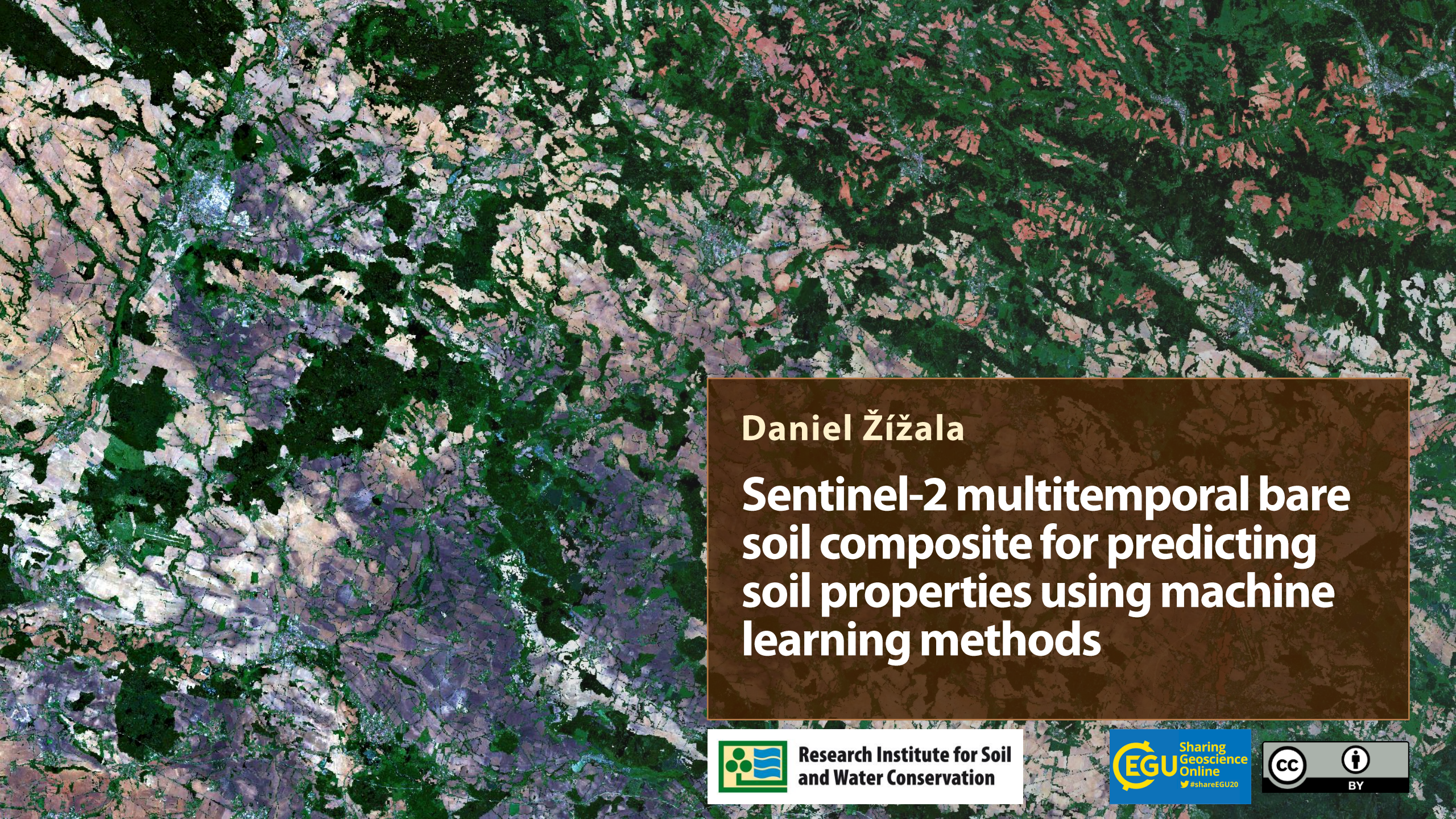

Daniel Žížala

Sentinel-2 multitemporal bare soil composite for predicting soil properties using machine learning methods

