Big Data from Space – Turning Earth Observation Data into Insights

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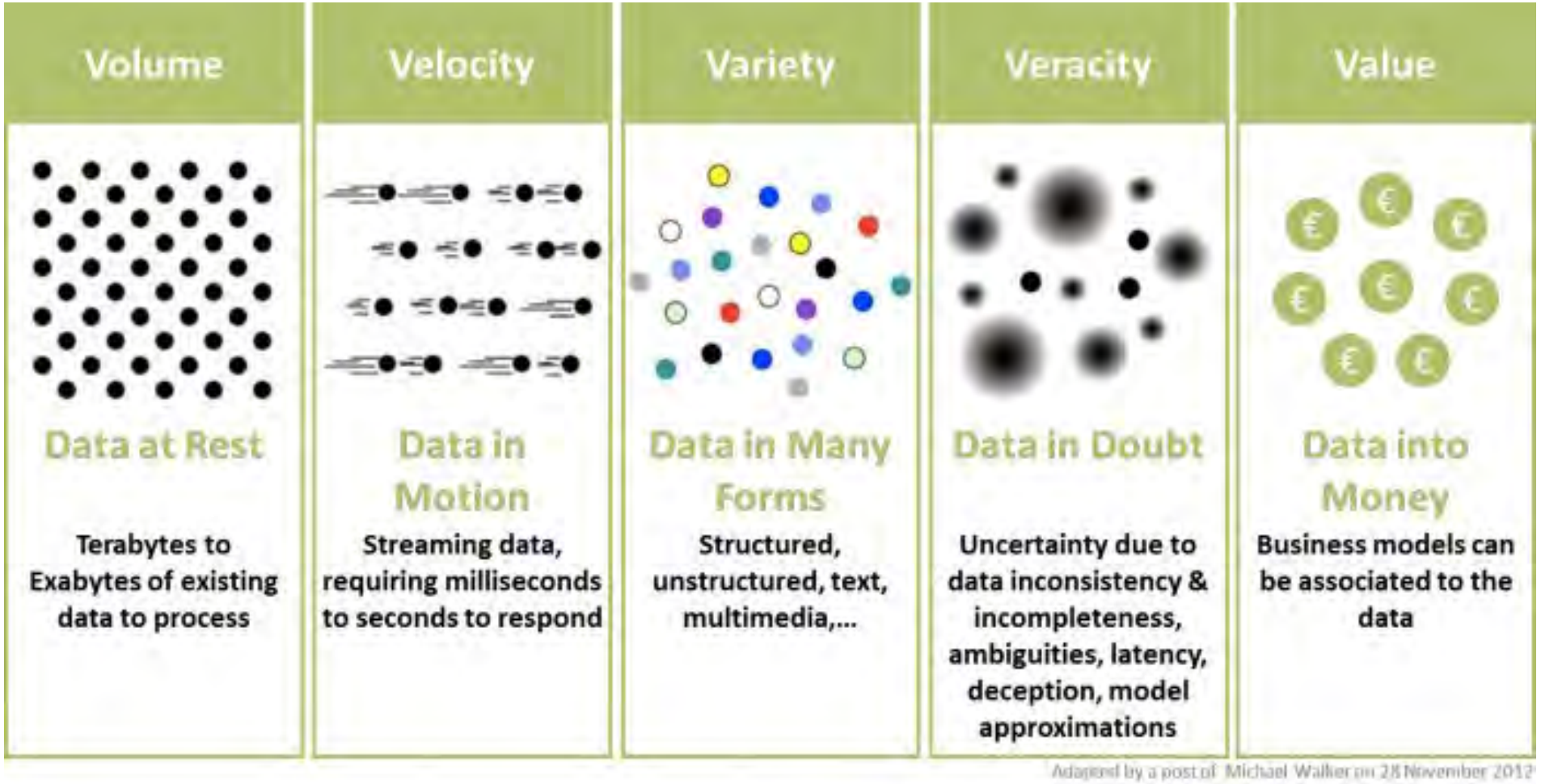
Big Data — The 5 Vs

