# Round Table Online Event 14/09/2020

# SItE - Towards Lecce2021





ifeWatch

www.congresso.ecologia.it

#### **Digital Ecotwins**

Antonello Provenzale, Institute of Geosciences and Earth Resources, CNR, Italy

Round Table Session "Arctic and Alpine ecosystems in face of climate change"



### Observations and measurements

Development of ecosystem models

Validation and verification: proposals for new observations Global climate and environmental change scenarios Forecast and prediction of ecosystem response

> ecosystem model(s)

Estimate of ecosystem response

# **Digital Twin:**

- A digital twin is the virtual alter-ego of a real system
- It can be process-based or data-based
  - (e.g., neural networks, machine-learning, etc.) or blending both aspects, using AI and IoT
- It requires a continuous flow of data to build and operate it: need for data assimilation procedures and model adaptation
- It can be used to test the functioning of the system and/or to predict response to internal changes or changes in the drivers



# Ecosystems are seen as "one physical system" with their environment, with strong geosphere-biosphere-hydrosphere interactions



Global climate and environmental change scenarios Use digital ecotwins for decision and management

**Digital ecotwin** 

Ecosystem sensitivity

Le Roy Poff et al, Nature Climate Change 2016

# The Earth Living Skin (aka the Critical Zone)





and Scales to Understand the Critical Zone

<sup>2</sup> Martin B. Goldhaber,<sup>2</sup> and K. Vala



www.czen.org , http://criticalzone.org/national/

The layer between the top of vegetation canopy and the "rocky matrix", where physics, chemistry, hydrology, eco-hydrology, geology and biology closely interact



# The Nivolet (PNGP) Critical Zone Observatory

In-situ data and remote sensing observations, laboratory analyses, data analysis, modelling







## ICOS







Thanks for your attention