



Central European Institute of Technology  
BRNO | CZECH REPUBLIC

FACULTY OF CHEMISTRY  
institute of physical  
and applied chemistry

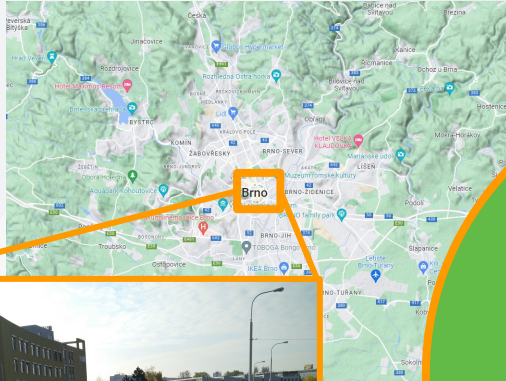


**ToSCA**  
Tomography for Scientific Advancement  
8-9<sup>th</sup> September 2022

# Drug transport in urban soil through the seasons in a combination of X-ray CT and chemical analyses: *Preliminary results*

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# Our Urban Soil



## “Natural” Soils

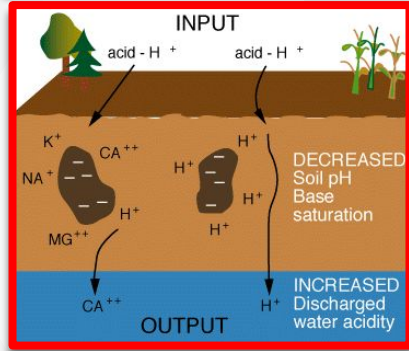
Fragmented  
Common  
Unaltered directly by human  
Impacted by indirect effects

## Technosols

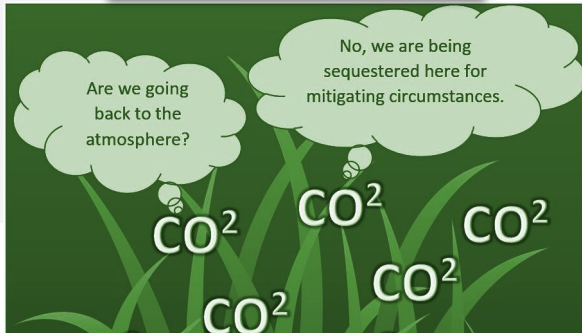
Graded  
Filled  
Terraced  
Impacted by direct effects

