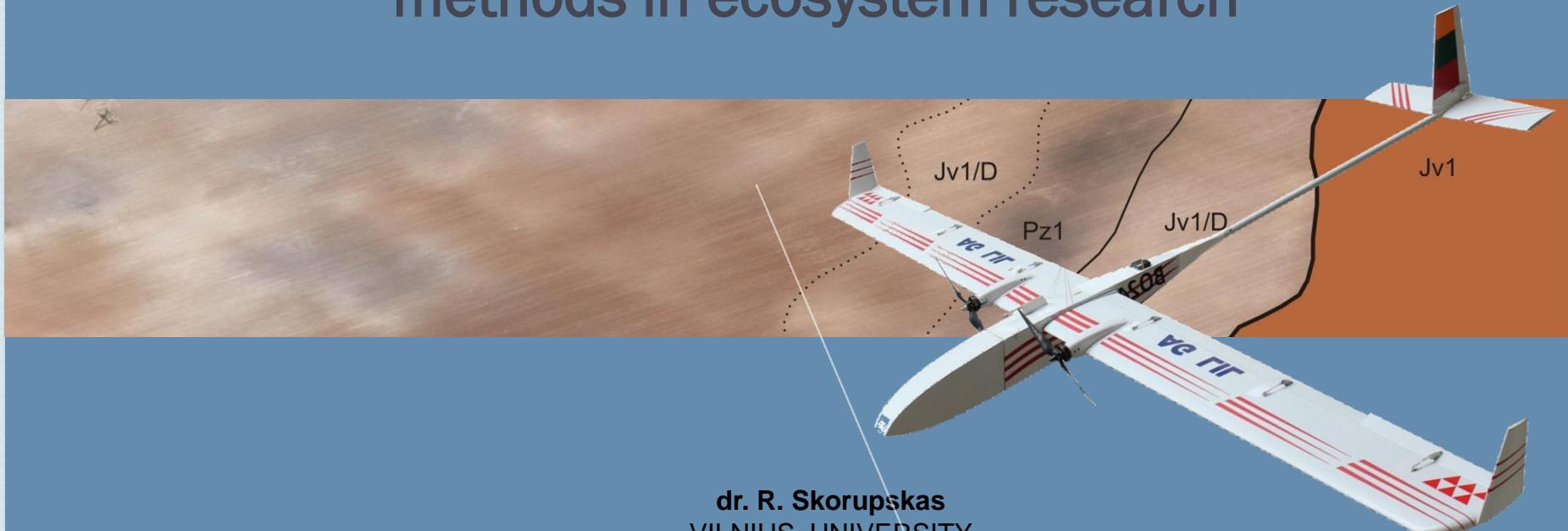


# Possibilities and strengths of using remote sensing methods in ecosystem research



dr. R. Skorupskas  
VILNIUS UNIVERSITY  
Institute of Geosciences  
Department of Geography and Land Management

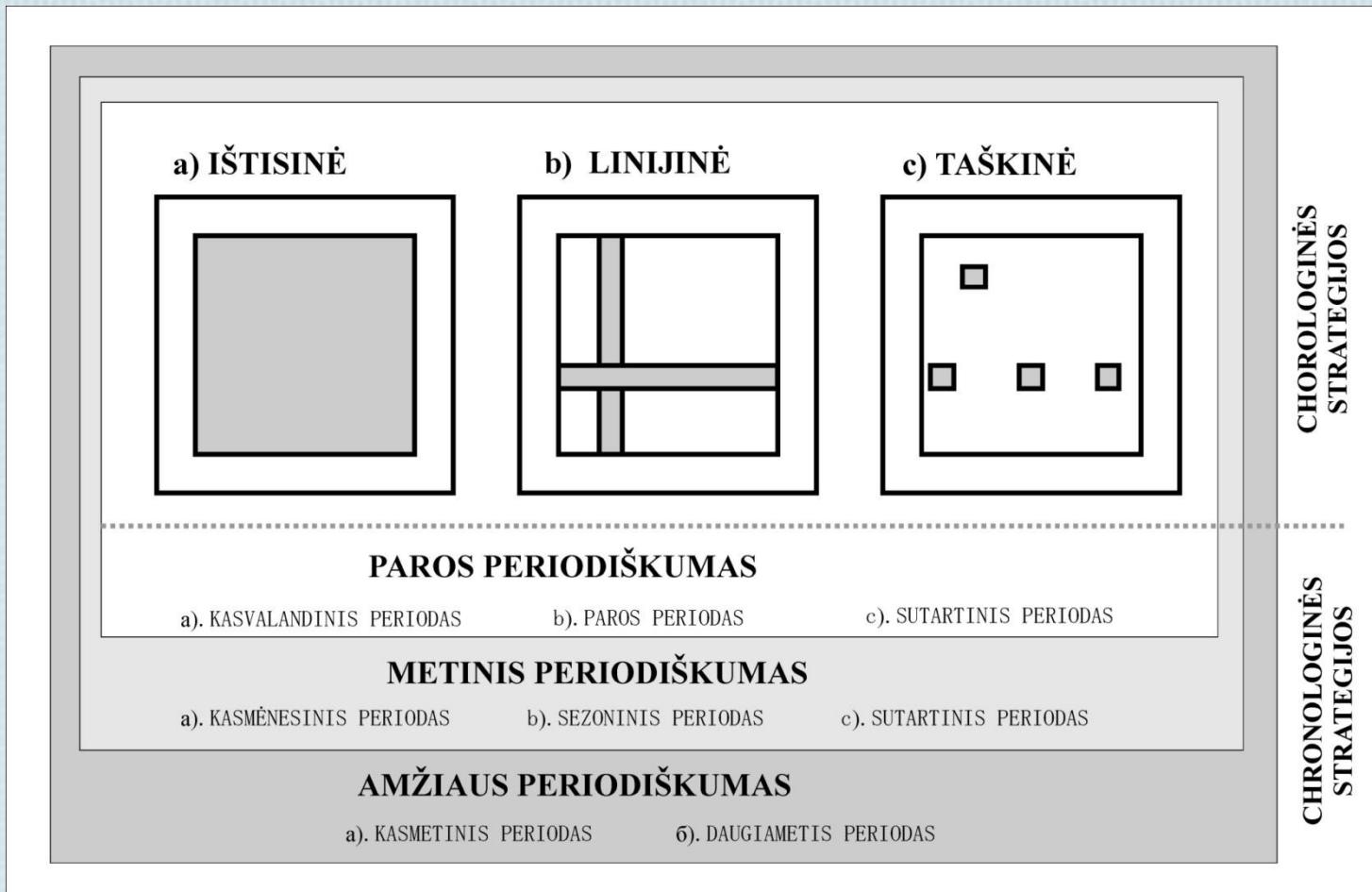
- ✖ Remote sensing tools used for the research:
- ✖ Unmanned aerial vehicles system consisting of:
  - ✖ (A) Fixed wing unmanned aerial vehicle (BO)

