

# Big Data from Space – Turning Earth Observation Data into Insights

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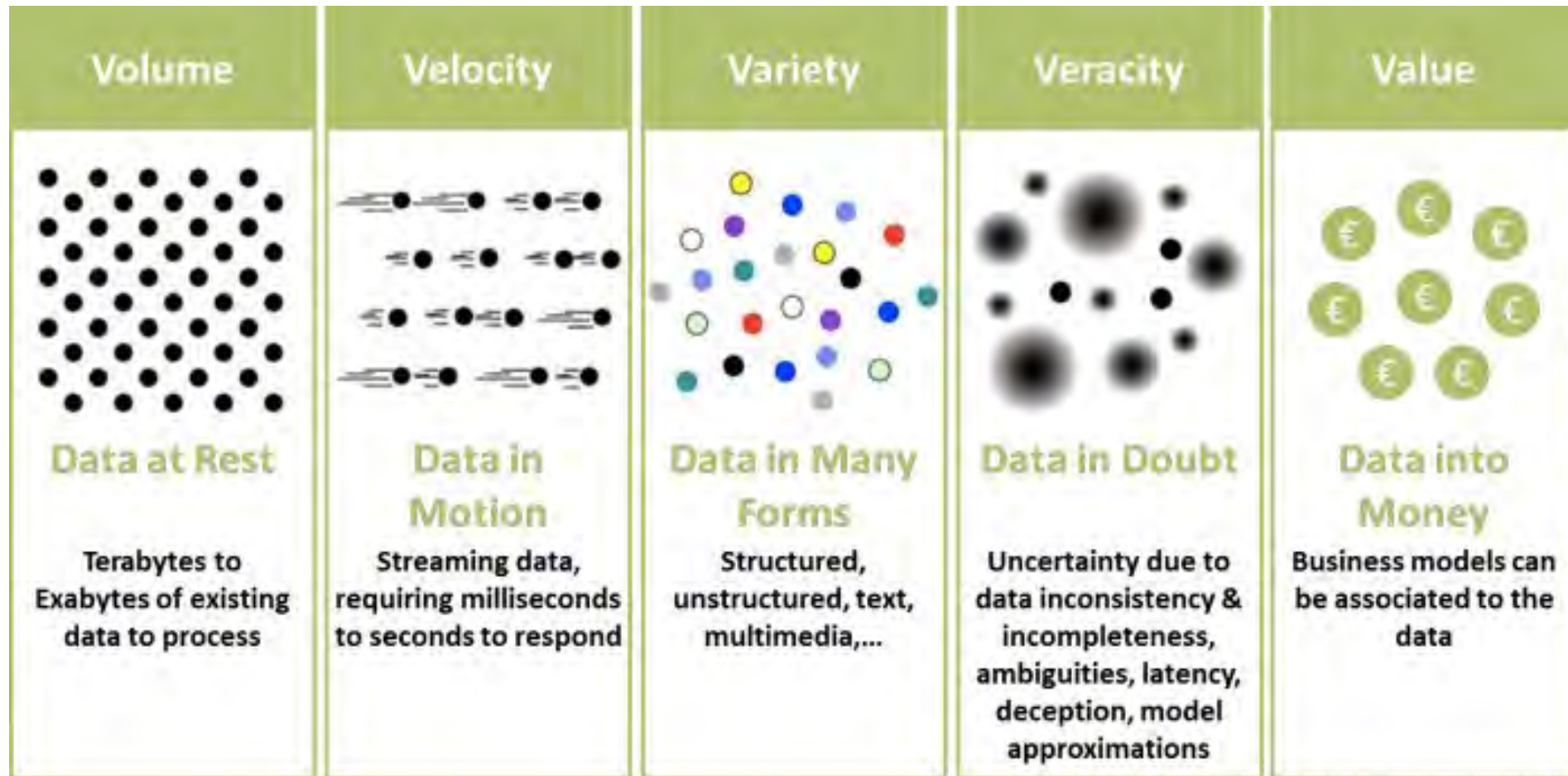
BiDS 2019 (19.02.2019)