# What is it good for ?

## Buffering contaminants



## Sequestering Carbon



Flood storage  
Infiltration capacity  
Mitigating heat island effects

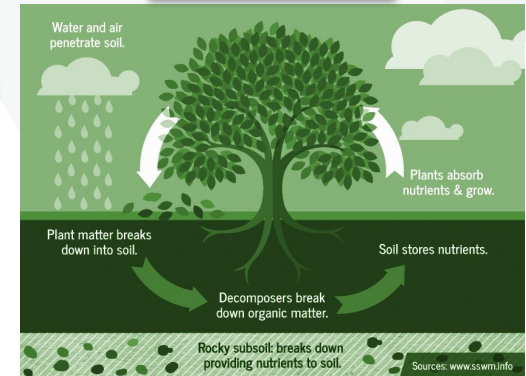


Promoting Hydrologic functioning

Biodiversity

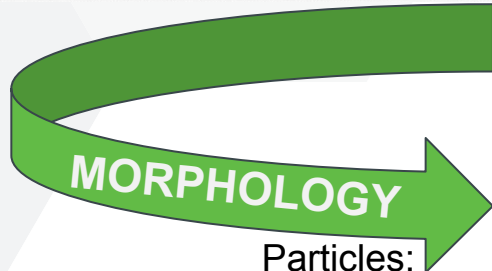
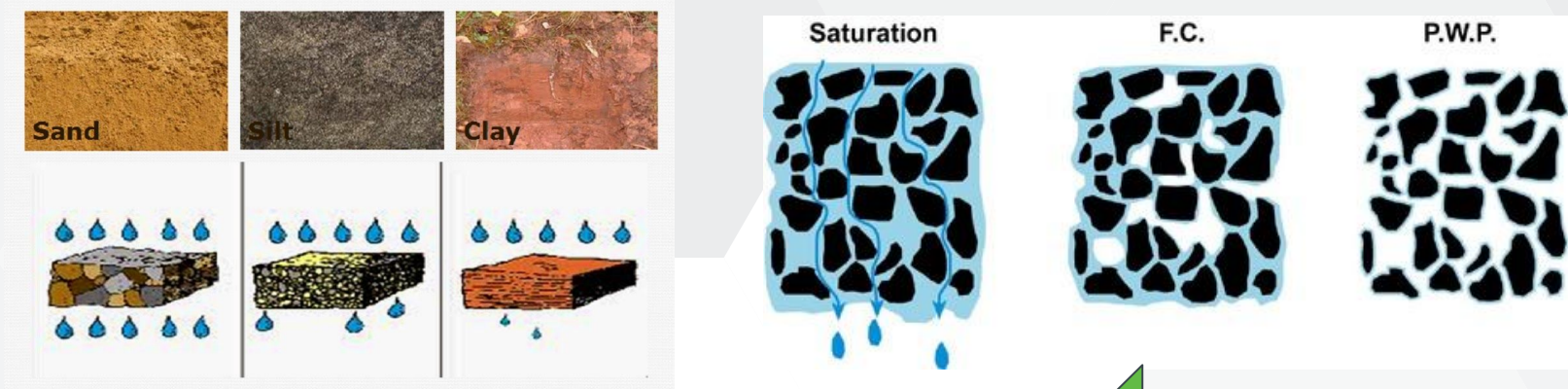


Nutrient cycle



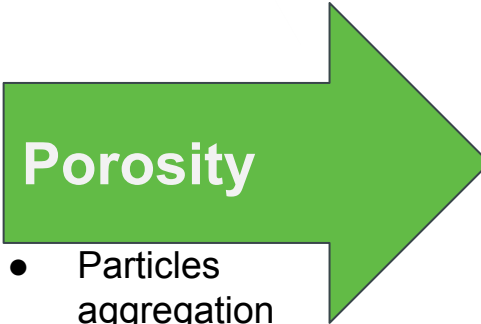
ENHANCED  
RESPONSE CAPACITY  
to  
CLIMATE CHANGE

# Drug Transport and Soil Morphology



Particles:

- Shape
- Size



- Particles aggregation
- Organic matter

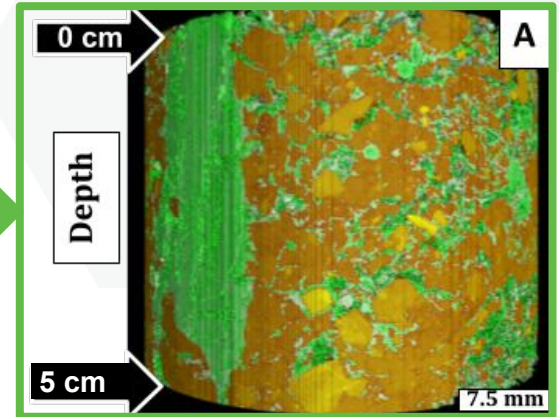
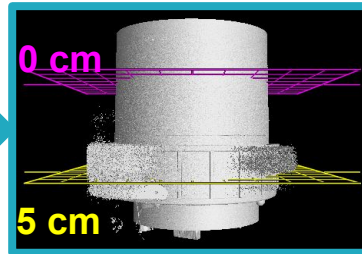
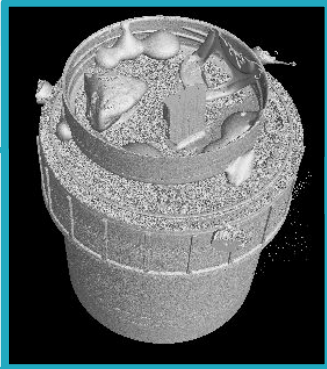