- ✖ B) Visual spectrum and IR cameras



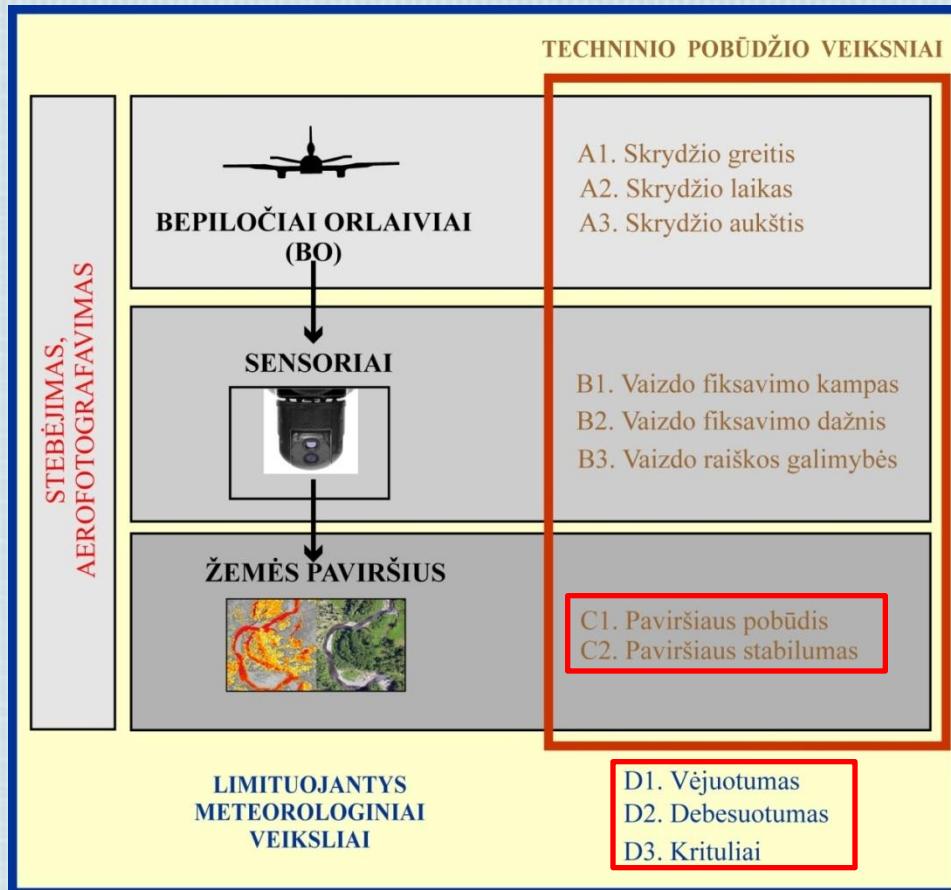


## Chronological and chorological ground surface investigation strategies using unmanned aerial vehicles



a. Continuous; b. Linear; c. Scatter;

## Research implementation strategy



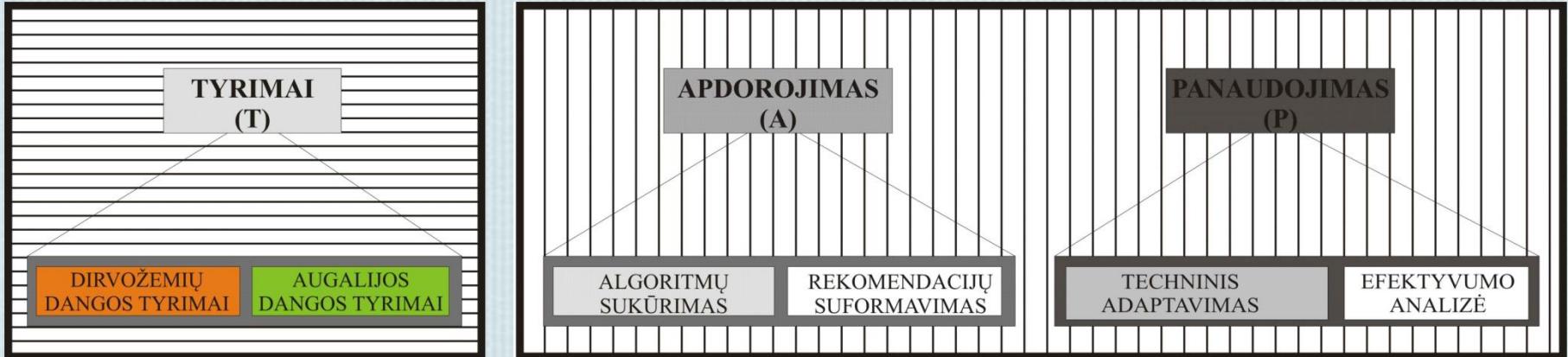
The main factors determining the research results:

Technical factors:  
**C1. Nature of the surface**  
**C2. Surface stability**

Meteorological factors:  
**D1. Windiness**  
**D2. Cloudiness**  
**D3. Precipitation**

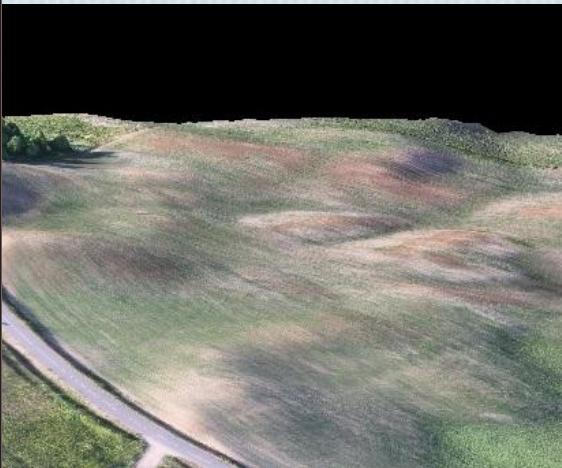
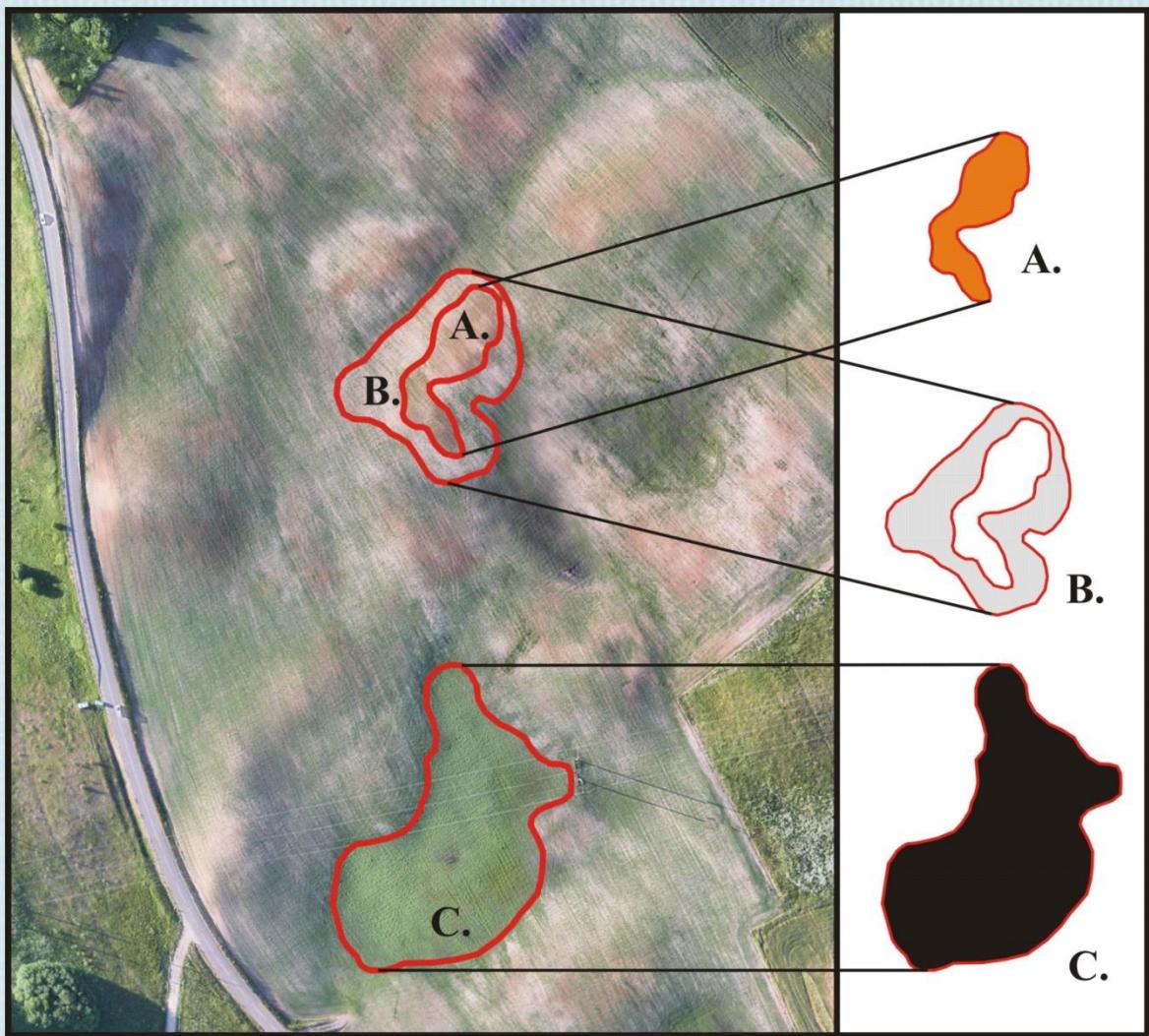
## TERRESTRIAL ECOSYSTEMS

