The LISA extension to INSPIRE LC/LU data model: The Austrian experience

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INSPIRE KEN
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Content

- LISA
  - Project evolution
  - Product portfolio
- Data model
  - EAGLE based
  - INSPIRE compatible
  - extension

LISA – land information system Austria

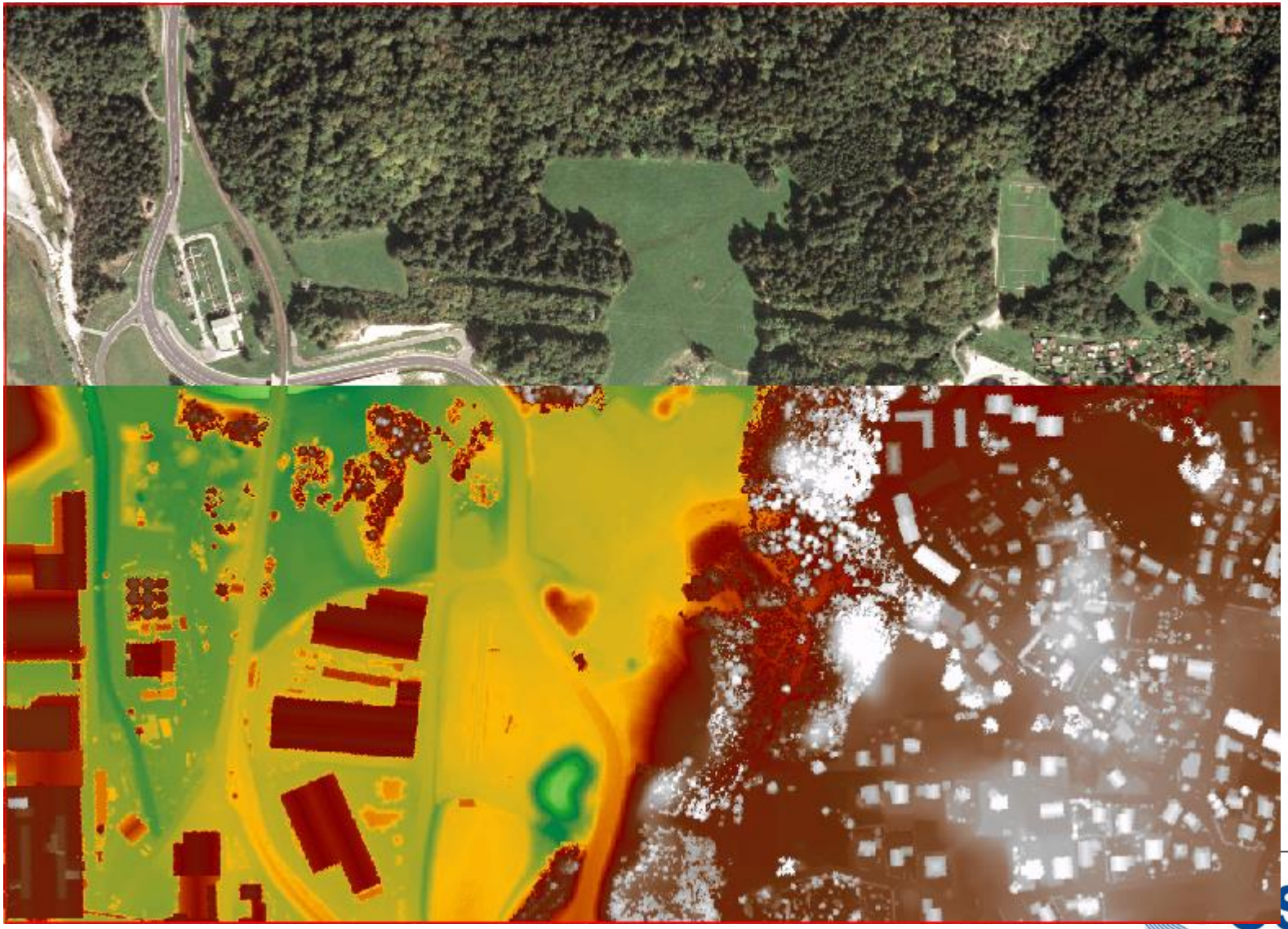
- http://www.landinformationsystem.at
- LISA phase 1: 2009-2010 (FFG financed)
  - Segmentation and classification of orthofotos
- LISA phase 2: 2010-2012 (FFG financed)
  - Larger test sites
- LISA phase 3: 2013-2015 (ESA financed)
  - Mapping of larger areas (urban agglomerations)
- LISA phase 4: 2015-2017 (ESA financed)
  - Integration of Sentinel-2 data
  - Temporal dimension

LISA – cooperation project

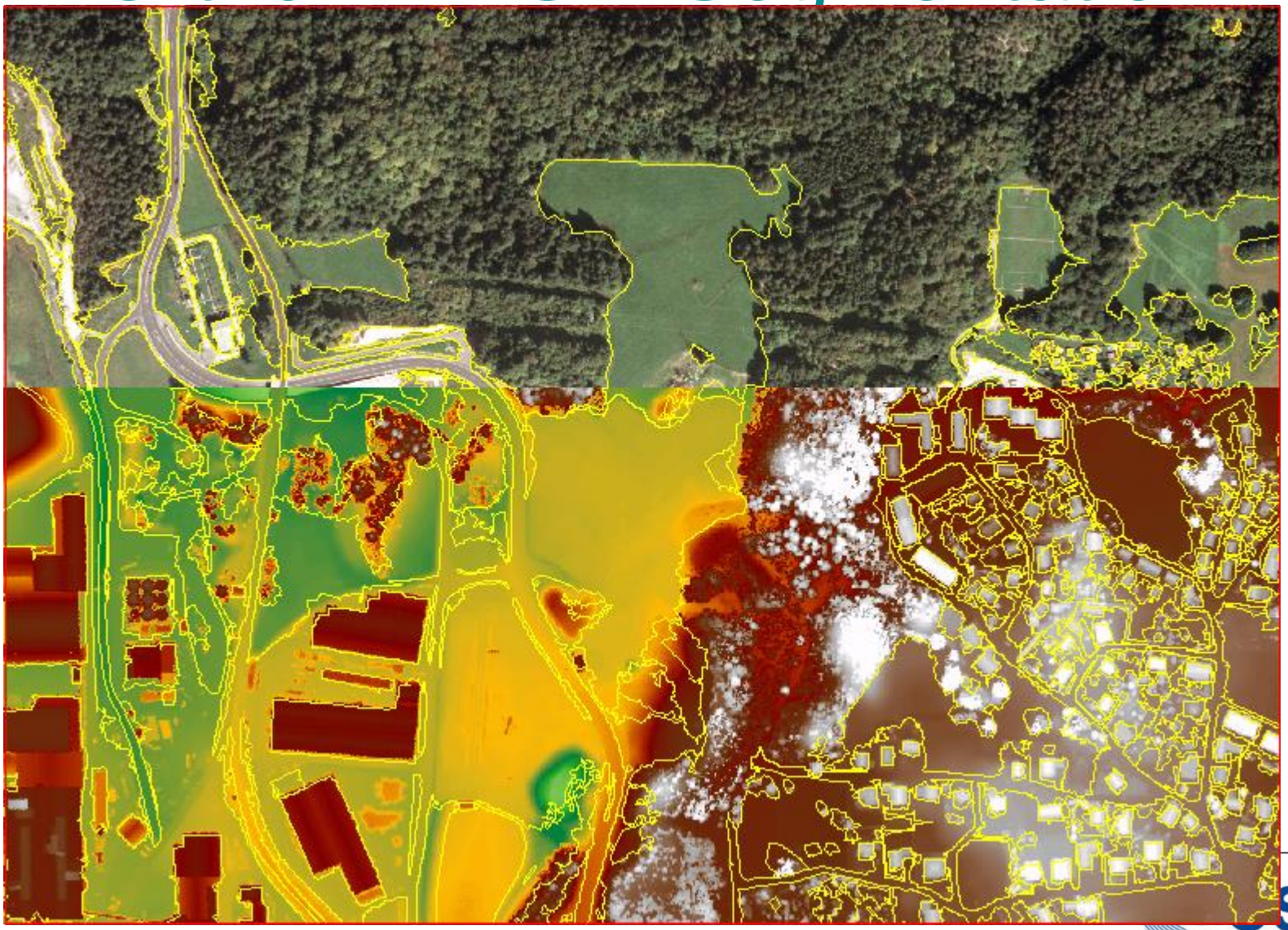
- Project lead + main service provider:
  - GeoVille GmbH, Innsbruck
- Service provider:
  - Joanneum, Graz
- Scientific team:
  - AIT Austrian Institute of Technology, University of Life Sciences (BOKU), Technical University Vienna
- Users:
  - Umweltbundesamt,
  - BEV, ministry for agriculture & environment, statistical office Austria, regional states, …
- Financing programm
  - FFG – Austrian Space and application programme
  - ESA – European Space Agency