- Soil moisture
- Drug molecules size

# Sampling, CT scanning, Segmentation



GE PHOENIX -  
Thermofischer  
0.04 mm voxel  
size



# Weather Conditions - 4 days before sampling

## SPRING

## SUMMER

■ S\_MIN ■ S\_MEAN ■ S\_MAX

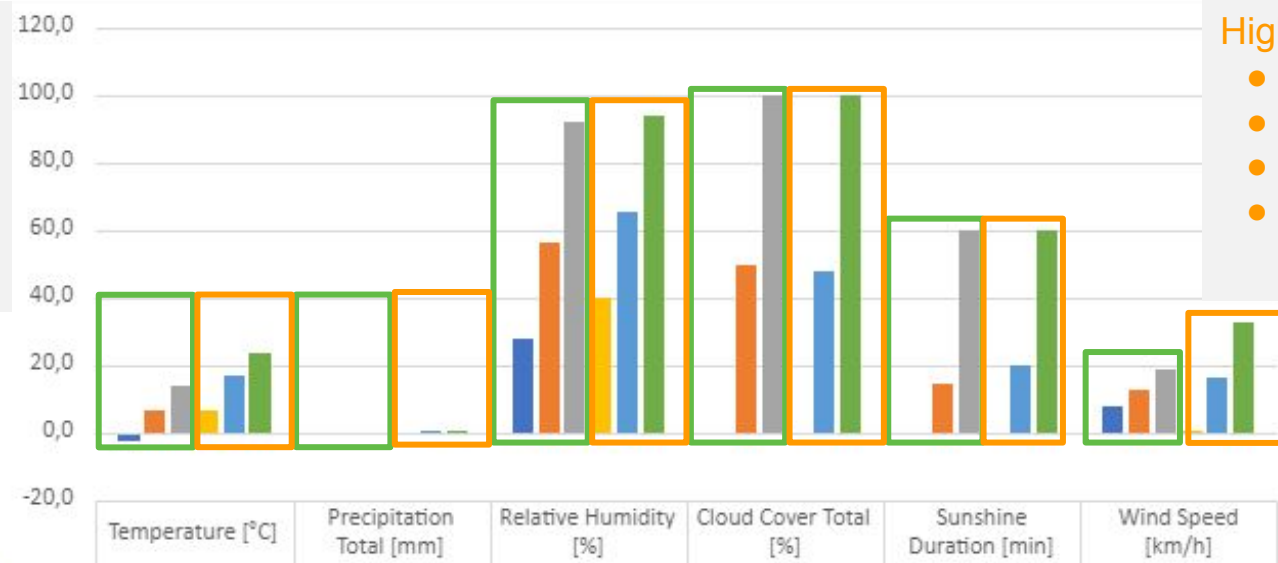
■ Su\_MIN ■ Su\_MEAN ■ Su\_MAX

Lower:

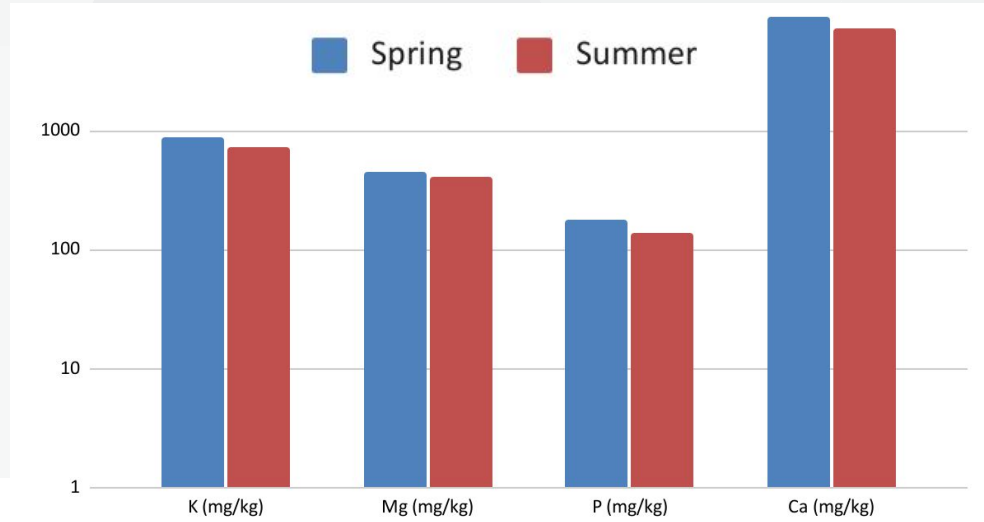
- Humidity
- Precipitation
- Wind speed
- T°C