Theoretical model of the implementation of a precise agricultural system



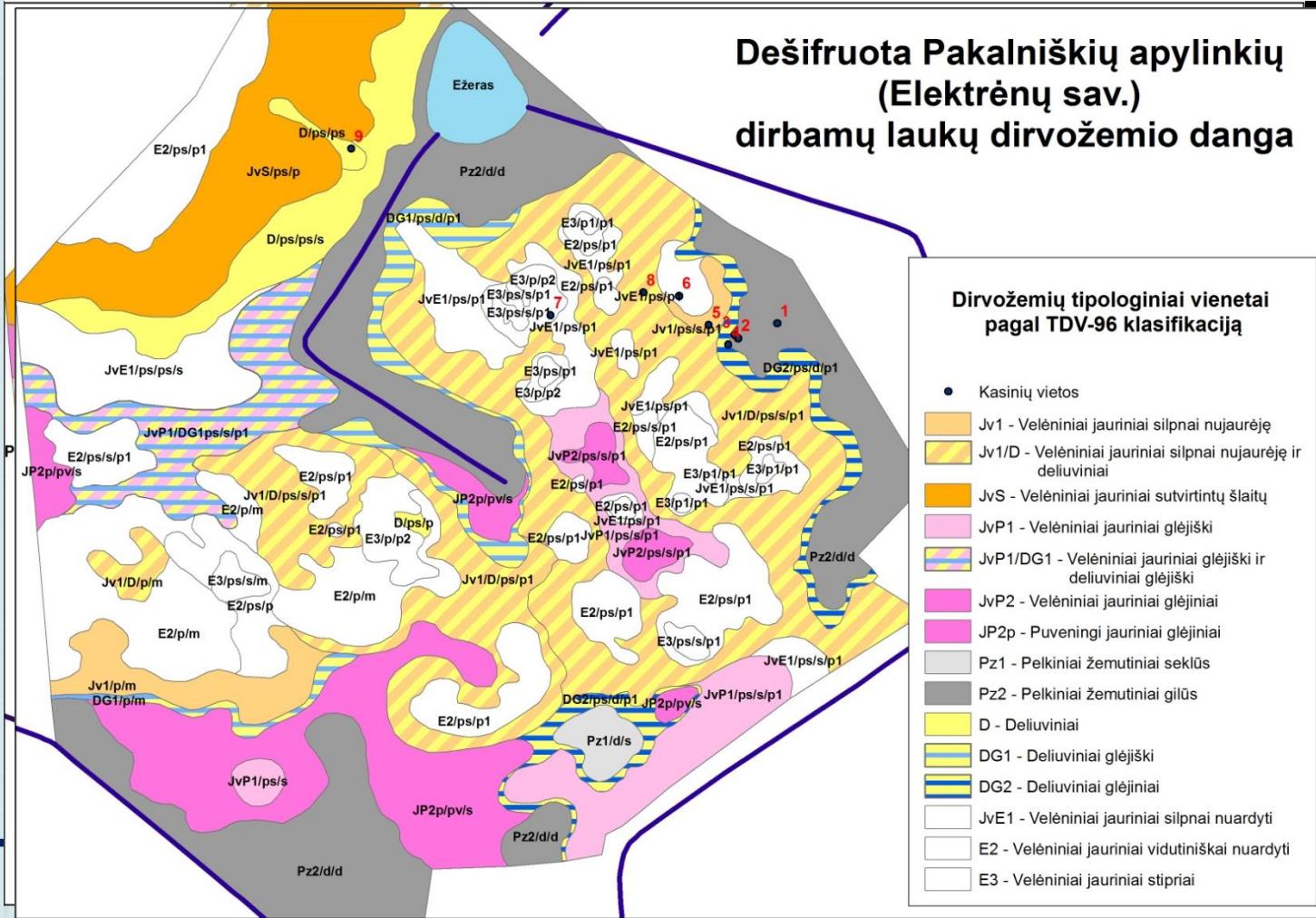
### Research (T)

1. Lack of accurate information on soil cover structure (lack of detailed soil mapping);
2. Lack of experience in remote sensing of soil physical and chemical properties;
3. Lack of experience in remote sensing of physical and chemical properties of crops.



Solutions relevant to precision agriculture should be formed on the typological basis of soils, by analogy with forestry.

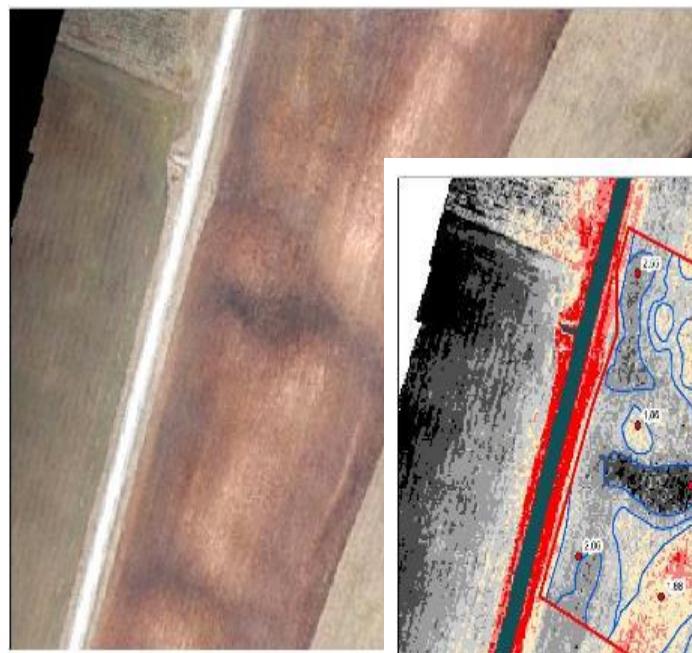
It is appropriate to consider as a territorial unit for the implementation of precision agricultural measures a soil facia (or landscape fraction) with the same subsoil composition, physical and chemical conditions of soils, and whose reaction to the impact and tendencies of changes in properties are the same.