Orthofoto (resampled from 25 to 50 cm)

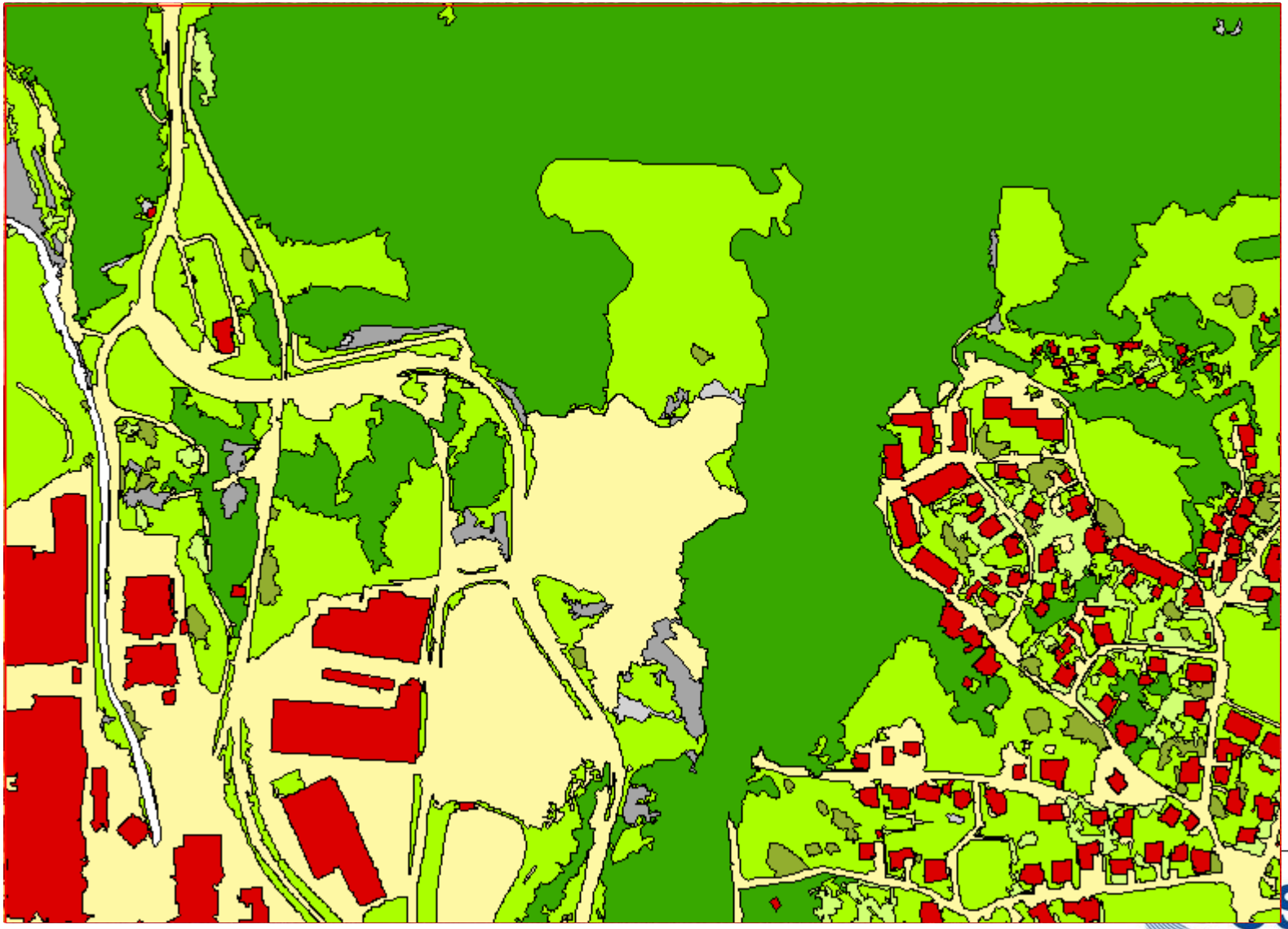
Orthofoto + nDSM



Ortho + ALS + Segmentation



LISA land cover classification



LISA Land cover classes

MMU (class depending)
25 m² – 500 m²

	Classes	MMU	Description
1	Buildings	25 m²	Buildings with all types of use
2	Other constructed areas	25 m²	Sealed areas except buildings, gravelled streets and parking zones
3	Bare soil	50 m²	Non-vegetated, bare soil
4	Screes	50 m²	Unconsolidated sediments as debris, scree slopes, crushed stones and sandy sections
5	Bare rock	50 m²	Rocks and (solid) bedrock
6	Surface water	50 m²	Open surfaces standing water bodies and watercourses
7	Snow	50 m²	Temporarily snow-covered areas
8	Ice	50 m²	Glaciers and ice fields
9	Trees	25 m²	Single trees and groups of trees
10	Bushes	50 m²	Bushes, hedges in settlements, dwarf pines and afforestation areas with low tree heights
11	Dwarf shrubs	50 m²	Outspread dense population of dwarf-shrubs
12	Herbaceous vegetation	50 m²	Artificial green areas (gardens and fields) and natural grassland
13	Reeds	50 m²	Reed belts
14	Shadow	500 m²	Non-interpretable shaded areas due to topographic conditions
15	Clouds	500 m²	Non-interpretable areas due to clouds

LISA: land information system austria

- Object based land information system
- Geometric objects (2-D information)
  - Mixed approach
    - Derived from existing databases (e.g. IACS)
    - Derived from segmentation of orthofotos + nDSM
- Thematic information = characterisation of objects
  - Thematic class
    - from CIR-orthofotos spectral reflection
    - According to EAGLE data model
  - Object height (3-D information)
  - TIME !!! (4-D information)
    - Sentinel-2
    - (Landsat 7+8)

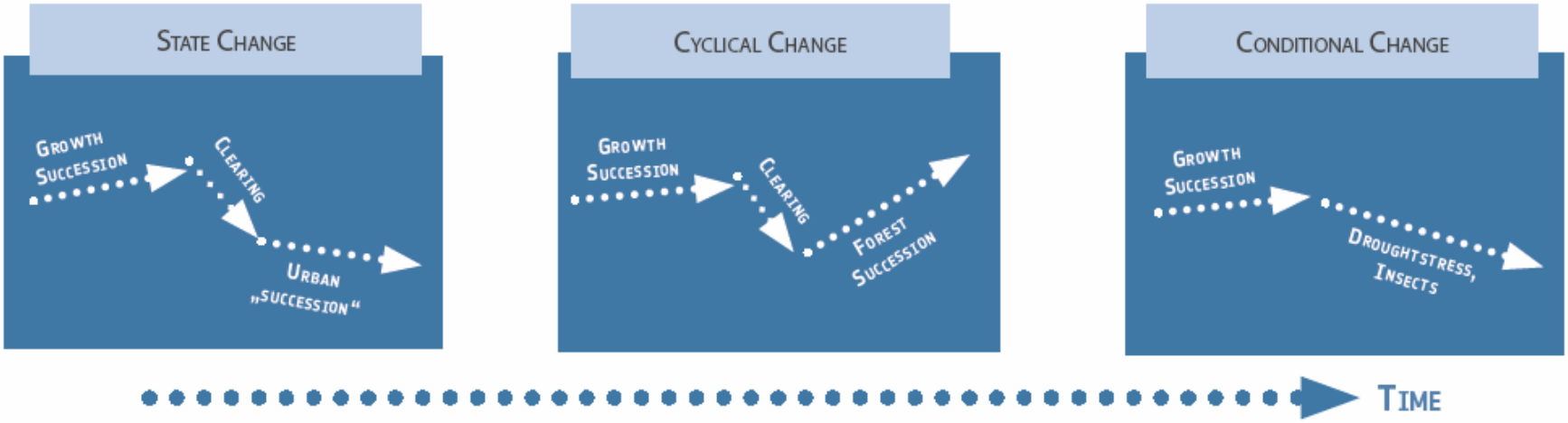
Products in CadasterENV

- P1: **HR Land Cover Map** using Sentinel-2 in 10 m resolution
- P2: **Enhanced LISA Land Cover Map** (adding information to existing, very detailled land cover)

