Big Data from Space – Turning Earth Observation Data into Insights

Prof. Dr. Hansjörg Dittus
German Aerospace Center (DLR) – Member of the Executive Board
BiDS 2019 (19.02.2019)
Big Data — The 5 Vs

**Volume**
- Data at Rest
  - Terabytes to Exabytes of existing data to process

**Velocity**
- Data in Motion
  - Streaming data, requiring milliseconds to seconds to respond

**Variety**
- Data in Many Forms
  - Structured, unstructured, text, multimedia, ...

**Veracity**
- Data in Doubt
  - Uncertainty due to data inconsistency & incompleteness, ambiguities, latency, deception, model approximations

**Value**
- Data into Money
  - Business models can be associated to the data

Current and Future Earth Observation Missions at DLR

Multi-Mission Ground Segments
- National Missions
- ESA / EU Missions
- Scientific and commercial partner missions

For ESA
- ERS-1/-2
- ENVISAT
- Sentinel-1 /-3
- Sentinel-5 Precursor

For scientific and commercial partners
- WorldView-2/-3
- RADARSAT-2
- IRS-1C/-1D, IRS-P3, Cartosat-1 (IRS-P5), Resourcesat-1 (IRS-P6), Resourcesat-2
Data Volume in Petabytes Archived in the German Satellite Data Archive D-SDA

DFD Oberpfaffenhofen and Neustrelitz

TODAY

Status November 2018
Parameter for „Global Change“- Research

Global Snowpack
(18 years daily snow cover)

Global Waterpack
(16 years of inland water dynamics)

Global Net Primary Productivity
(14 years)


Global Urban Footprint (2012)

Global TimeScan- Landsat
(Temporal indices 1990-2015)
World Settlement Footprint (WSF) – Next Generation of GUF 2012

• Use of free and open data

• Multi-source (Sentinel-1, Landsat/Sentinel-2)
• Multi-date (use of all scenes acquired)
• Multi-facility (DLR, HPC-IT4I, GEE)
• AI / machine learning

Product portfolio

• WSF 2015 (10m, binary mask)
• WSF 2015 Density (30m, imperviousness)
• WSF 2015 Network (settlement pattern)
• WSF Evolution (30m, 1984-2018)
• WSF/GUF 3D (average building volume, number of floors)
WSF Evolution
Big Data for 4D Global Urban Mapping – $10^{16}$ Bytes from Social Media to EO Satellites
Building Function Classification from Street View Data by CNN

High-resolution remote sensing image → Building instance footprints from GIS map → Geotagged street view images → Outliers removal and classification by ConvNet (CNN) → Building instance classification map

Munich
TEP Urban

• „ready to use“ – data for users

• Automated statistics, e.g. SDG 11.3.1 – Indicator for settlement growth vs. Population growth

• >500 registered institutions
• ~600 analysis / month from users (>730,000 portal visits in total)
Thank you for your attention.

Prof. Dr. Hansjörg Dittus