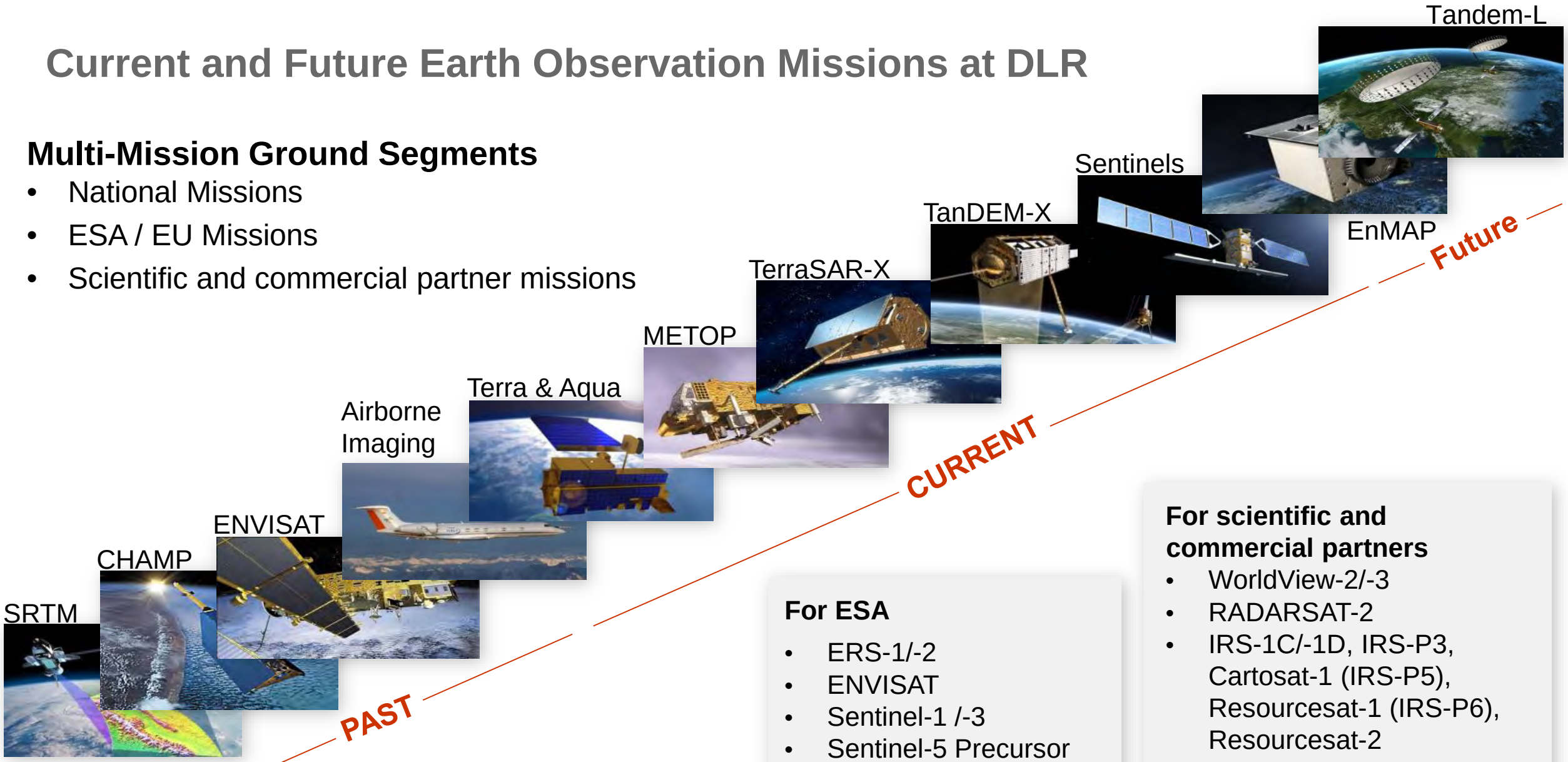


Source: https://www.kdnuggets.com/2017/n19.html

Current and Future Earth Observation Missions at DLR

Multi-Mission Ground Segments

- National Missions
- ESA / EU Missions
- Scientific and commercial partner missions