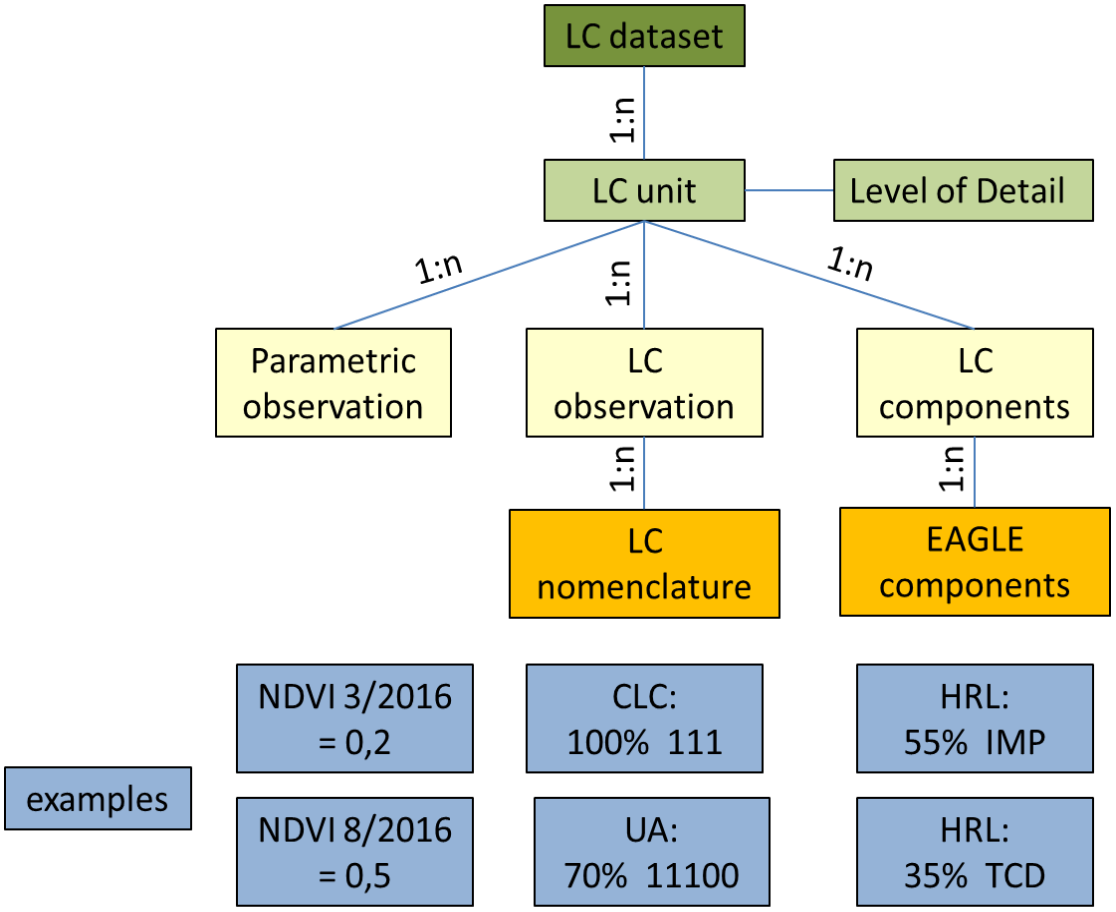
Change Alerts (P3)
- New urban areas
- Deforestation

HR Land Cover Monitoring (P4)
- Bare soil count
- Mowing count
- Water occurrence

Ecosystem Maps (P5)
- Forest degradation

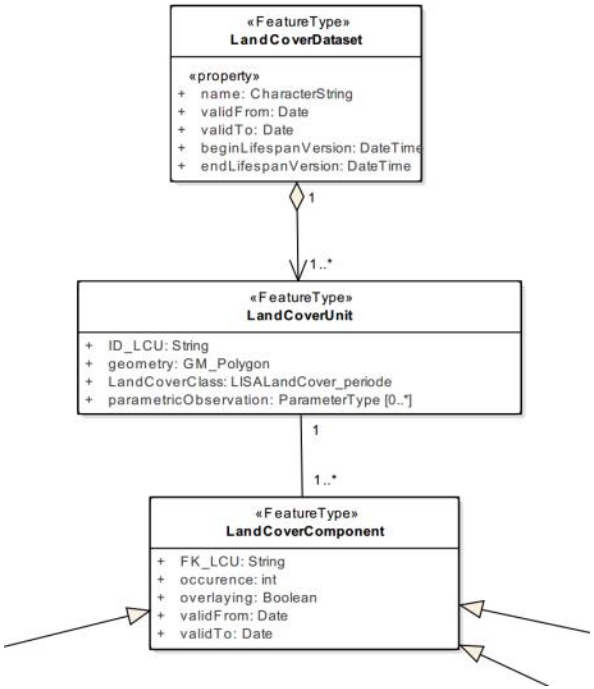


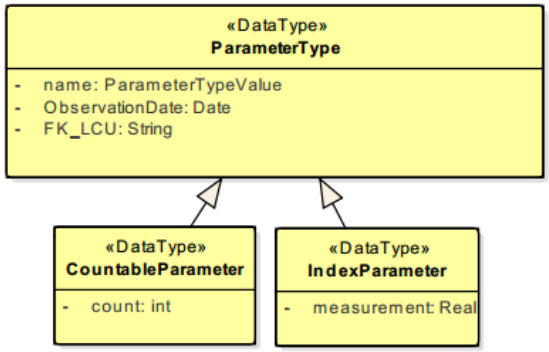
Integration of data: informal data model



Data model: LISA, INSPIRE + EAGLE

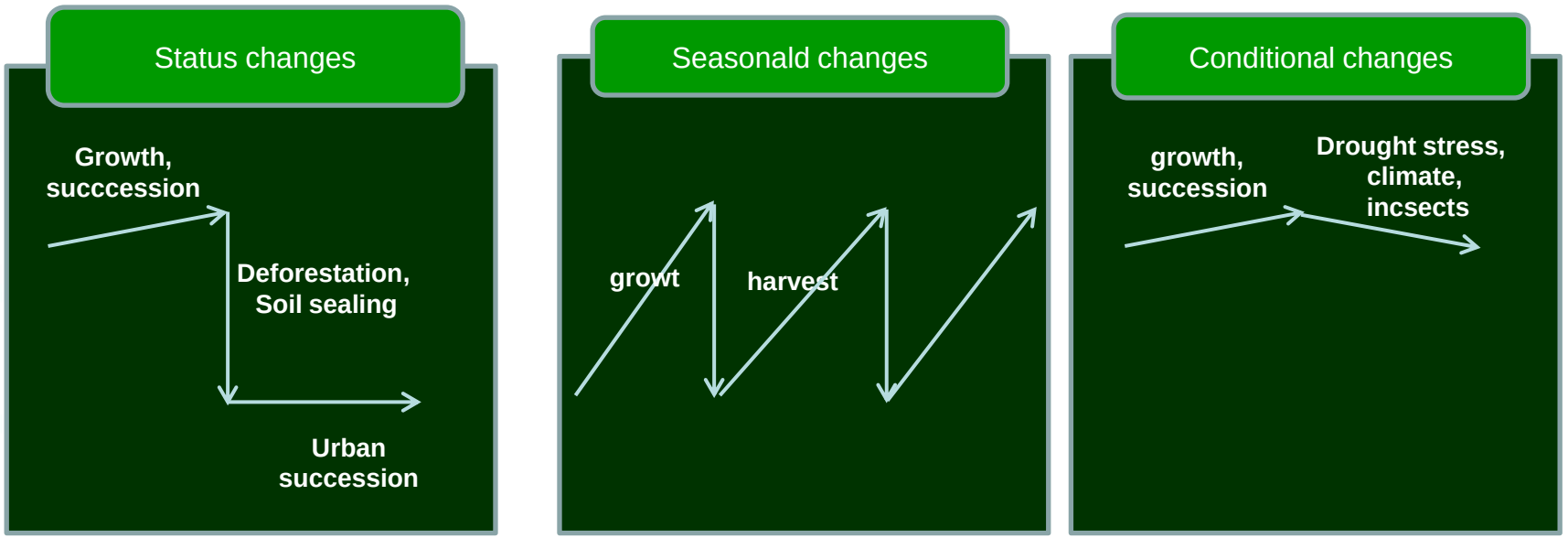
- EAGLE – European Action Group on Land Monitoring in Europe
  - Extension of INSPIRE data model for land cover
- LISA data model
  - Modification to reach compatibility with INSPIRE and EAGLE



