Earth Observation at ESA in the context of a ‘Digital Earth’ and a Changing Anthropocene

ICES Biennial Workshop V
”Digital Earth in a transformed Society”

Michael Rast
ESA-ESRIN, Frascati, Italy
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<th>Sentinel Status</th>
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Rainforest Clearing

Rondonia, Brazil
Landsat 5
8 July 1989
Sea level rise is accelerating. Sea levels could rise 1.3 meters in the next 80 years.

Proceedings of the National Academy of Sciences

February 2018
The Space 4.0 Era

**Space 1.0**
Astronomy
Since millennia

**Space 2.0**
Space Race
Since 1958

**Space 3.0**
Int. Cooperation
Since Fall of the Wall

**Space 4.0**
Space for Society
Now
Transfer learning from drone data to Sentinel 2

- **ImageNet**: 14M images, 20k categories
- **Drone & reference data**: 40 mosaics, 1000 referenced samples
- **Sentinel-2 time series**
- **Crop types maps**

**Transfer learning** (6 categories) → **Sen2agri classifier** → **Campaign planning**
Big Data Challenges

Data volume

Data continuity

Data sharing

Data quality

Innovation

Timeliness

Mission synergies

Uniqueness
AI Opening a new Dimension for EO

- On Board Autonomy
- Process Automation
- Data Science
- Enhanced Resolution
- Detection / Classification
- Big Data Analytics

ESA UNCLASSIFIED – For Official Use
Building a Digital Twin Earth

Observations

Modelling

AI
EO NEXT =

- reference missions
- new space
- brain
- connected
- programmable

Copernicus
Earth Explorers
Constellations
AI on-board
Internet to space
Interactive community
ESA Monitors the Health of our Planet