For ESA

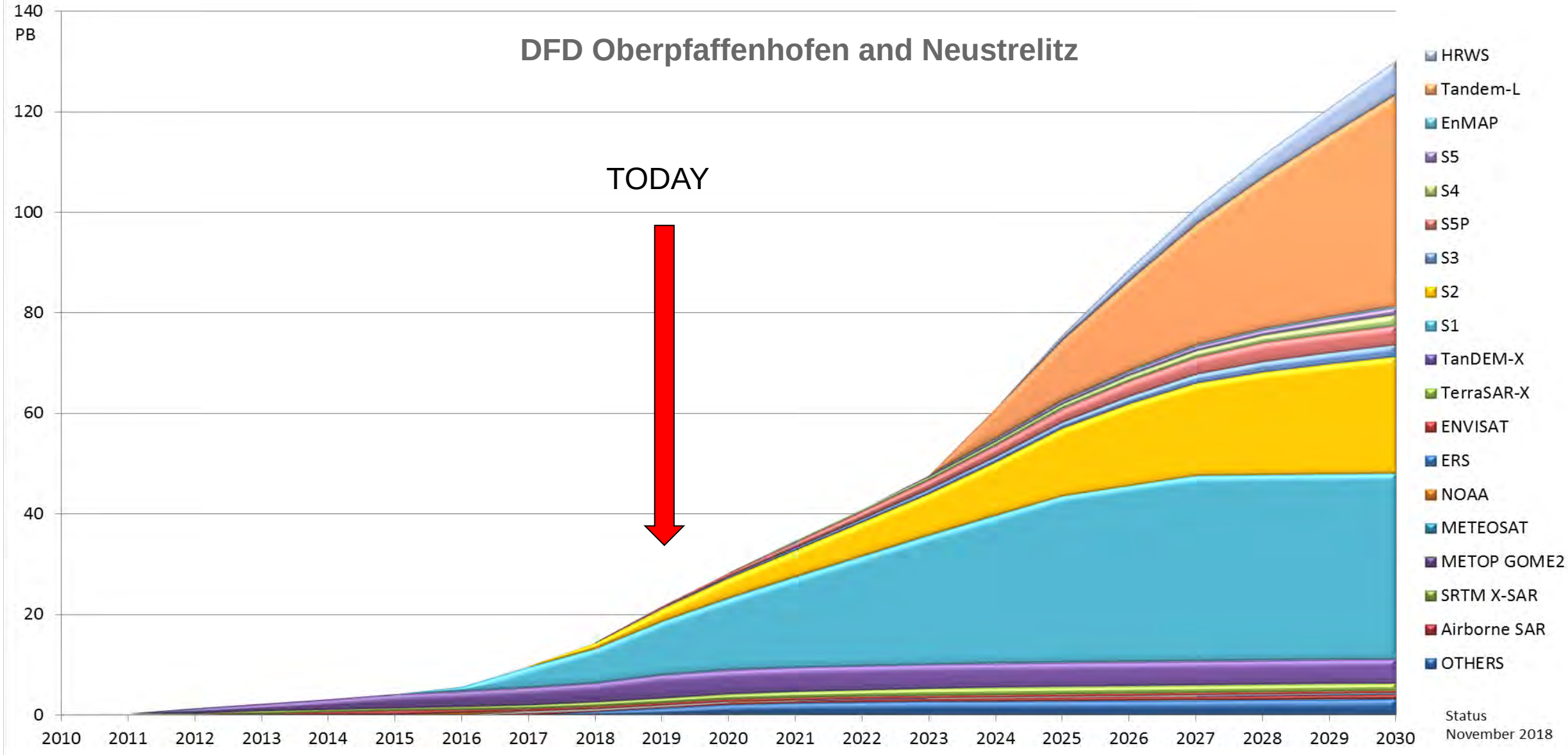
- ERS-1/-2
- ENVISAT
- Sentinel-1 /-3
- Sentinel-5 Precursor