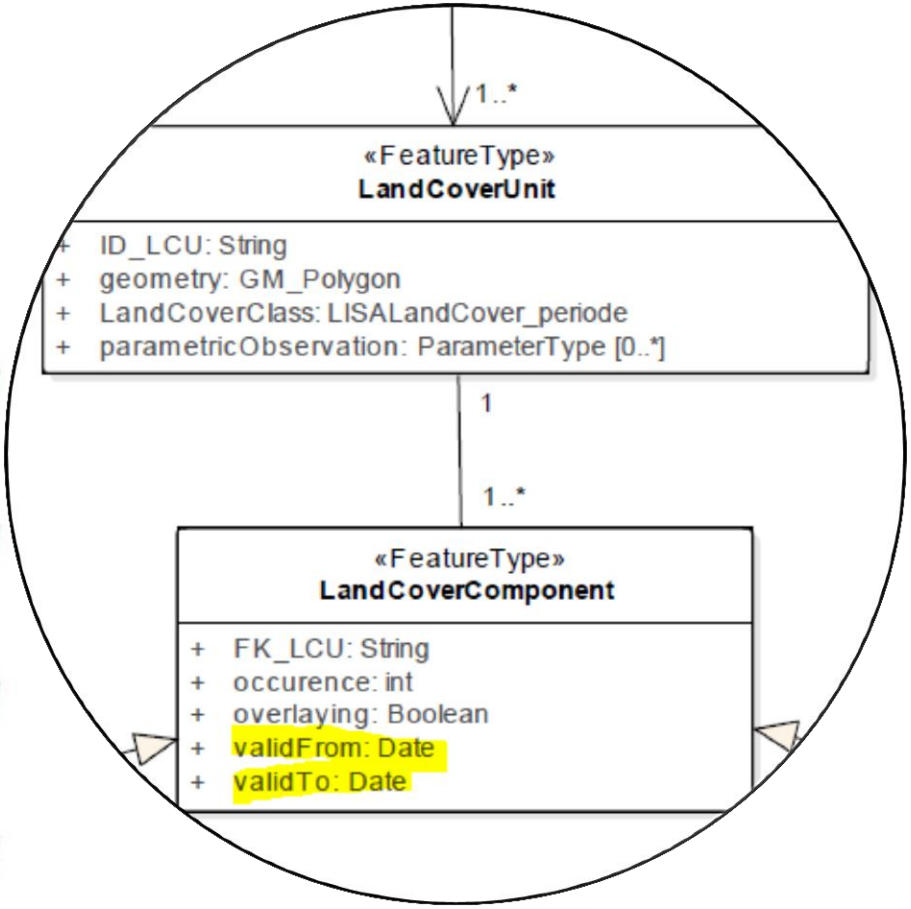


Changes in landmonitoring

Various types of changes

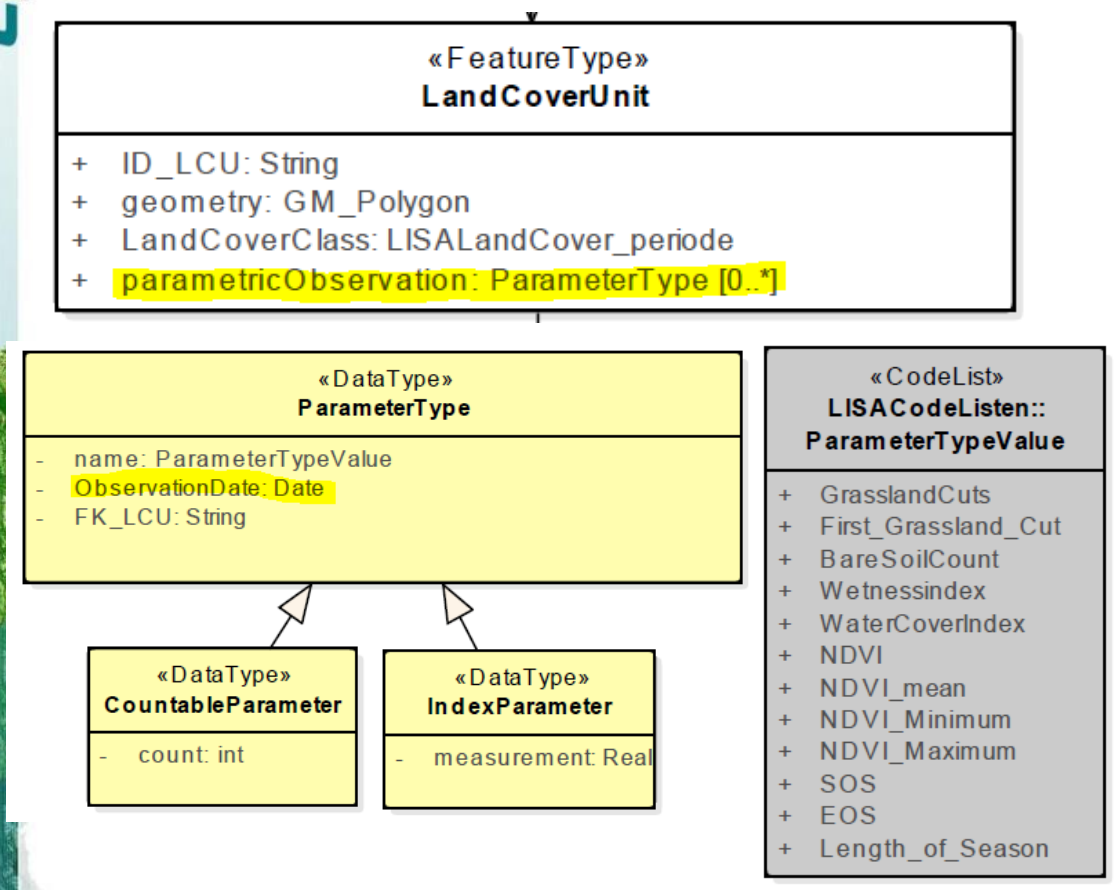


Data model „time machine“

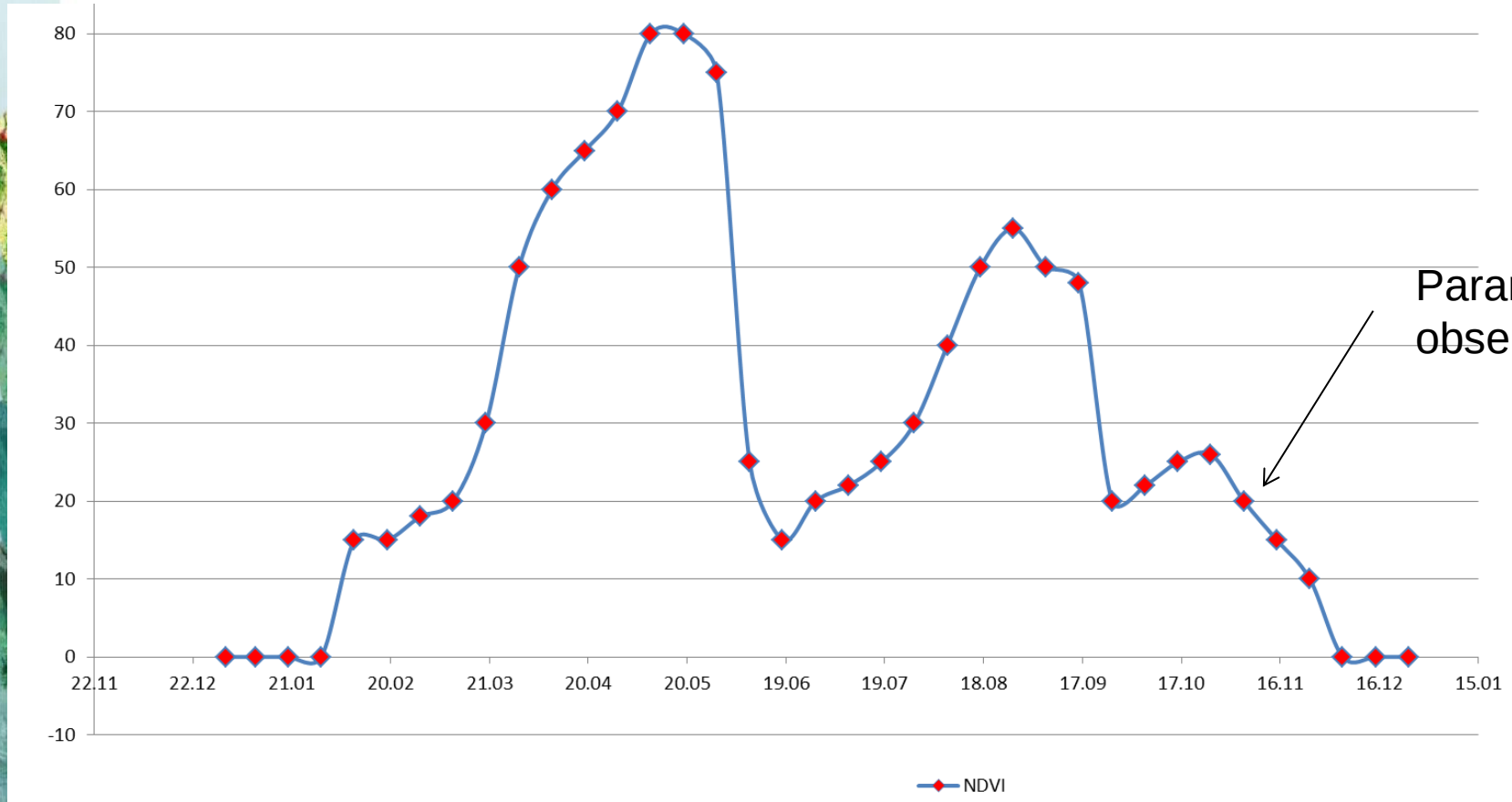


- Wihtin 1 LC-unit more than 1 LC component can exist over time (seasonal changes)