Higher:

- Humidity
- Precipitation
- Wind speed
- T°C

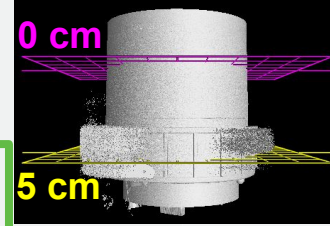


# Soil Composition

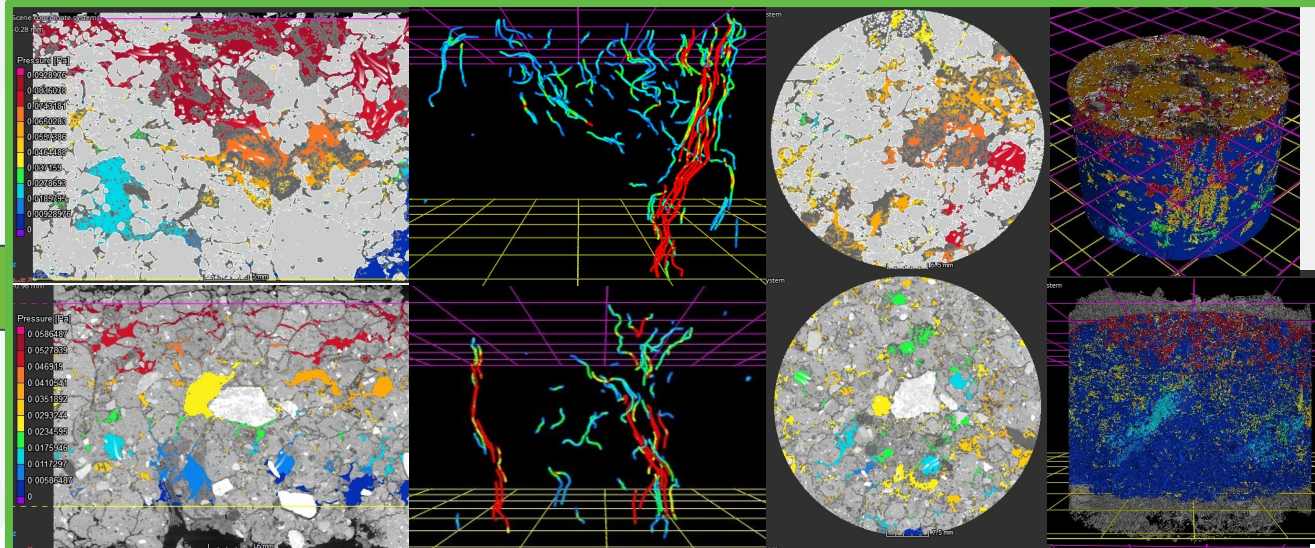


	Water [%] (0-200°C)	Organic [%] (200-600°C)	Carbonate [%] (600-900°C)	Ash [%]
Spring	2.3	6	3	88

