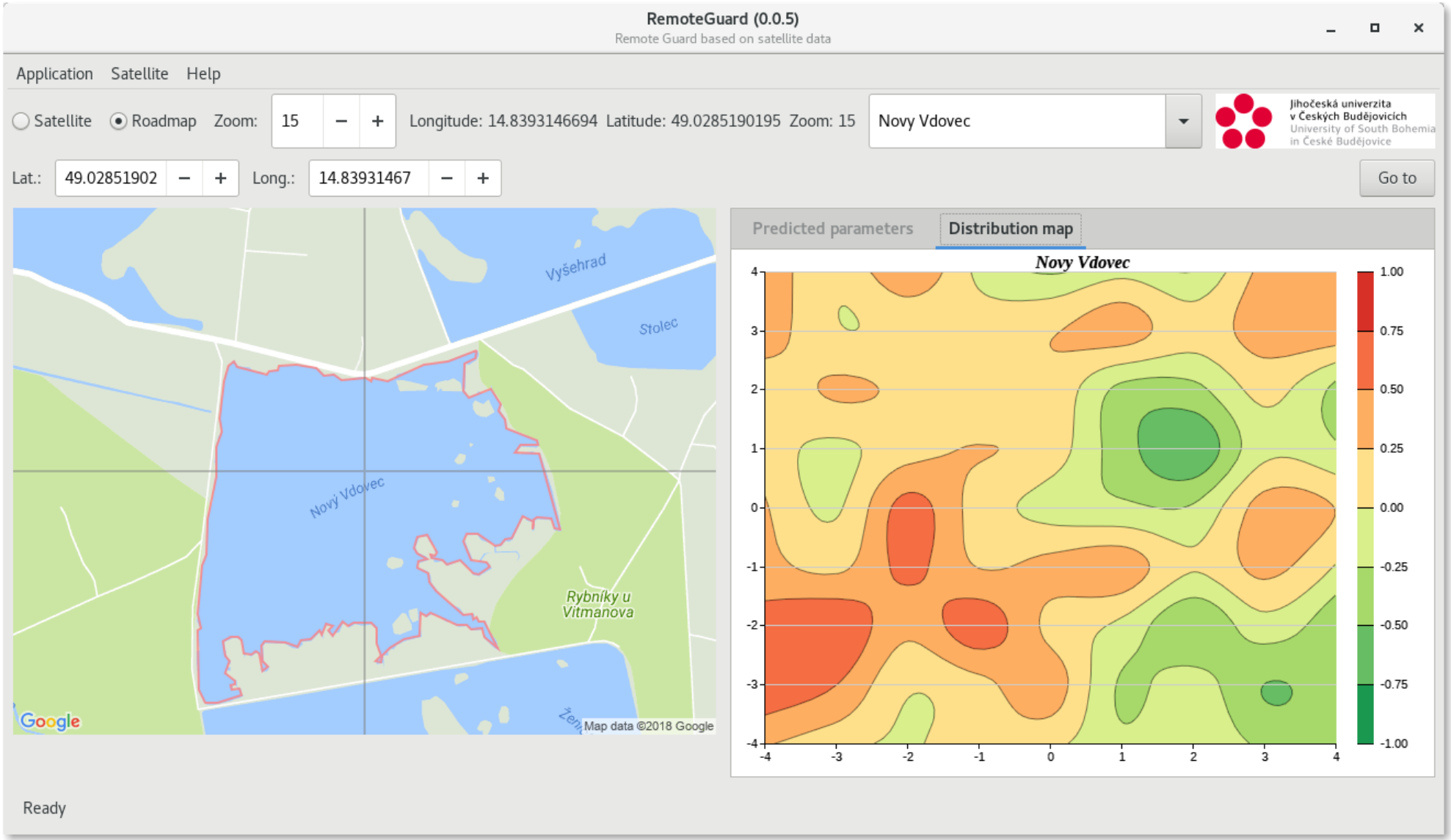
Ready


RemoteGuard (0.0.5)
Remote Guard based on satellite data
Application
Satellite
Help
Satellite
Roadmap
Zoom:
15
Longitude: 14.8393146694 Latitude: 49.0285190195 Zoom: 15
Novy Vdovec
Jihočeská univerzita
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in České Budějovice
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Go to