attributive parameters for LC unit



- A single observation can be stored with
  - A specific observation date
    - *ObservationDate*
  - With a specific thematic reference
    - *parametricObservation*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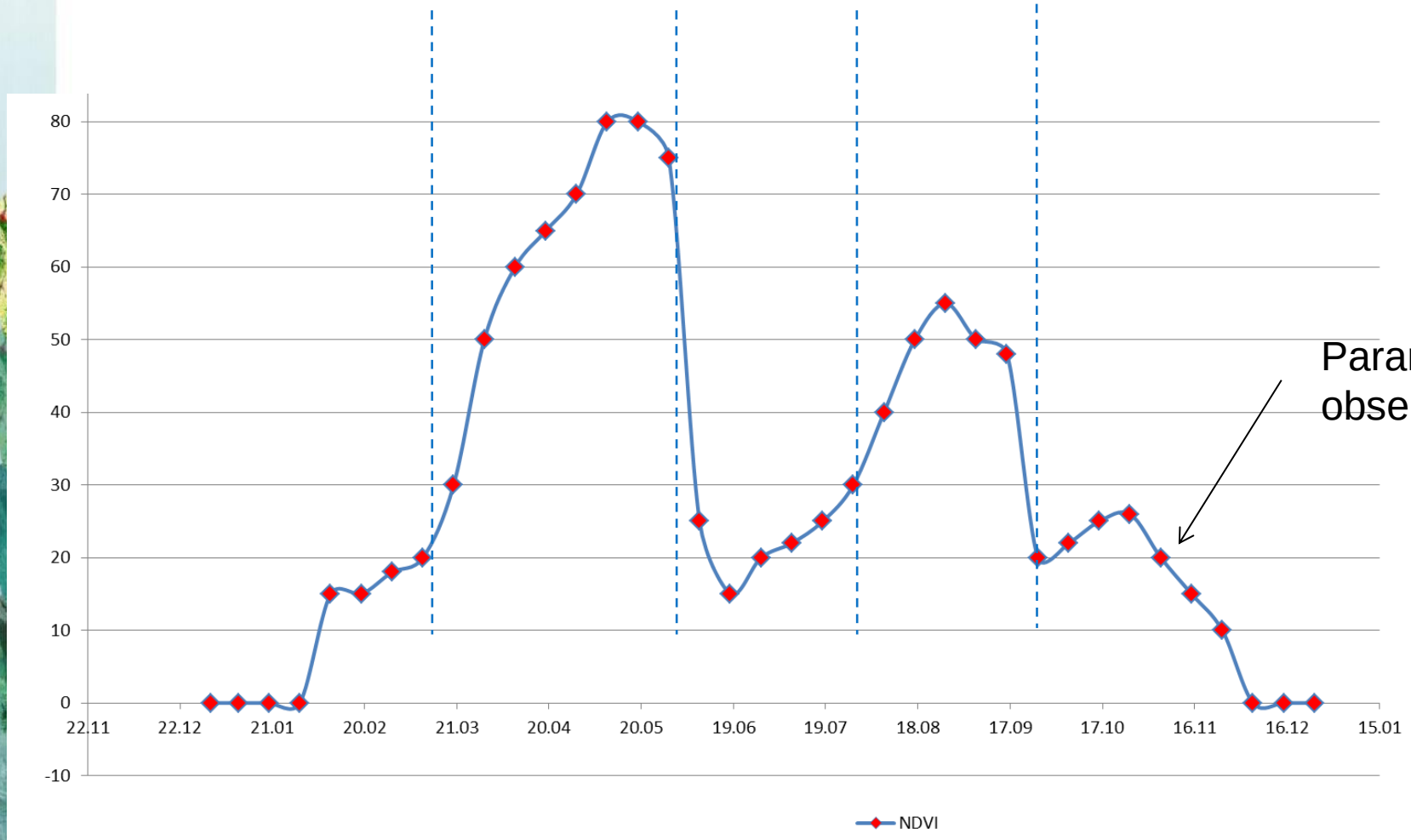
NDVI
Parametric observation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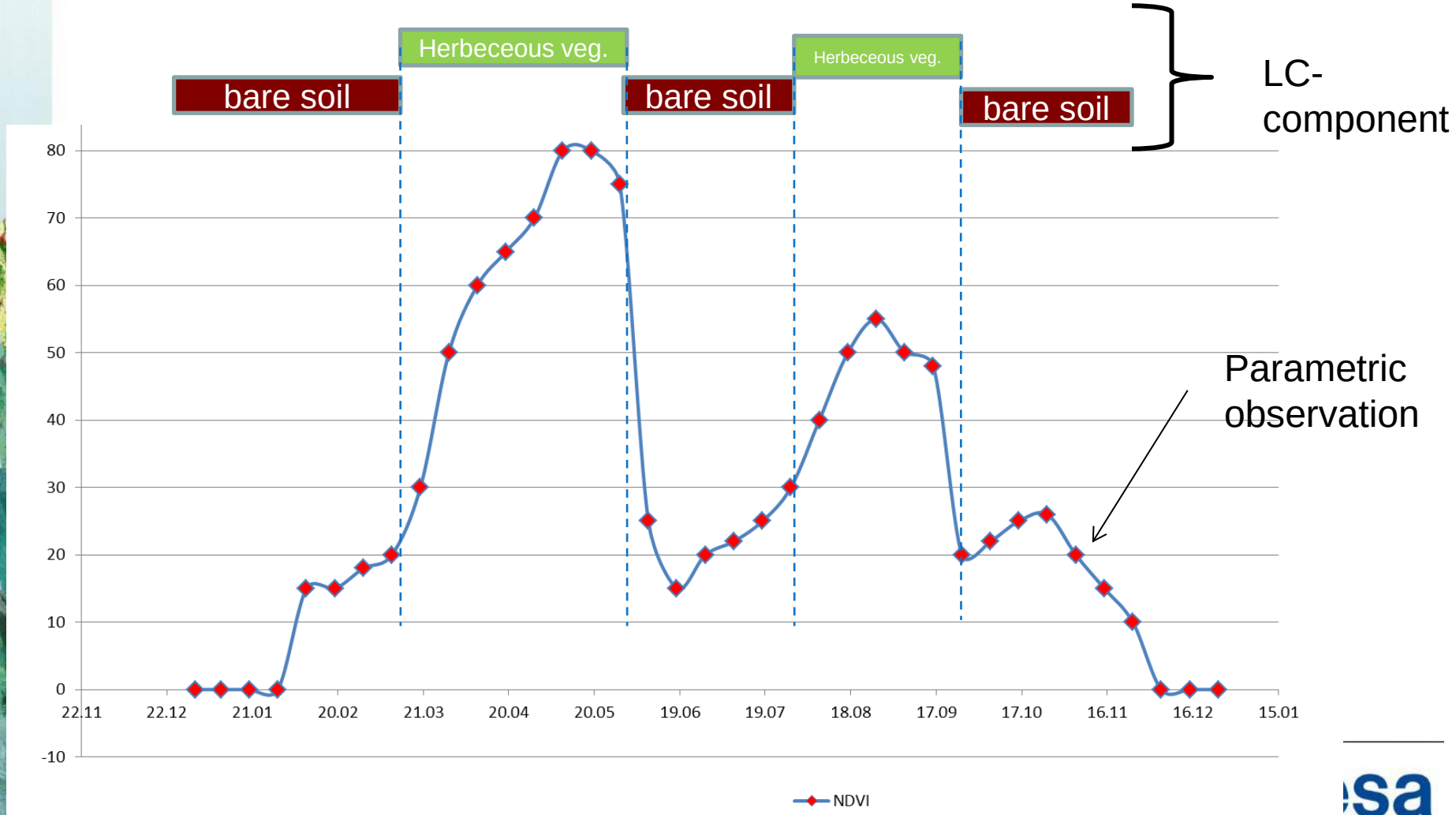
15.01
NDVI
Parametric observation