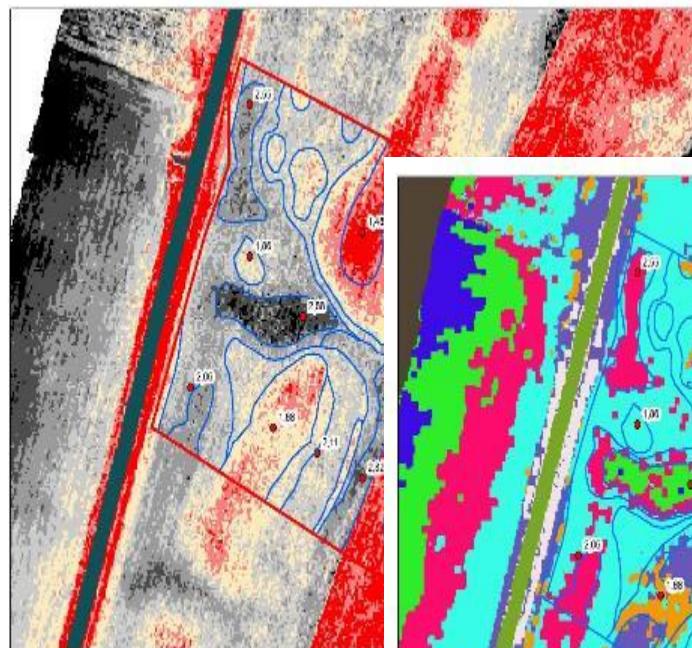
Example of detailed mounding of hilly terrain soils and its comparison with available data of state soil mapping.

## Isolation of qualitatively different soil areas

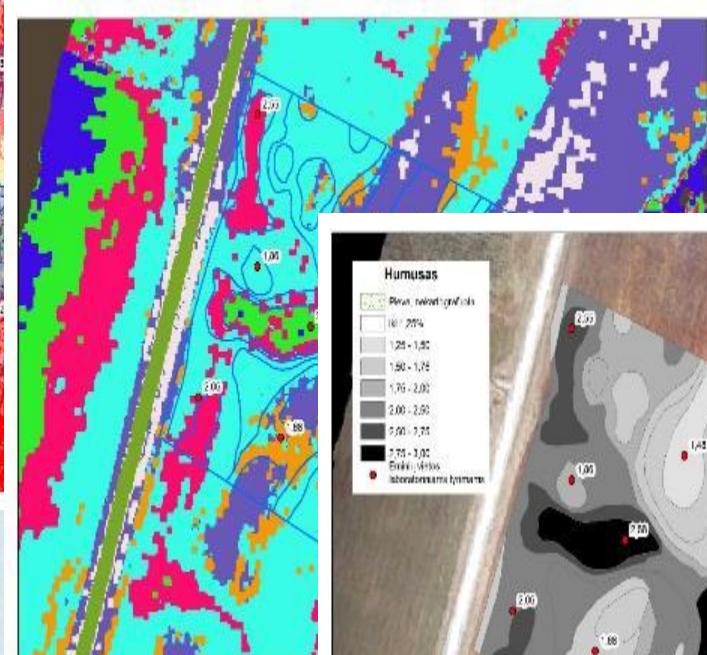




Raster

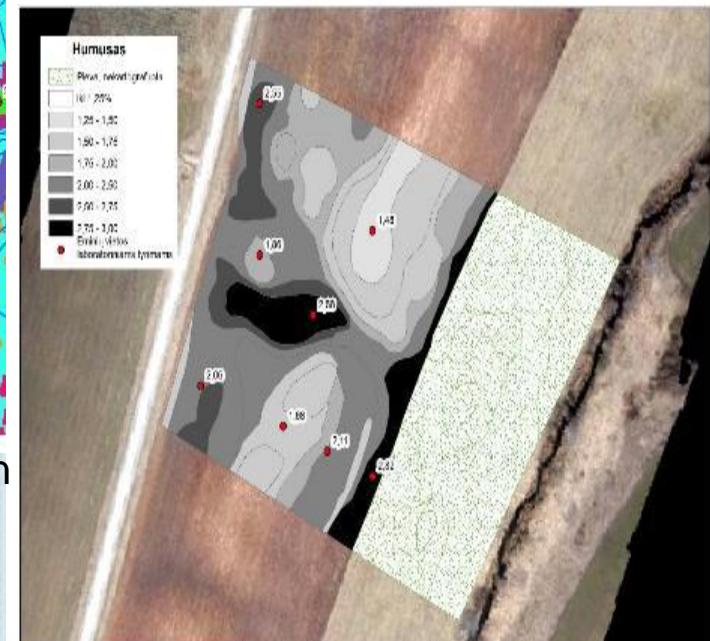


Classification



Generalization

The result is presented in the example of the humus content of the soil.