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motivation

- bare soils cover only a small part of the total area in a given part of the year
- For prediction of soil properties we need spatialy distributed rasters – bare soil composite is a solution
- Examples of current composites:
  - Exposed Soil Composite Mapping Processor (SCMaP) (Rogge et al. 2018),
  - Geospatial Soil Sensing System (GEOS3) (Demattê et al. 2018),
  - Bare Soil Composite Image (Gallo et al. 2018),
  - Barest Pixel Composite for Agricultural Areas (Diek et al. 2017),
  - ***all developed from Landsat time series***,
  - multitemporal bare soil image developed from RapidEye time series (Blasch et al. 2015b),
  - bare soil mosaic (Loiseau et al. 2019) derived from Sentinel-2 data.
- the potential of these spectral composites has not yet been tested in a relevant number of studies
- the setting of basic parameters of composite creation is very complex and challenging and it requires to use exact algorithms for masking clouds and bare soil.

methods

- **Sentinel-2 Level 2A** images
- 2017-2020, 60 – 305 day of the year
- ~500 images per each scene (with 40% maximum cloud coverage)
- ***Masking clouds***: QA60 bitmask band with cloud mask information + SCL – scene classification mask
- ***Masking vegetation***: NDVI (< 0.25), NBR2 (< 0.075), GVI1 (>0), GVI2 (>0)
- ***Composition***: median value

- ***Implementation***: Google Earth Engine

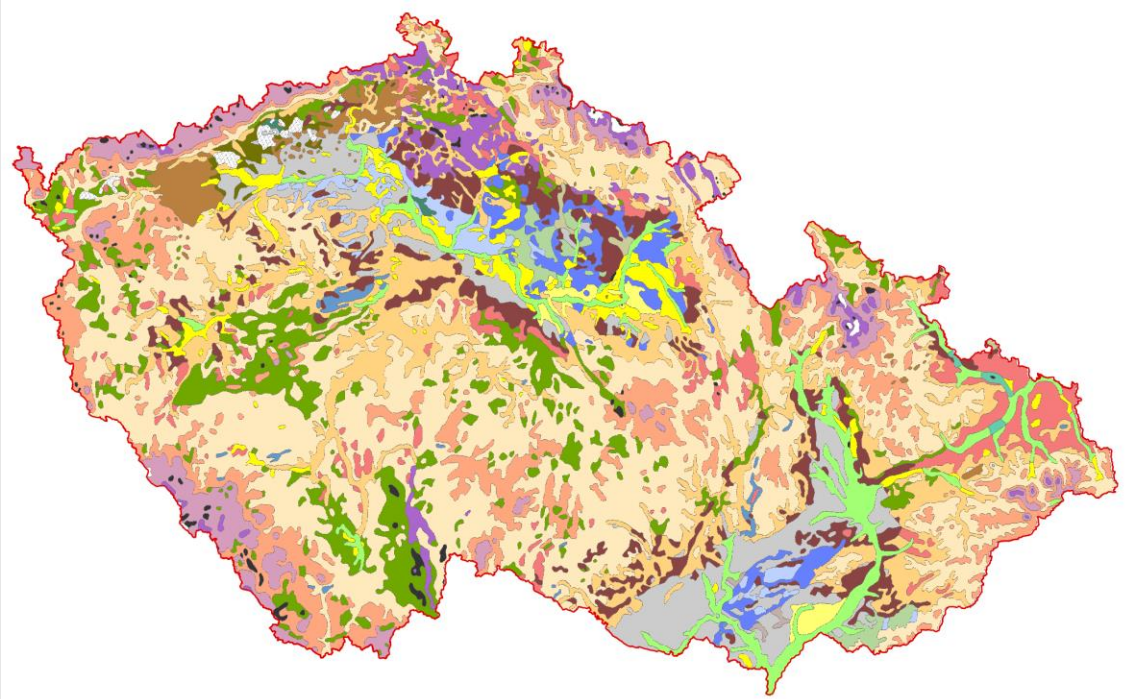
- **Output**:
  - 10 spectral bands (B2, B3, B4, B5, B6, B7, B8, B8A, B11, B12)
  - 20m spatial resolution
  - whole Czechia
  - Masked areas filled by greenest composite (max NDVI)

bare soil composite + greenest composite

ready to use for DSM – 20m resolution

Bare soil composite

Soil map 1:1,000,000



planned future improvements **under construction**

- Site-specific threshold settings – based on distribution of NDVI and NBR2 values
- Better statistics – confidence interval based on distribution of reflectance values
- Masking moist soils – based on daily meteorological radar data - combined radar-gauge grid layer (1km resolution)
- Masking soils with higher roughness – based on Sentinel-1 images
- Testing for prediction of soil properties in a national scale