For scientific and commercial partners

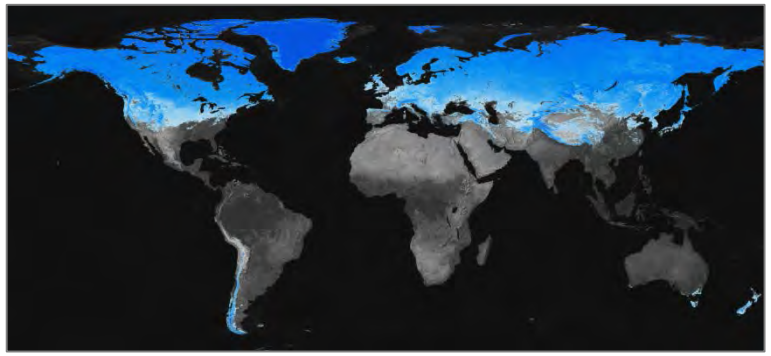
- WorldView-2/-3
- RADARSAT-2
- IRS-1C/-1D, IRS-P3, Cartosat-1 (IRS-P5), Resourcesat-1 (IRS-P6), Resourcesat-2

DLR

Data Volume in Petabytes Archived in the German Satellite Data Archive D-SDA

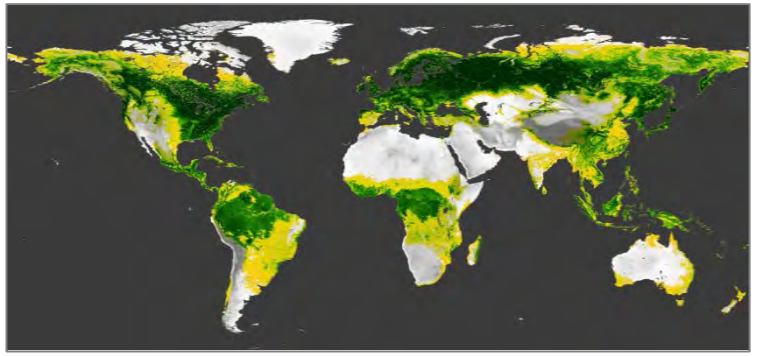


Parameter for „Global Change“- Research

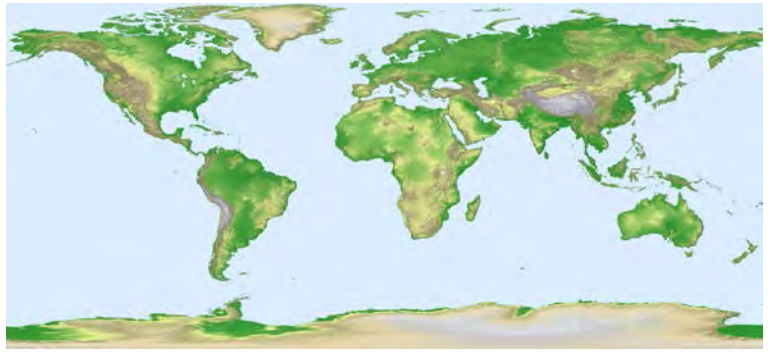


Global Snowpack
(18 years daily snow cover)

Global Waterpack
(16 years of inland water dynamics)

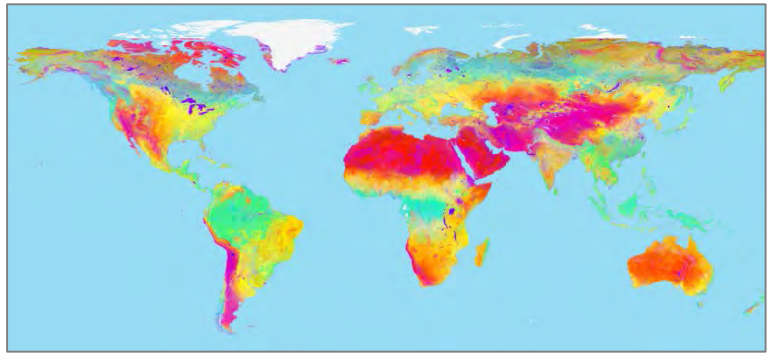


Global Net Primary Productivity
(14 years)