bare soil
Herbeceous veg.
bare soil
Herbeceous veg.
bare soil
LC-component
Parametric observation
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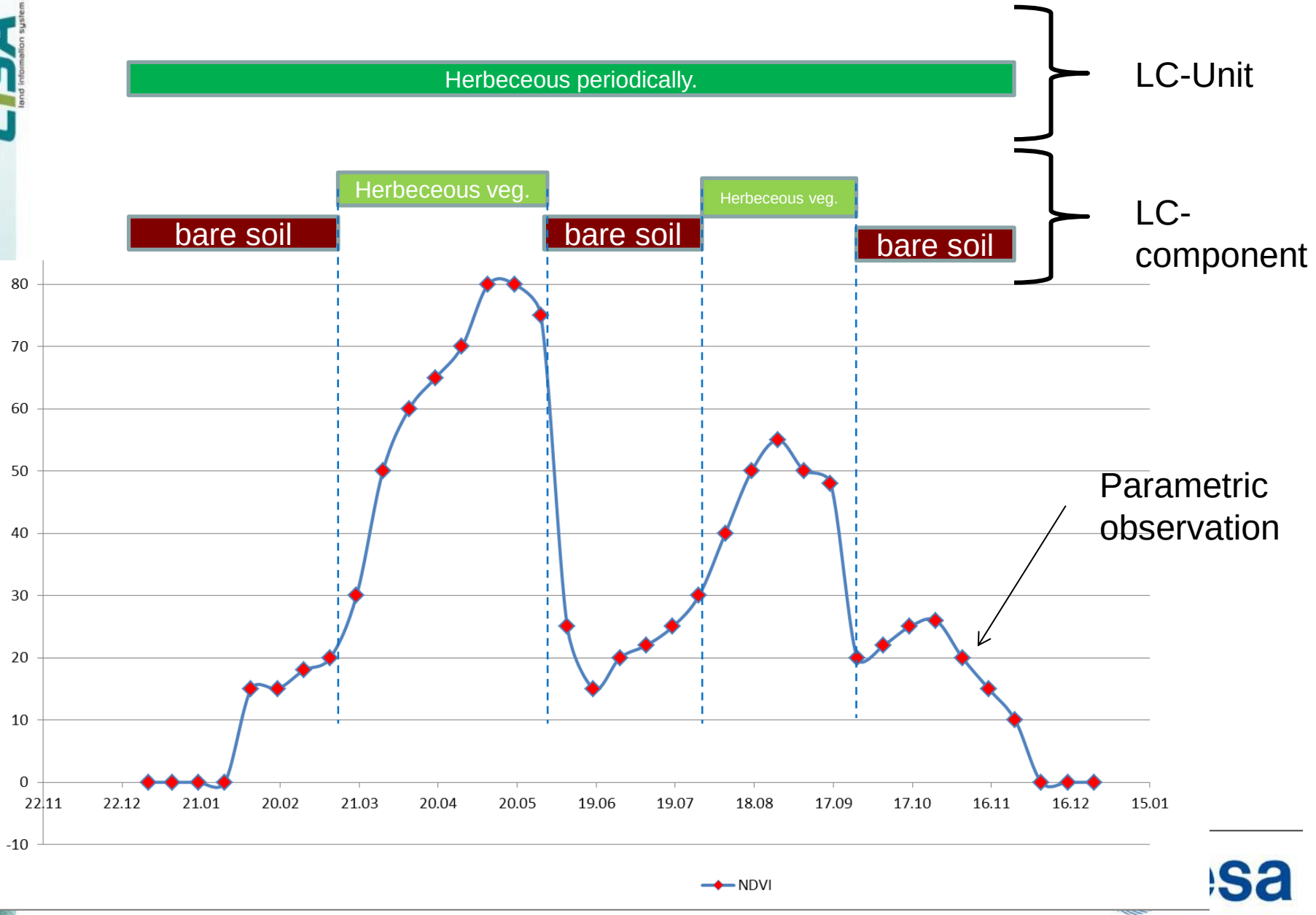
NDVI