Knowledge for Tomorrow



# Big Data — The 5 Vs



Adapted by a post of Michael Walker on 28 November 2012

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

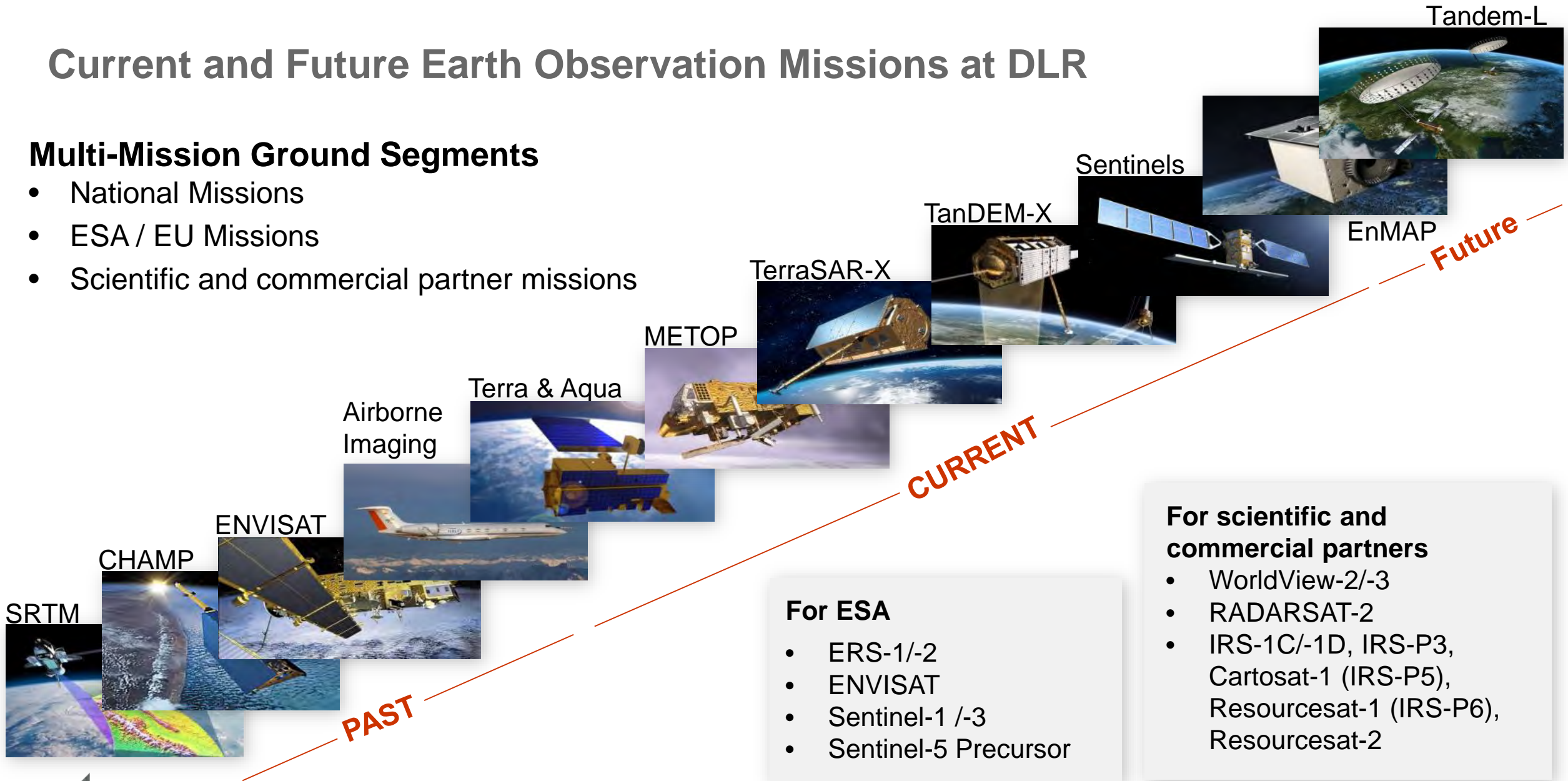




# Current and Future Earth Observation Missions at DLR

## 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

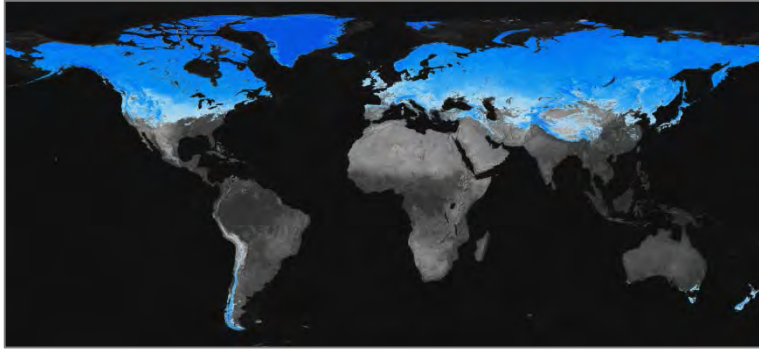
### For scientific and commercial partners