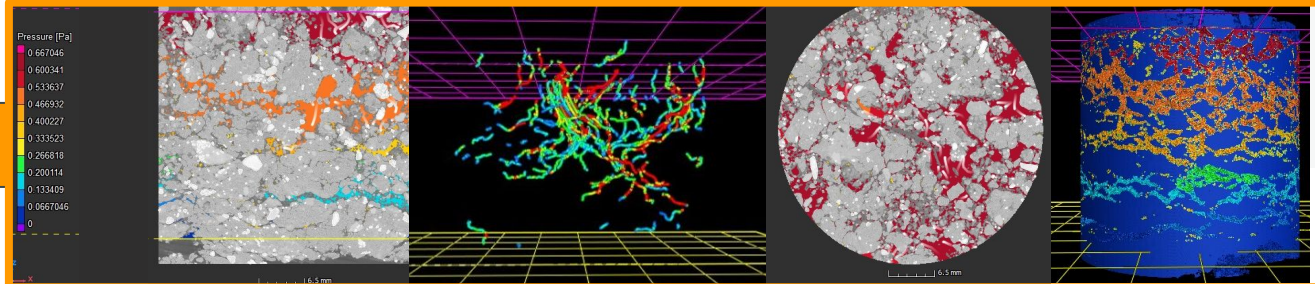
# Absolute permeability



Spring



Summer

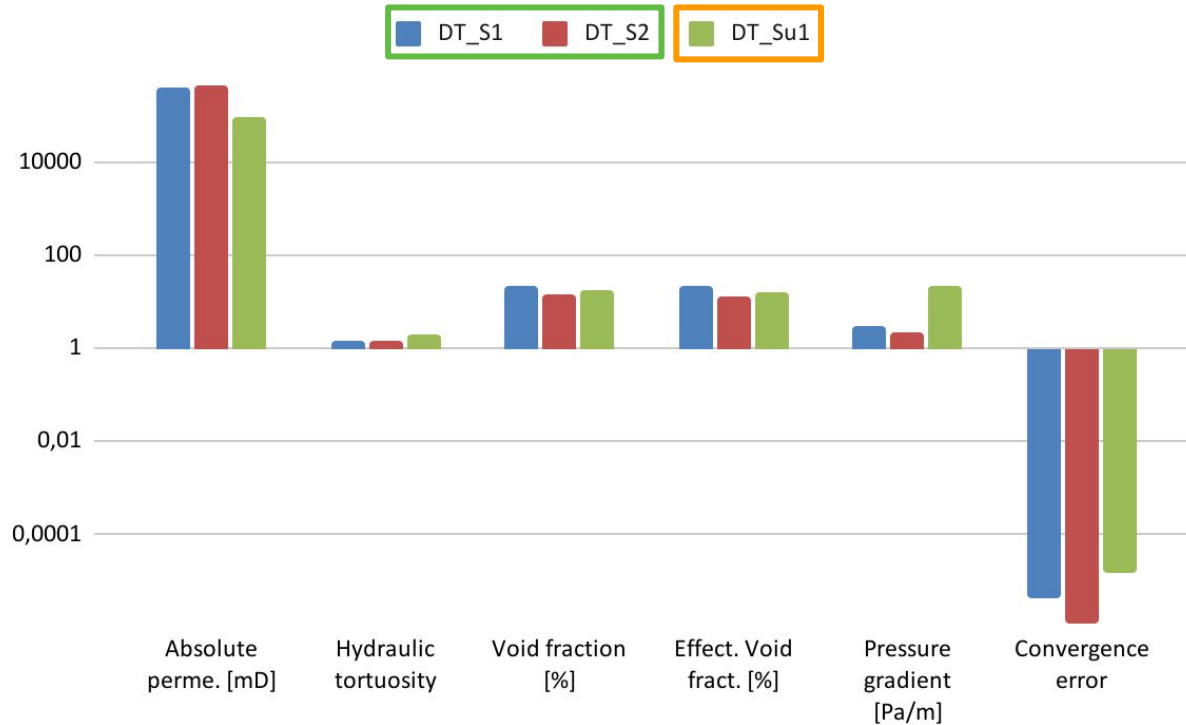




# Absolute permeability

Spring (S)