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Rybníky u
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Map data ©2018 Google
Predicted parameters
Distribution map
Novy Vdovec
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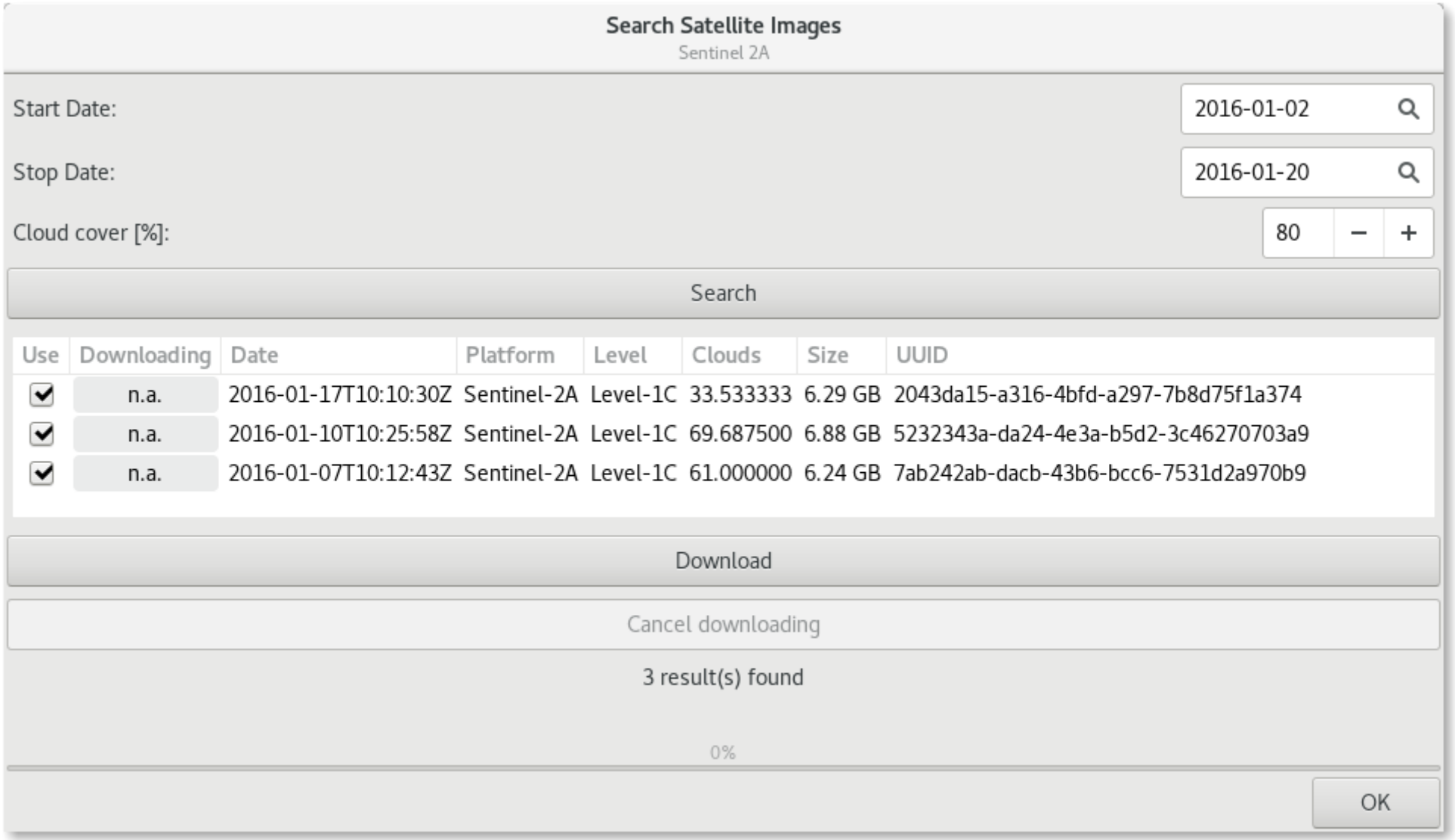
Search Satellite Images
Sentinel 2A
Start Date:
2016-01-02
Stop Date:
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Search