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





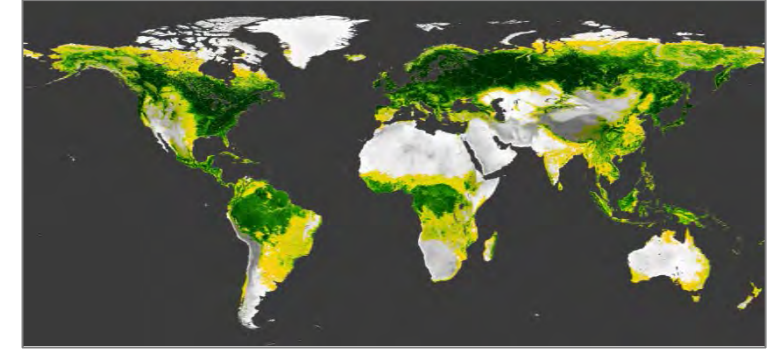
# Parameter for „Global Change“- Research



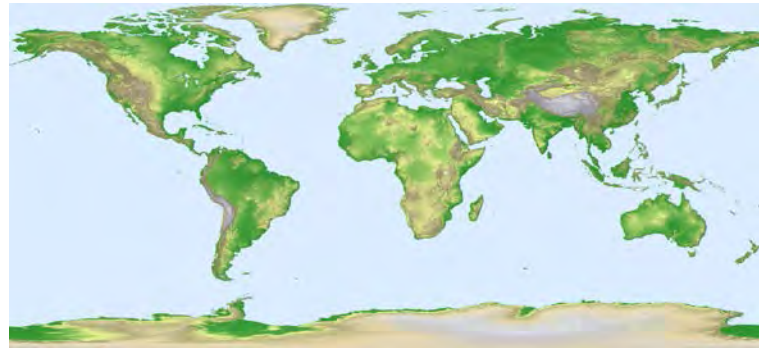
Global Snowpack  
(18 years daily snow cover)



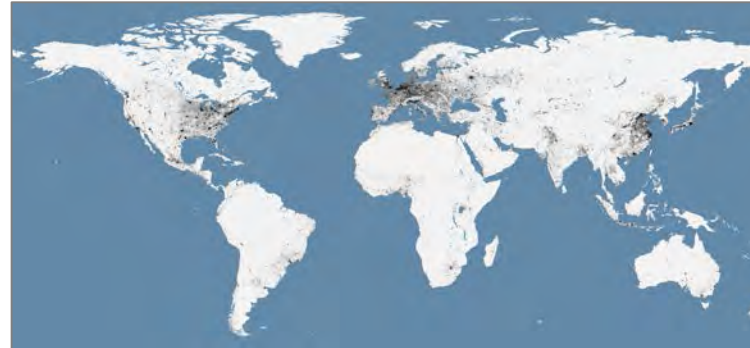
Global Waterpack  
(16 years of inland water dynamics)



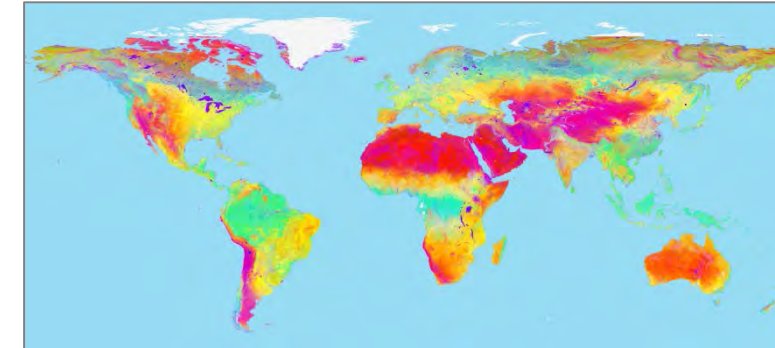
Global Net Primary Productivity  
(14 years)