TanDEM-X Digtal Elevation
Modell (2015)

Global Urban Footprint (2012)



Global TimeScan- Landsat
(Temporal indices 1990-2015)

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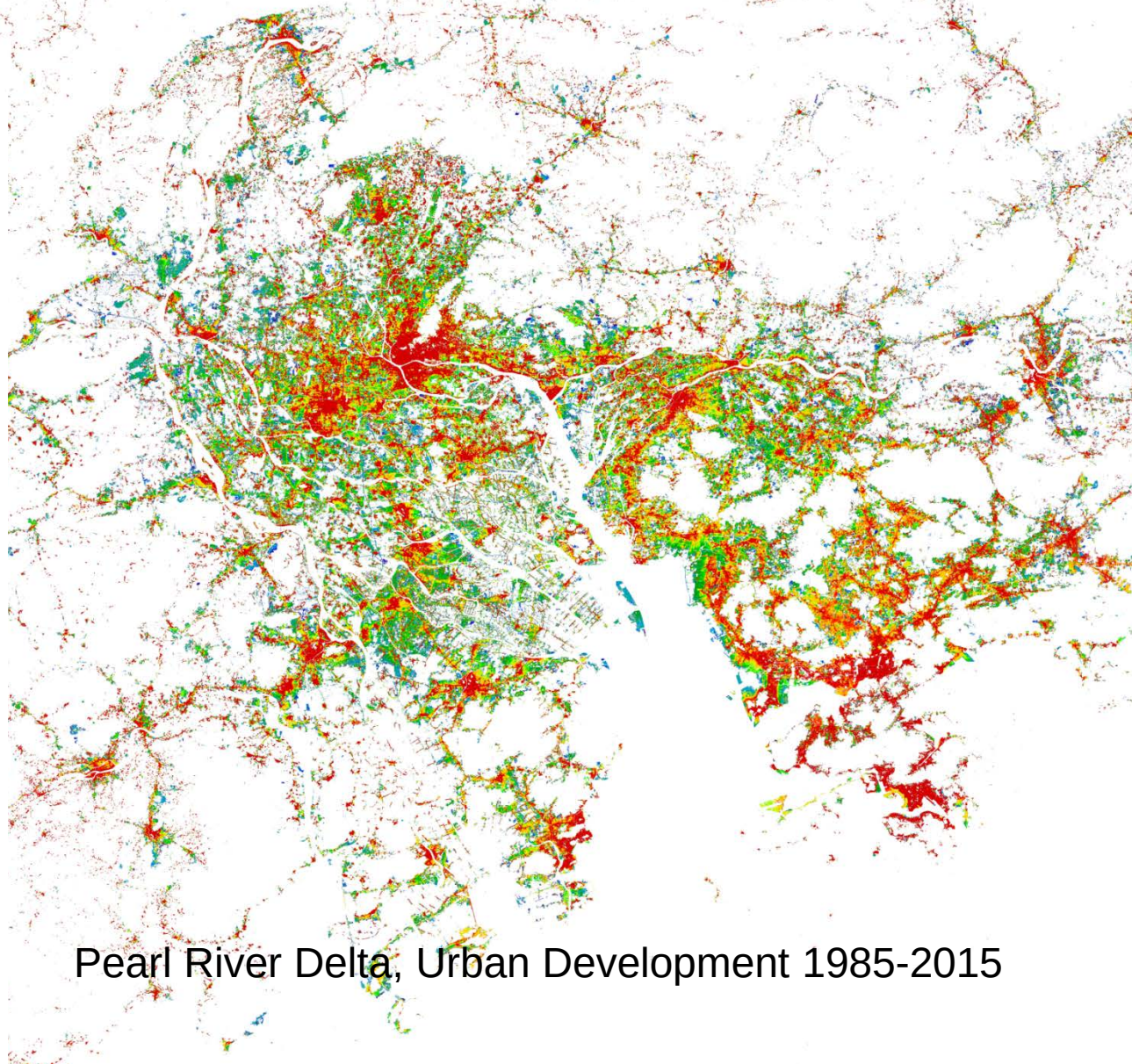
World Settlement Footprint (WSF) – Next Generation of GUF 2012