Herbeceous periodically.
LC-Unit
Herbeceous veg.
Herbeceous veg.
bare soil
bare soil
bare soil
LC-component
Parametric observation
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-10
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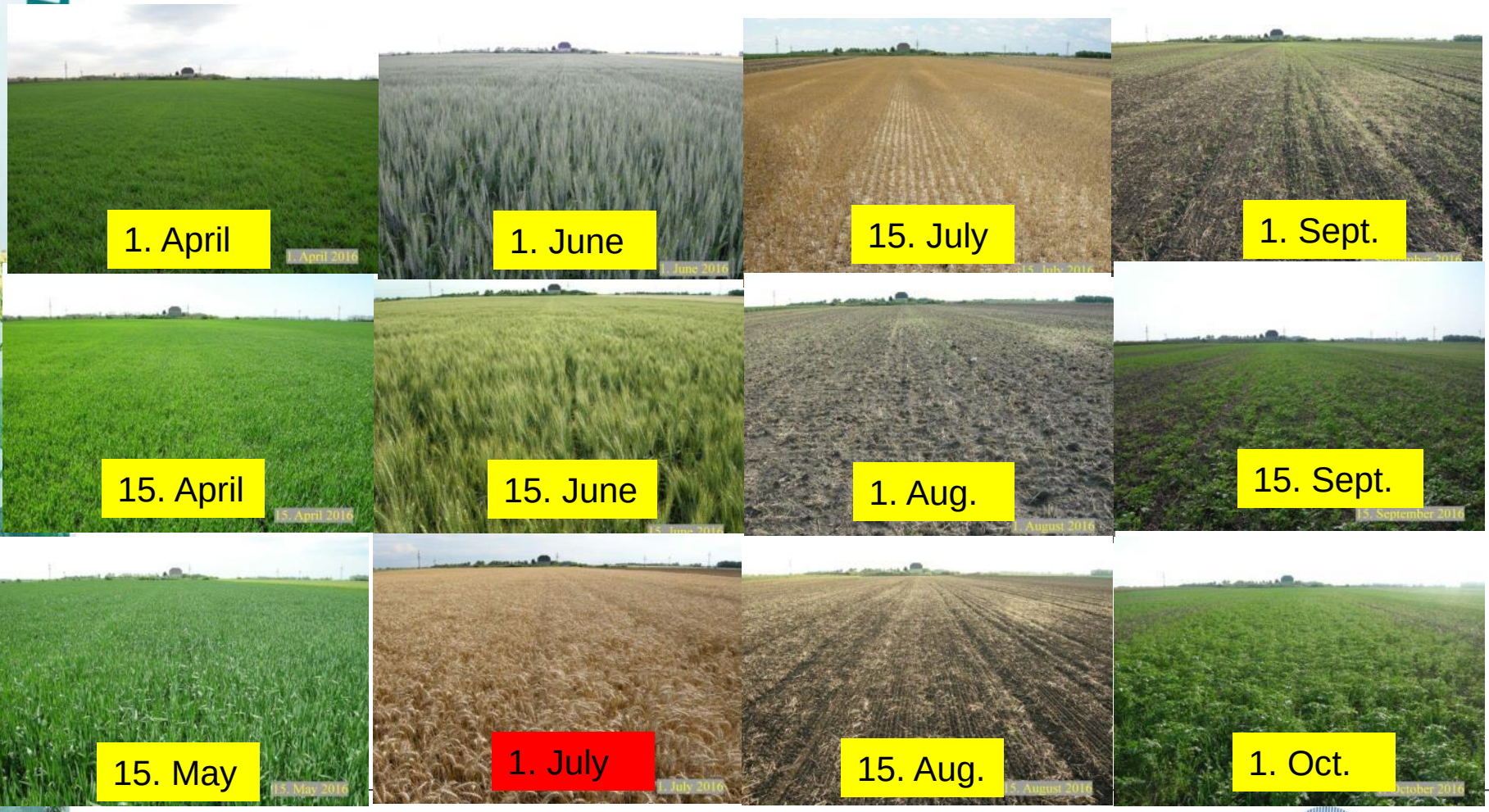
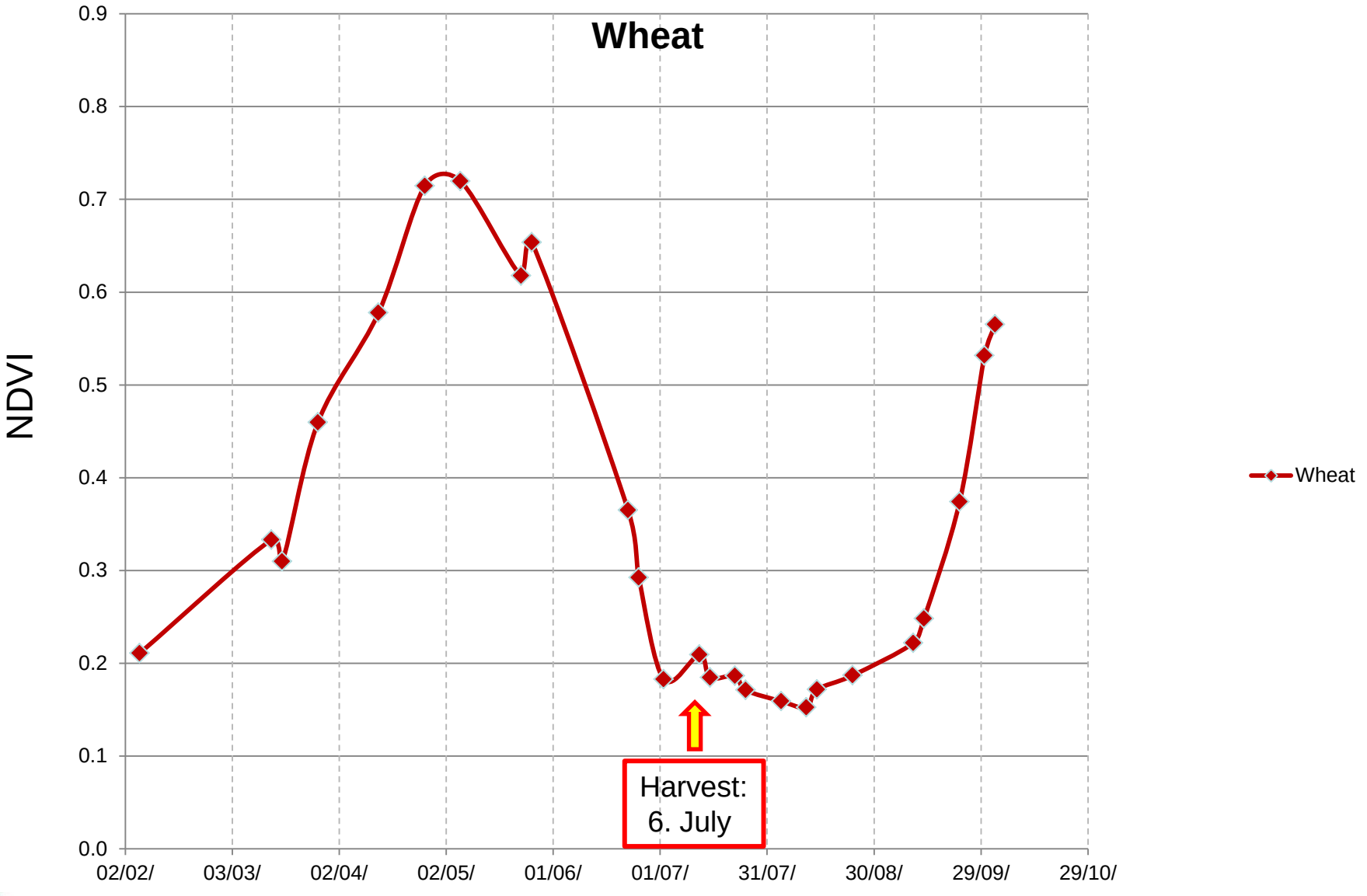
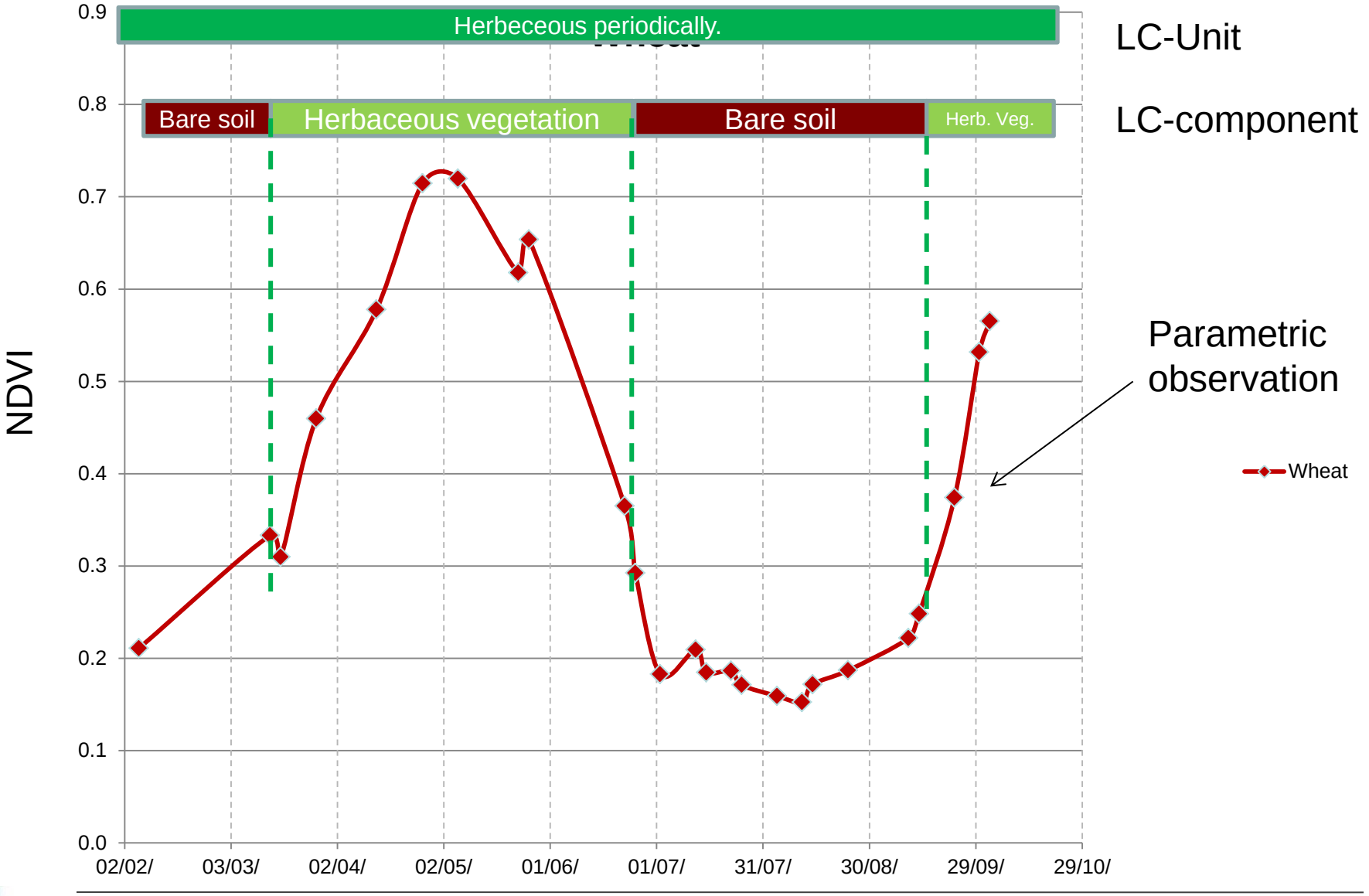
16.11
16.12
15.01
NDVI

Wheat – vegetation cycle




Wheat
NDVI
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
02/02/
03/03/
02/04/
02/05/
01/06/
01/07/
31/07/
30/08/
29/09/
29/10/
Harvest:
6. July
Wheat


Herbeceous periodically.
Bare soil
Herbaceous vegetation
Bare soil
Herb. Veg.
LC-Unit
LC-component
Parametric observation
Wheat
NDVI
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
02/02/
03/03/
02/04/
02/05/
01/06/
01/07/
31/07/
30/08/
29/09/
29/10/