TanDEM-X Digital Elevation  
Modell (2015)



Global Urban Footprint (2012)



Global TimeScan- Landsat  
(Temporal indices 1990-2015)



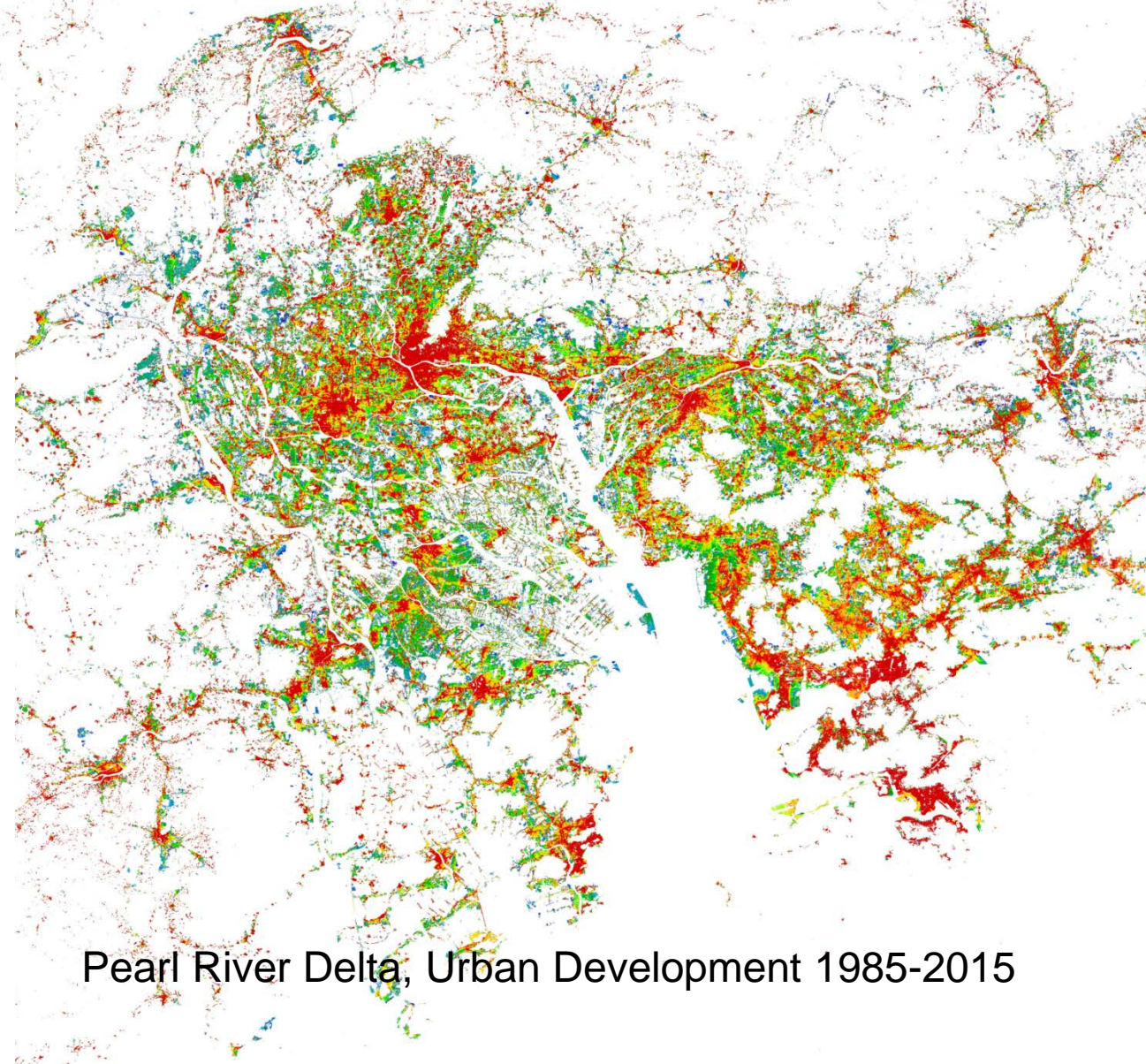


# World Settlement Footprint (WSF) – Next Generation of GUF 2012

- 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