- 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)



Pearl River Delta, Urban Development 1985-2015


Shanghai
1985
WSF Evolution


Shanghai
1990
WSF Evolution

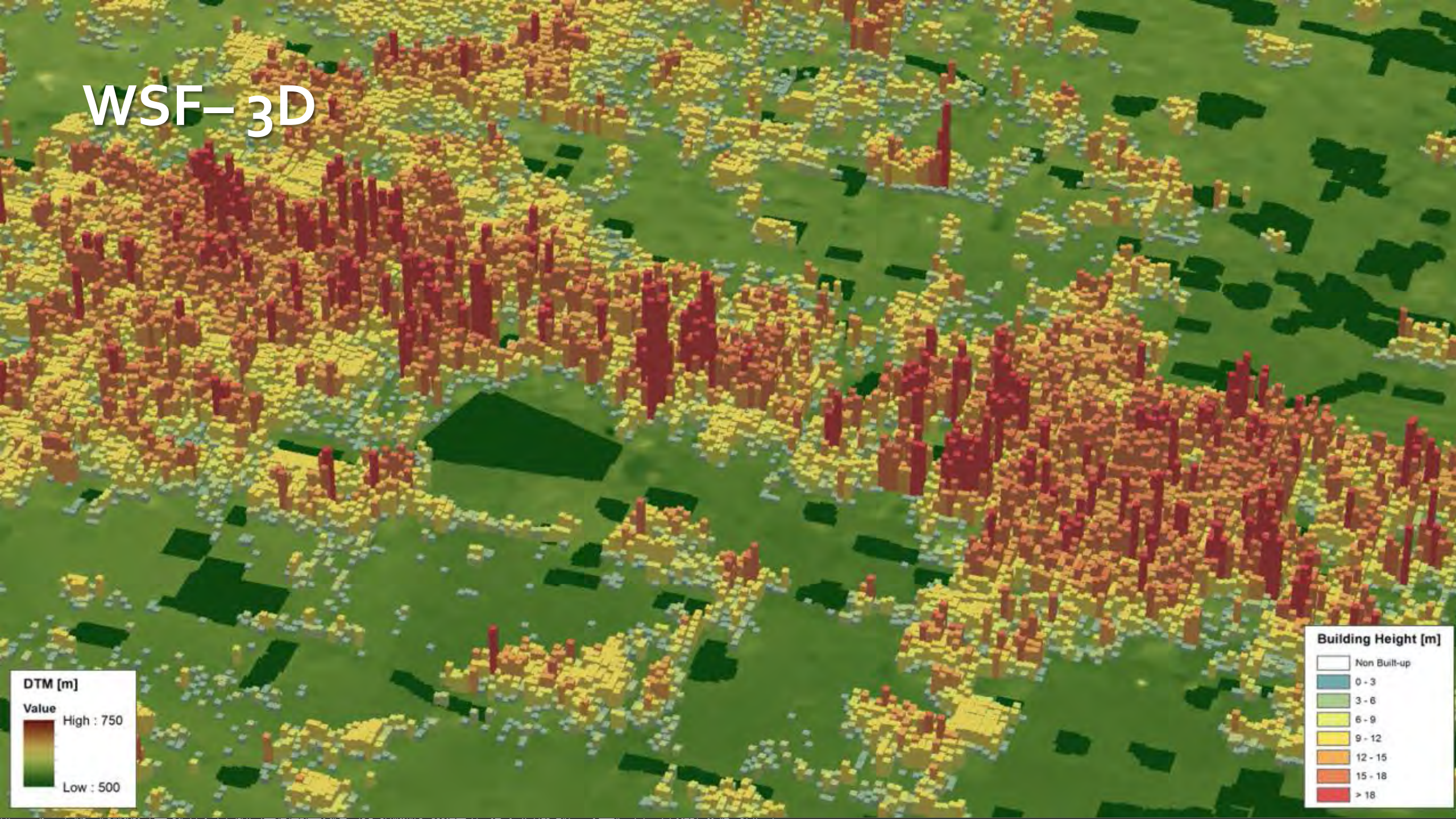

Shanghai
1995
WSF Evolution


Shanghai
2000
WSF Evolution

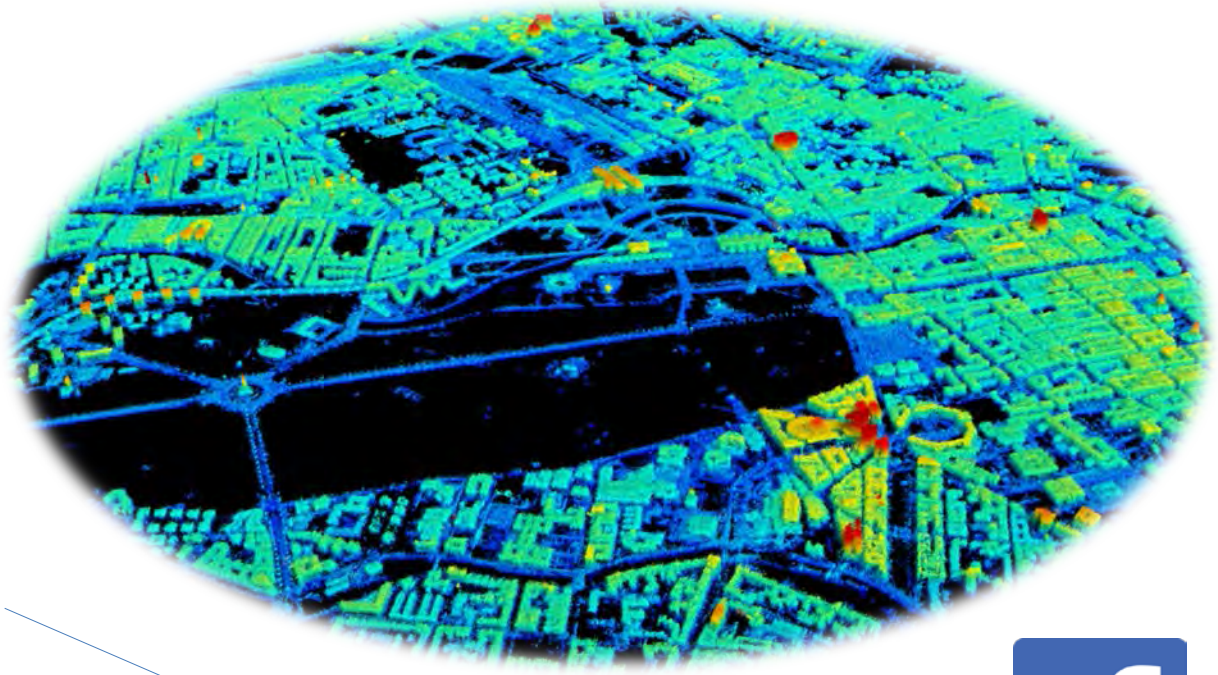

Shanghai
2005
WSF Evolution


Shanghai
2010
WSF Evolution

WSF– 3D


DTM [m]
Value
High : 750
Low : 500
Building Height [m]
Non Built-up
0 - 3
3 - 6
6 - 9
9 - 12
12 - 15
15 - 18
> 18

Big Data for 4D Global Urban Mapping – 10^{16} Bytes from Social Media to EO Satellites