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3 result(s) found
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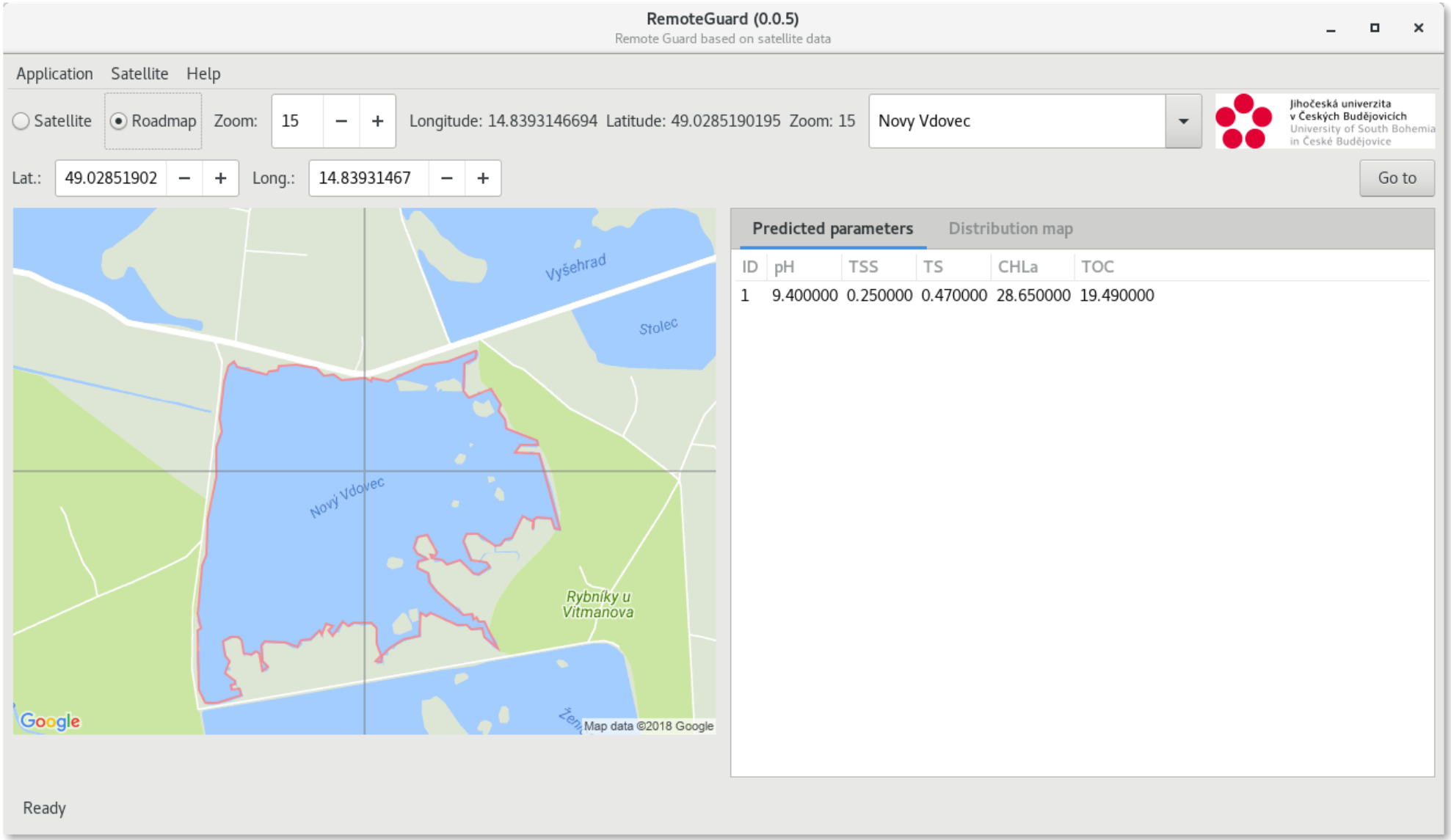

Future

- RemoteGuard is still in development…
- First production release will be available at the end of the year
- Plans:
  - Web based application for users – simplicity, availability
  - Direct offering of the analysis


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