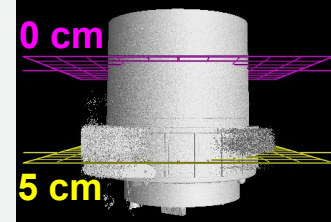
Humidity  
11.08 %



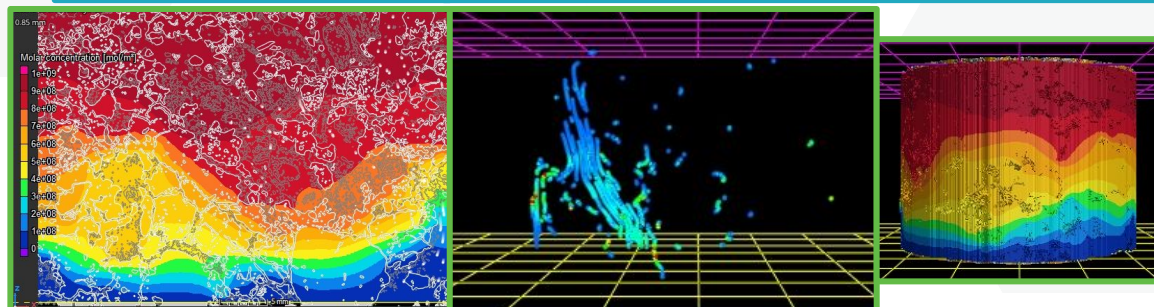
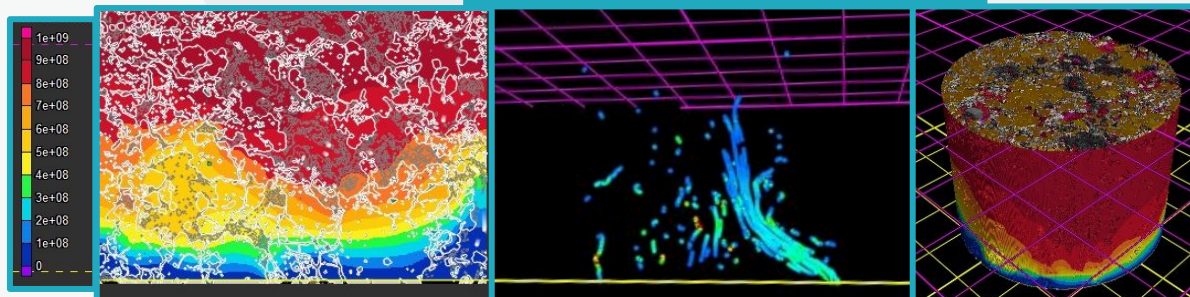
Summer (Su)

Humidity  
7.81%

# Molecular diffusivity: Sulfapyridine



S. in Tap Water [4.39E-01]

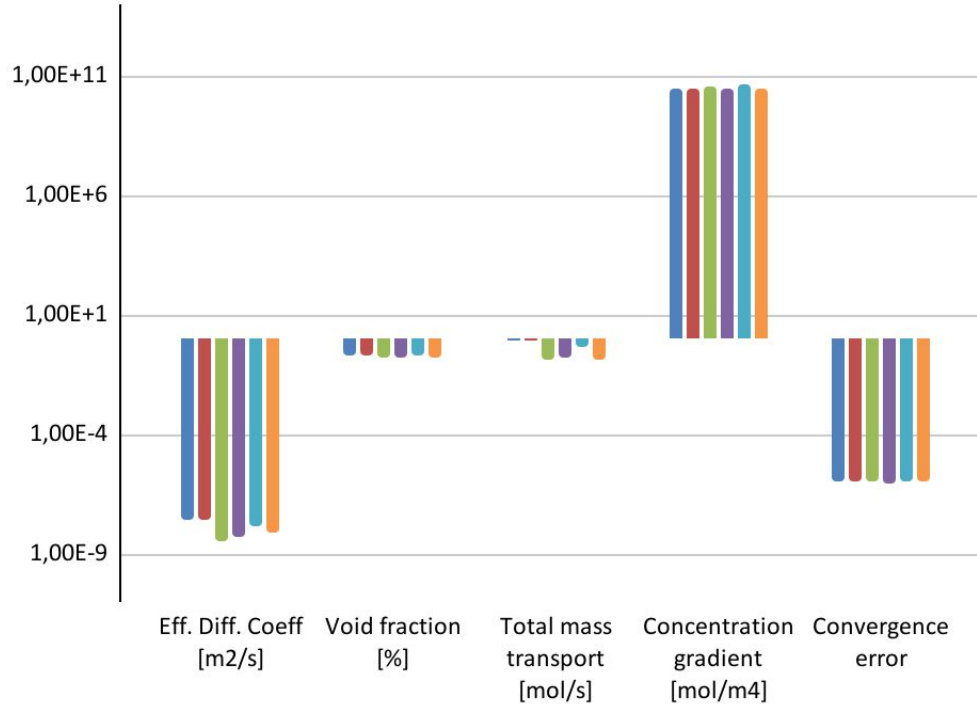


S. in Distilled Water [4.23E-01]

# Molecular Diffusivity

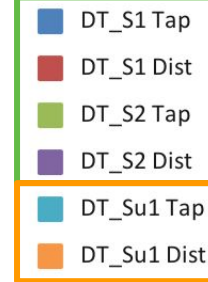
Spring (S)