Google

flickr

DLR

erc

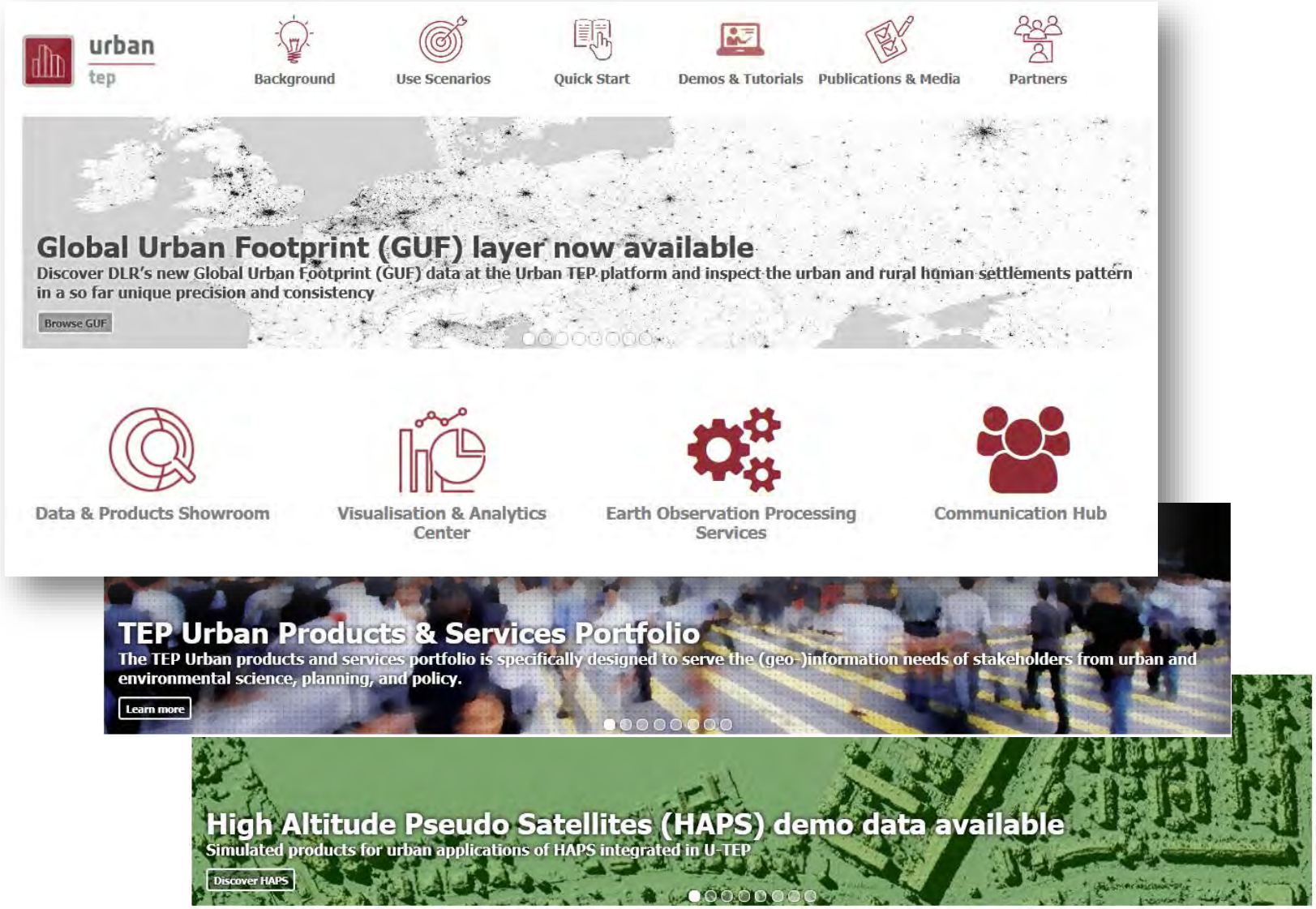
Building Function Classification from Street View Data by CNN

apartment
church
garage
house
industrial
office building
retail
roof

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)



TanDEM-X Elevation Modell

Thank you for your attention.

Prof. Dr. Hansjörg Dittus