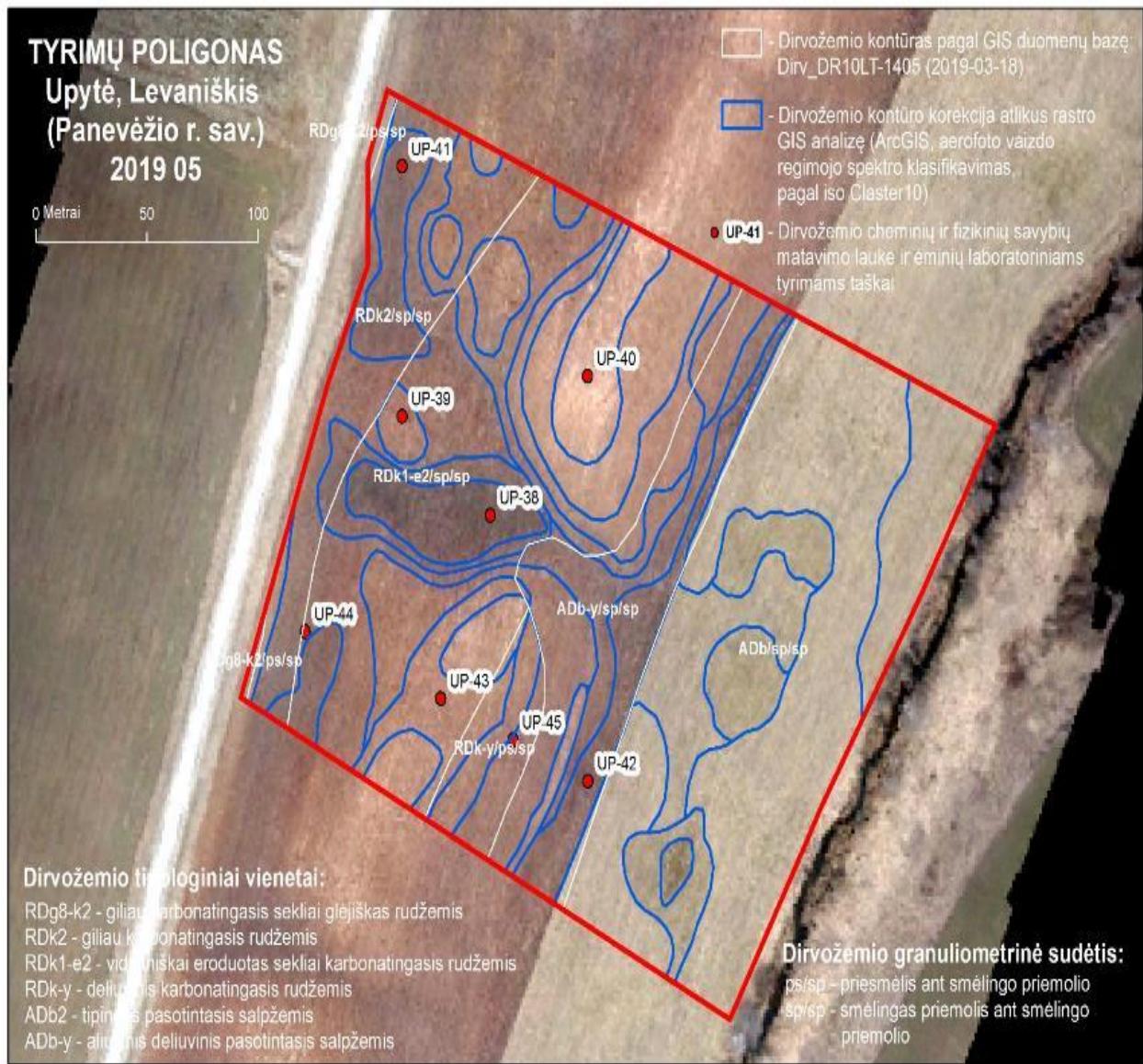


Typing according to available data

Volungevičius, Skorupskas, 2019

- Creation of a soil typological map:

- makes it possible to estimate soil productivity as accurately as possible;
- calculate humus stocks;
- to identify problem areas of eroded soils;
- Basis for more accurate calculations and more efficient business planning;
- draw up a plan for continuous and objective research / monitoring of soil conditions.



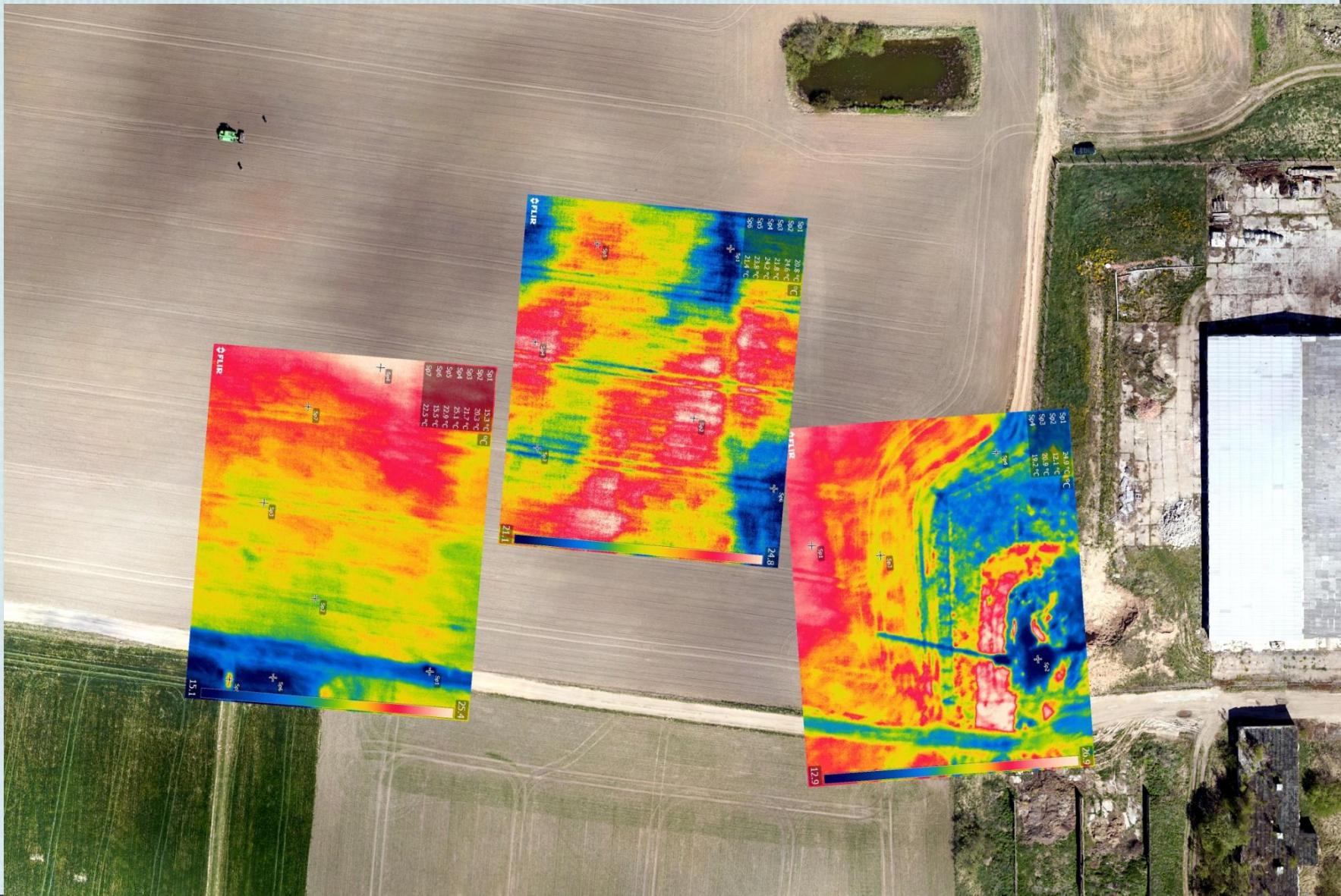
Volungevičius, Skorupskas, 2019

TYRIMŲ POLIGONAS  
Stukiai (Kėdainių r. sav.)  
2019 05 9-10



Soil typological mapping data are related to soil humus data

# Assumptions of soil moisture research using thermal imaging cameras



**TYRIMŲ POLIGONAS**  
**Daigėlaičiai (Radviliškio r. sav.)**  
**2019 05 9-10**

0 Metrai      50      100

Perteklinės drėgmės gylis, cm



18,3 drėgmės kiekis dirvoje, % (2019 05 9-10)

- Dirvožemio kontūras pagal GIS duomenų bazę: Dirv\_DR10LT-1405 (2019-03-18)
- Dirvožemio kontūro korekcija atlikus rastro GIS analizę (ArcGIS, aerofoto vaizdo regimojo spekto klasifikavimas, pagal iso Claster10)
- UP-41 - Dirvožemio cheminių ir fizinių savybių matavimo lauke ir ēminiu laboratoriniams tyrimams taškai