Humidity  
11.08 %

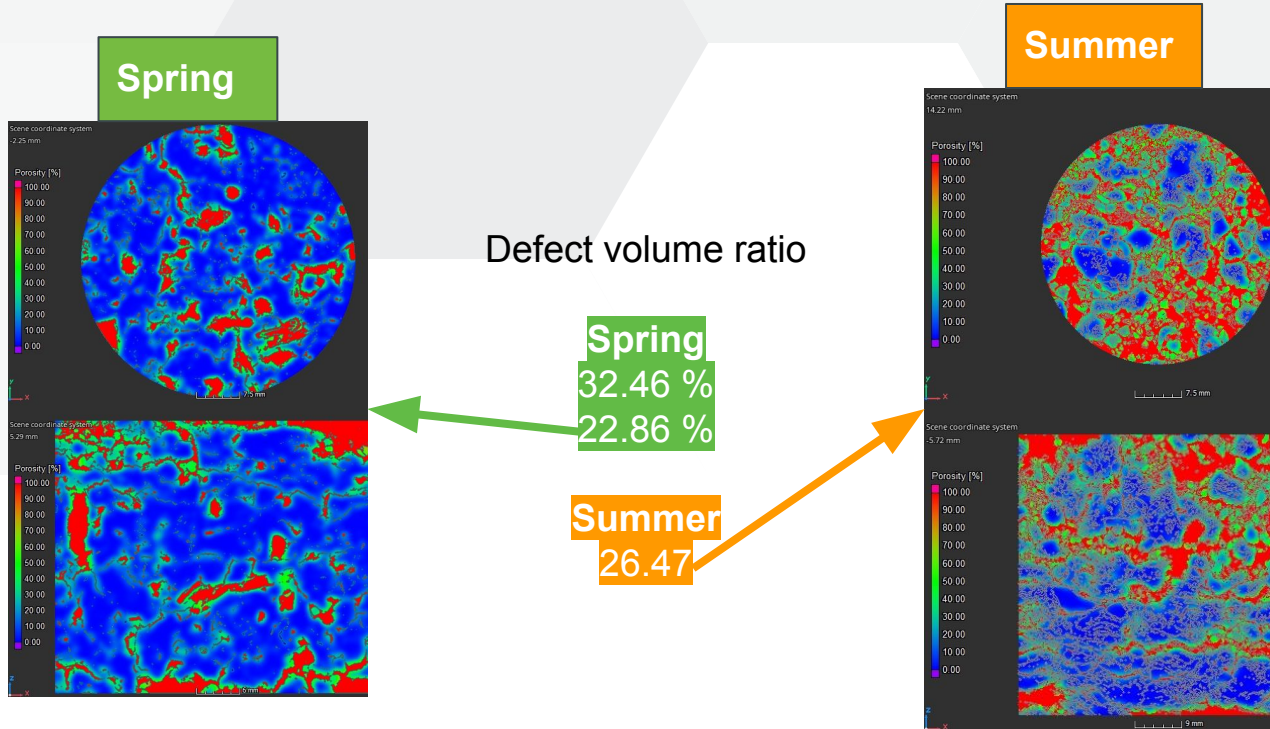


Summer (Su)

Humidity  
7.81%



# Porosity



## CT + Chemistry ?

- CT calibration of simulation
- Verification with acknowledged methods
- Real morphology combined with composition

## Drug Transport in Urban soil ?

- Urban soil enhanced comprehension
- Best uses determination

## Seasonal Variations ?

- Too unpredictable to be assessed with the actual data

# To Follow

2022

- Autumn sampling
- Winter sampling
- Percolation speed
- Drug concentration compared to simulation

202...

**New sampling:**

- Same periods
- Same location



Thank you for your attention !

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