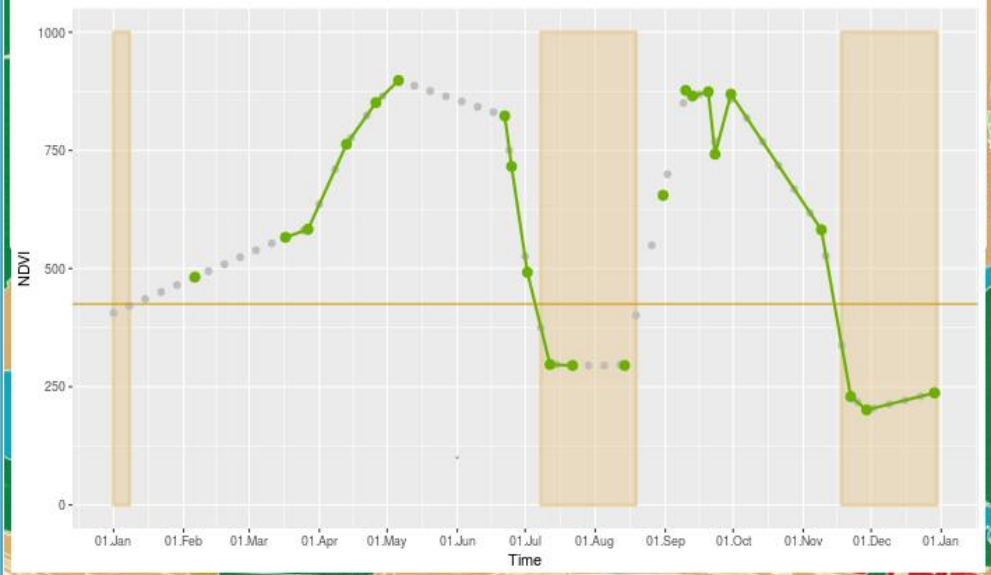
GeoVille - Shiny Server | Final Enriched LISA Land

demo.geoville.com/shiny/cadenv/p2/wien/

Final Enriched LISA LandCover Dataset - Vienna East | Showcase

Data Explorer

Temporal NDVI profile:



LandCoverComponents:

Valid from	Valid to	Type
2016-01-01	2016-01-08	Bare Soil
2016-07-08	2016-08-19	Bare Soil
2016-11-18	2016-12-30	Bare Soil
2016-01-08	2016-07-08	Herbaceous vegetation
2016-08-19	2016-11-18	Herbaceous vegetation

ParameterType:

Class:	Herbaceous periodic
Datasource:	INVEKOS 2016
Bare Soil Count:	3
NDVI min:	195
NDVI max:	898
NDVI mean:	582

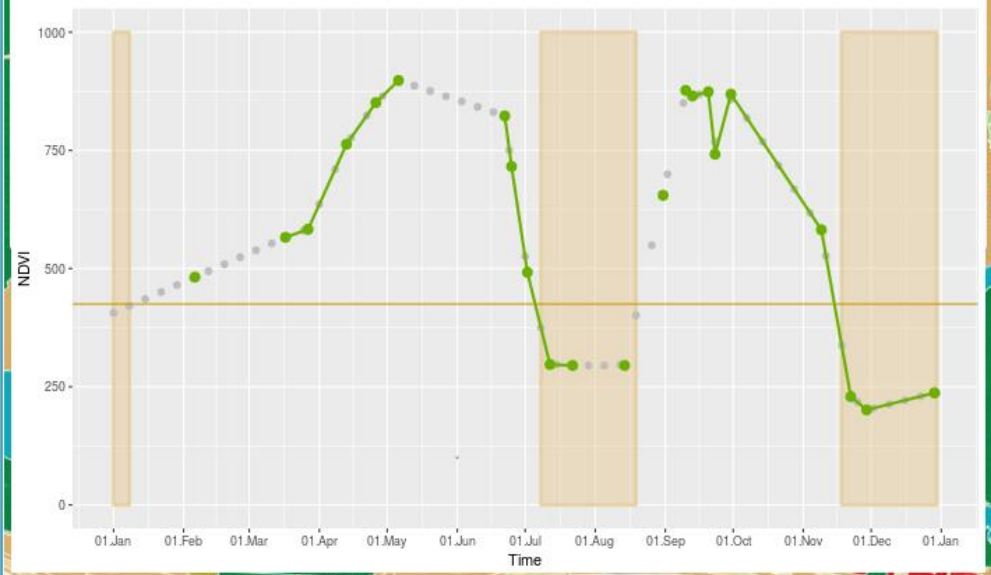
Legend

- Buildings
- Sealed Area
- Permanent Soil
- Scree
- Bare rock
- Surface water
- Trees
- Bushes
- Dwarf Shrubs
- Herbaceous
- Coniferous Forest
- Mixed Forest
- Deciduous Forest
- Herbaceous Permanent

Final Enriched LISA LandCover Dataset - Vienna East | Showcase

Data Explorer

Parametric observation



LC components

Valid from	Valid to	Type
2016-01-01	2016-01-08	Bare Soil
2016-07-08	2016-08-19	Bare Soil
2016-11-18	2016-12-30	Bare Soil
2016-01-08	2016-07-08	Herbaceous vegetation
2016-08-19	2016-11-18	Herbaceous vegetation

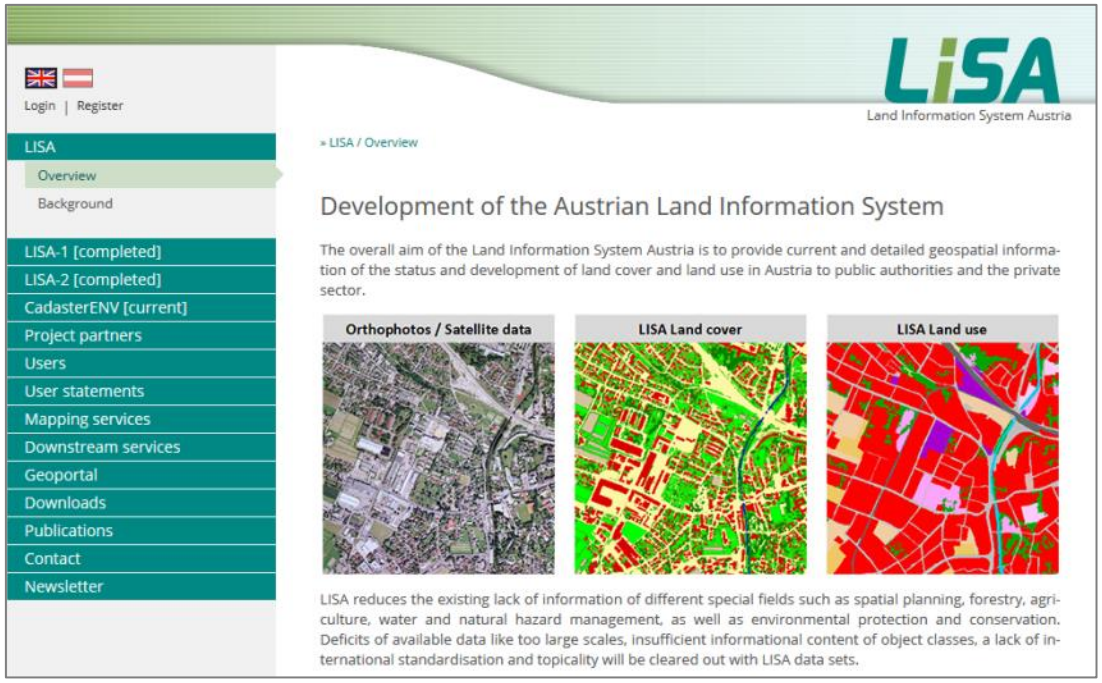
LC Unit

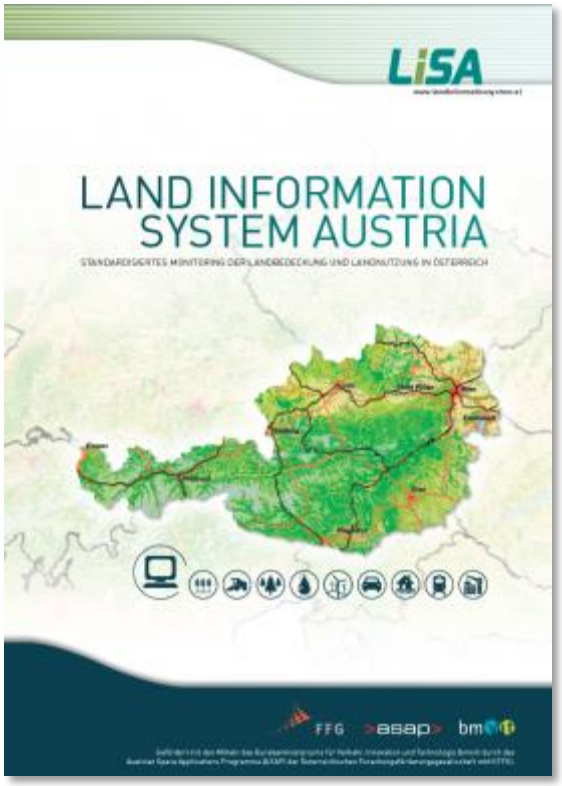
Class:	Herbaceous periodic
Datasource:	INVEKOS 2016
Bare Soil Count:	3
NDVI min:	195
NDVI max:	898
NDVI mean:	582

conclusions

- Demo-application
  - http://demo.geoville.com/shiny/cadenv/p2/wien/
- Extension of INSPIRE data model
- Application of EAGLE data model

www.landinformationsystem.at





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