**Dirvožemio granuliometrinė sudėtis:**

ps/sp - priesmėlis ant smėlingo priemolio

sp/p1 - smėlingas priemolis ant lengvo priemolio

pv/sp - puveningas sluoksnis ant smėlingo priemolio

**Dirvožemio tipologiniai vienetai:**

IDk-e1 - menkai eroduotas karbonatingas išplautžemis

IDk-g0 - giliai glėjiskas karbonatingas išplautžemis

IDg4-k - karbonatingas giliai glėjimas išplautžemis

IDg8-k - karbonatingas sekliai glėjimas išplautžemis

GLk2 - giliau karbonatingas šlynžemis

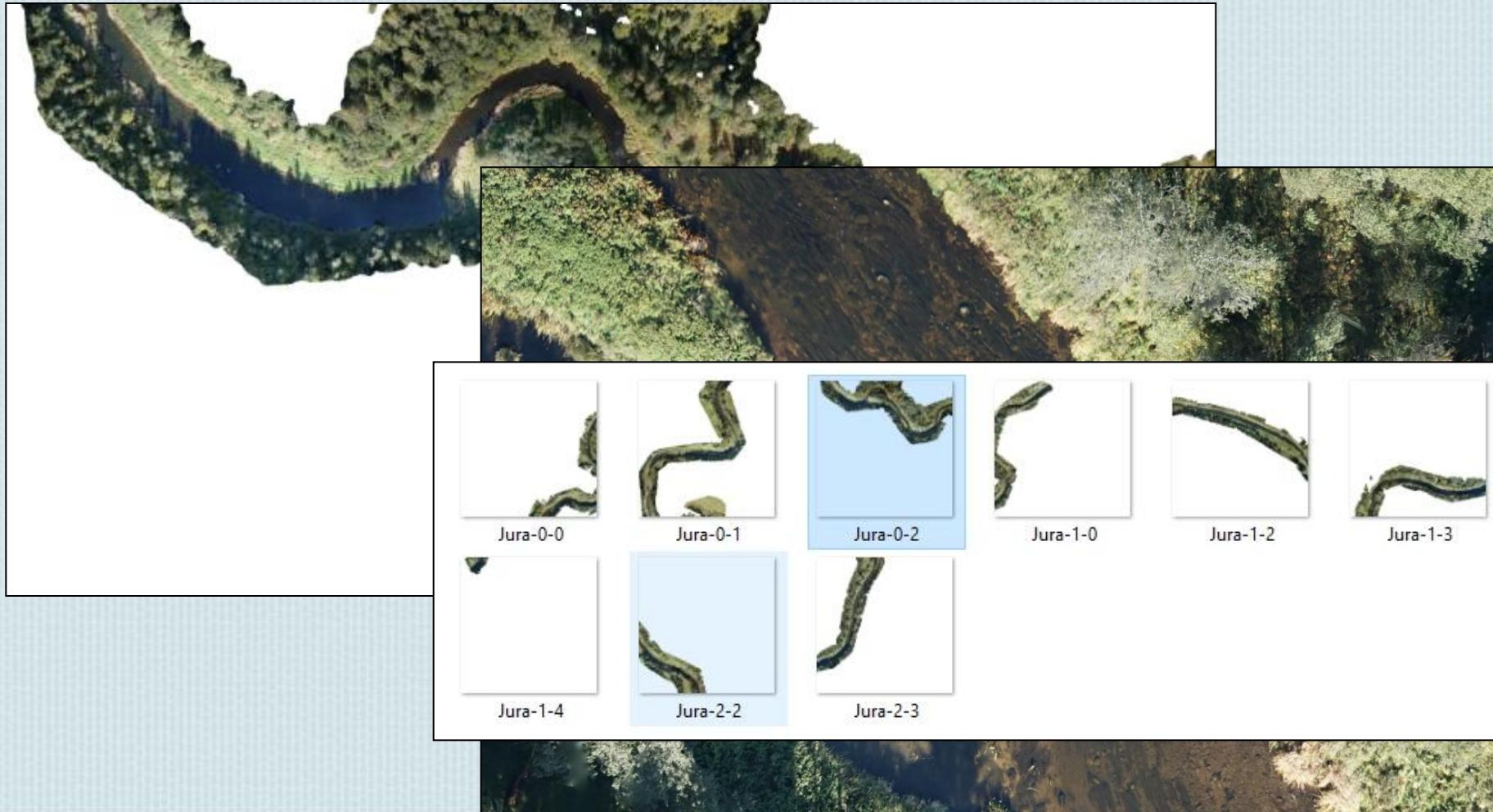
GLv-k - karbonatingas puveningasis šlynžemis



Soil typological mapping data are correlated with soil moisture data

# AQUATIC ECOSYSTEMS

## I Stage Preparation of aerial photograph material



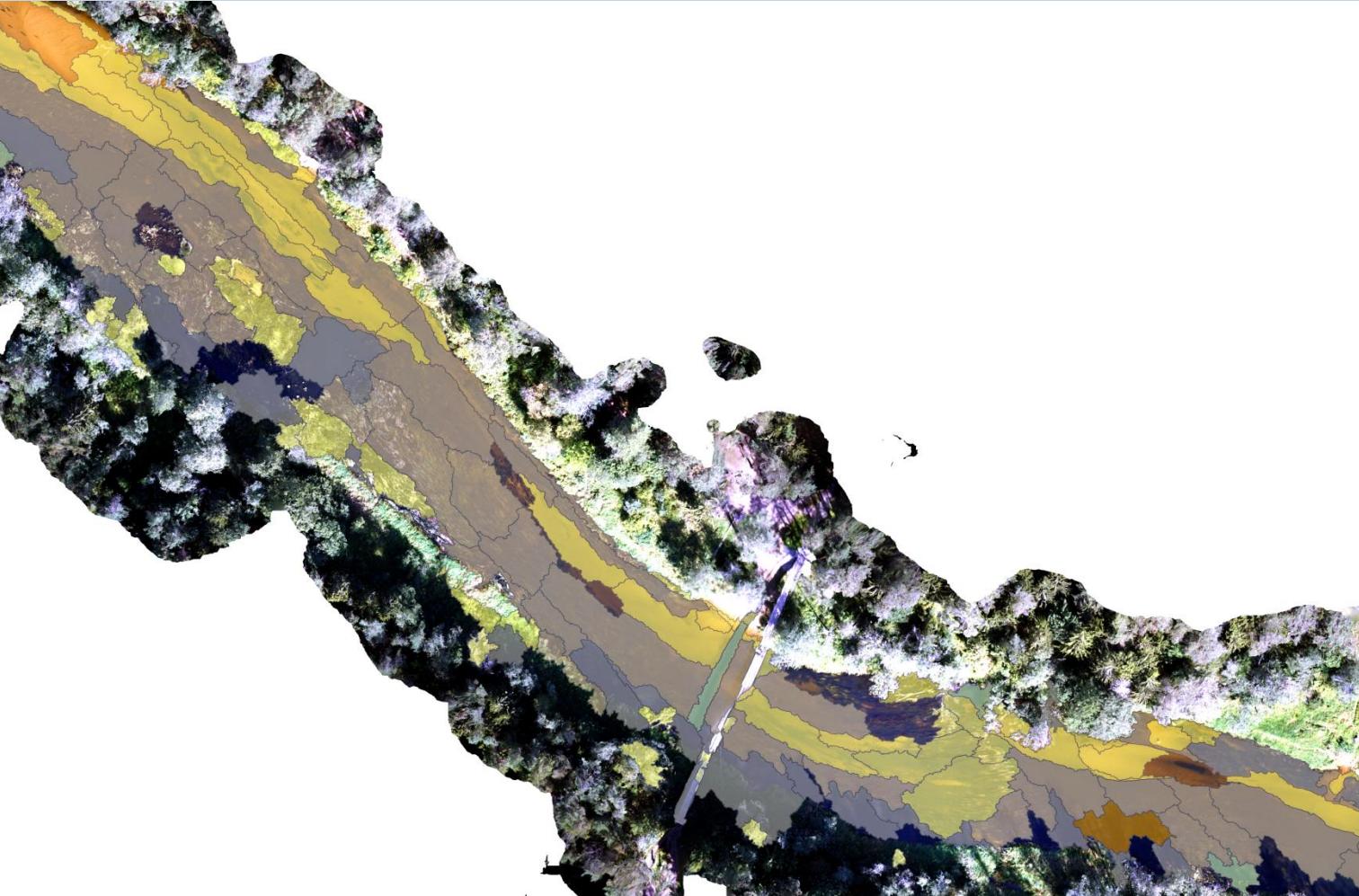
## II Stage Decoding and analysis of aerial material



Segmentation and classification  
of riverbed according to bottom  
and surface properties:

- A. Algae in water mass and surface;
- B. Algae in the bottom and in the water mass;
- C. Algae at the bottom;
- D. Sandy bottom with single plants;
- E. Sandy bottom.

TARPTAUTINIS MOKSLINIS – PRAKТИNIS SEMINARAS  
„NUOTOLINIAI METODAI GAMTINIŲ EKOSISTEMŲ TYRIMUOSE: PRIVALUMAI IR IŠŠŪKIAI“  
12 – Oktobr 2021  
Vilnius (Lithuania)



Segmentation and classification of the Šventoji river bed (in the section Mikieriai - Androniškis) according to the nature of the bed bottom and surface.

### III Stage Algae accounting and resource estimation

#### SUTARTINIAI ŽENKLAI

Svent\_Mik\_2020\_03

Vagos dumblėtumo tipai:

- Smel\_Dugn
- Smel\_Dugn\_Aug
- Dumbl\_Dugn
- Dumbl\_Mas
- Dumbl\_Mas\_Pav
- Sesel



OBJECTID *	Class_name	Count_Class_name	Sum_Dumbli_turis
1	Dumbl_Dugn	531	6914.727784
2	Dumbl_Mas	512	24597.022355
3	Dumbl_Mas_Pav	7	807.057388
4	Sesel	519	10435.741966
5	Smel_Dugn	395	1659.999796
6	Smel_Dugn_Aug	122	838.695852



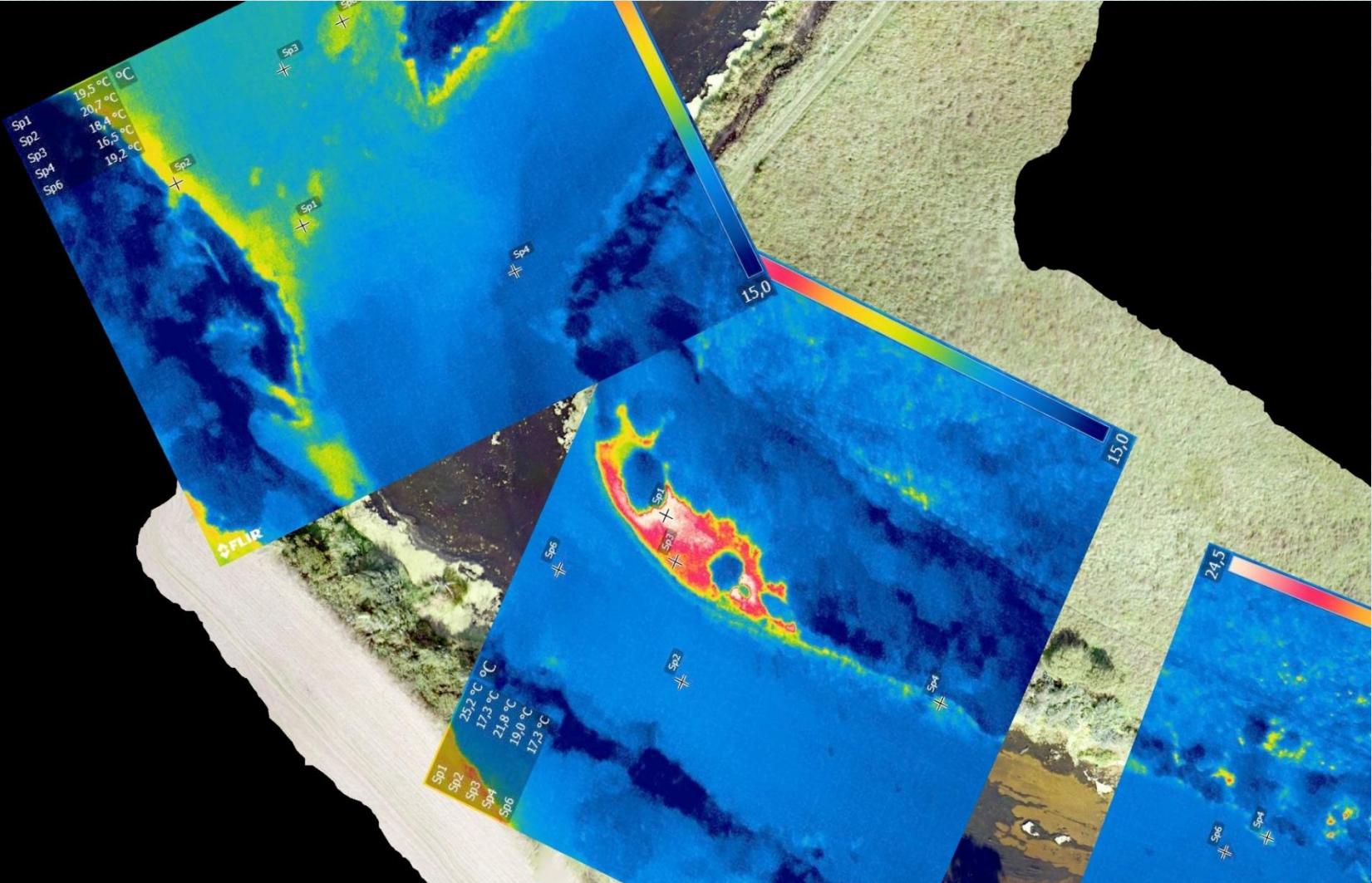


### III Stage Algae accounting and resource estimation

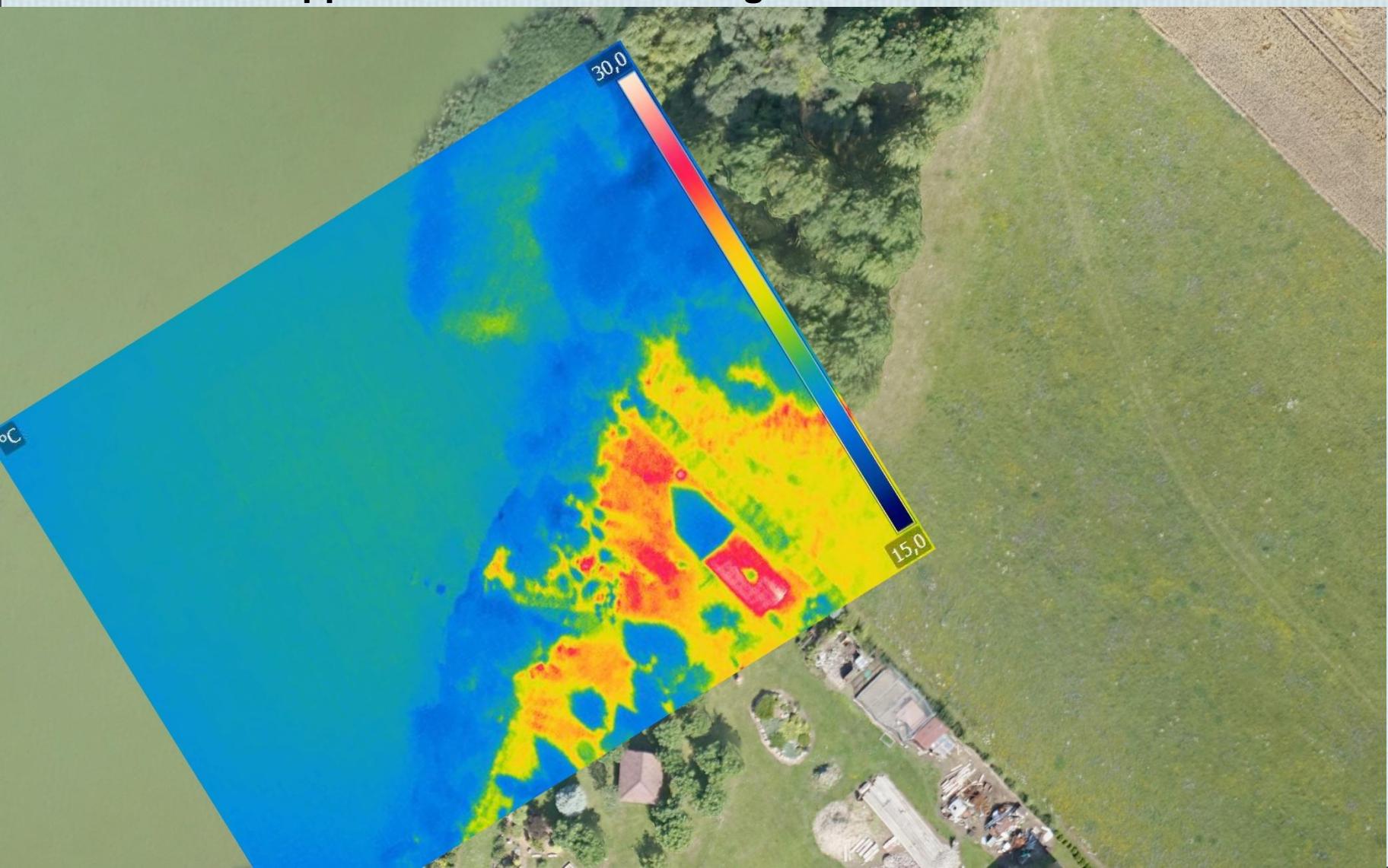
Distribution of areas and volumes of filamentous algae in the section of the Šventoji river (between Mikieriai and Androniškis) according to the nature of the river bed.

Vagos dugno tipai	Bendras tipui priskiriamų arealų plotas (ha)	Dugno tipo ploto dalis nuo viso tiriamo ploto (%)	Bendras tipui priskiriamų arealų dumblų tūris m <sup>3</sup>	Tipos dalies tūris nuo viso tūrio
Dumbliai dugne	69,147	35,36	6914	16,17
Dumbliai vandens masėje	49,149	25,13	24597	57,53
Dumbliai vandens masėje ir paviršiuje	1,008	0,52	807	1,89
Smėlėtas dugnas	15,699	8,03	0	0
Smėlėtas dugnas su augalų intarpais	8,386	4,29	0	0
Šešeliuoti plotai	52,178	26,68	10435	24,41
VISO	<b>195,567</b>	<b>100</b>	<b>42753</b>	<b>100</b>

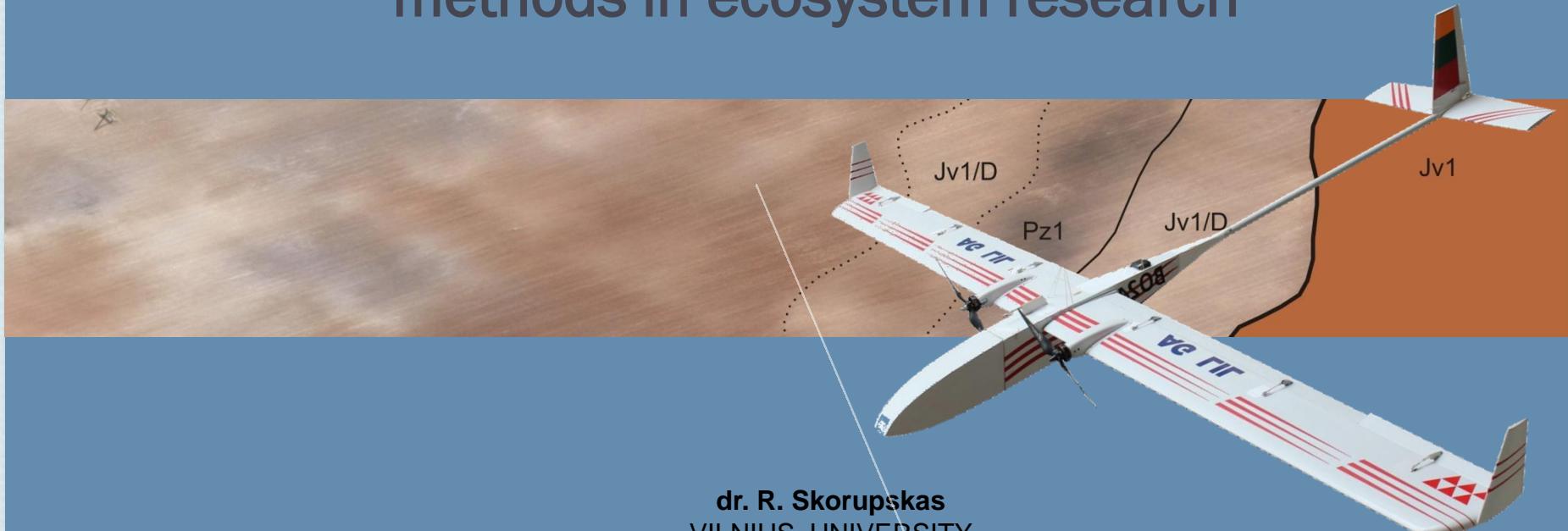
## Possibilities of application of additional algal resource identification methods



## Possibilities of application of additional algal resource identification methods



# Possibilities and strengths of using remote sensing methods in ecosystem research



dr. R. Skorupskas  
VILNIUS UNIVERSITY  
Institute of Geosciences  
Department of Geography and Land Management