Shanghai

1990



WSF Evolution





Shanghai

1995

WFC Evolution





Shanghai

2000

WSF Evolution





Shanghai

2005

WSF Evolution





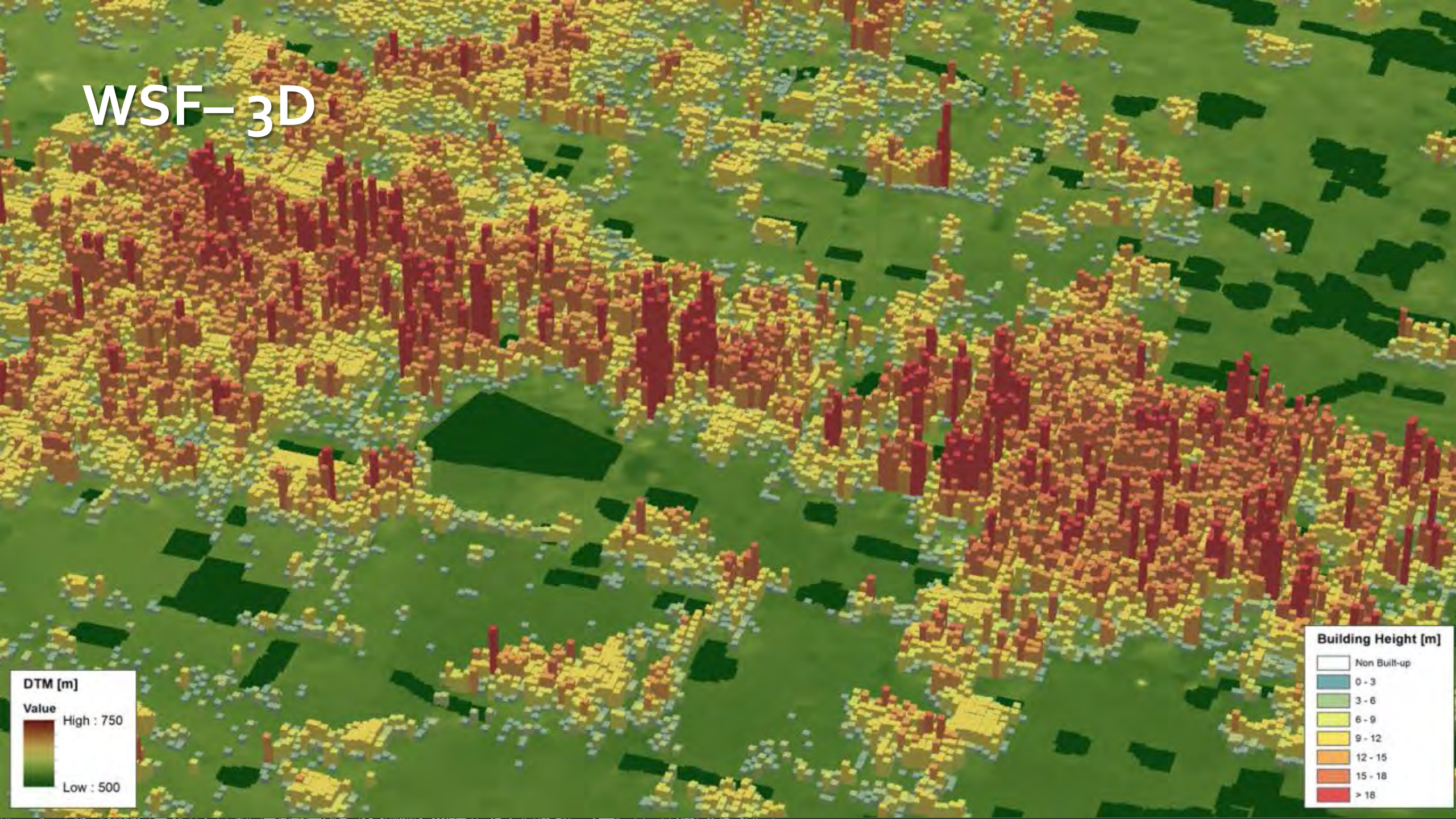
Shanghai

2010

WSF Evolution



# WSF-3D

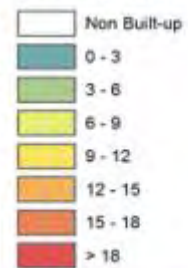


DTM [m]

Value



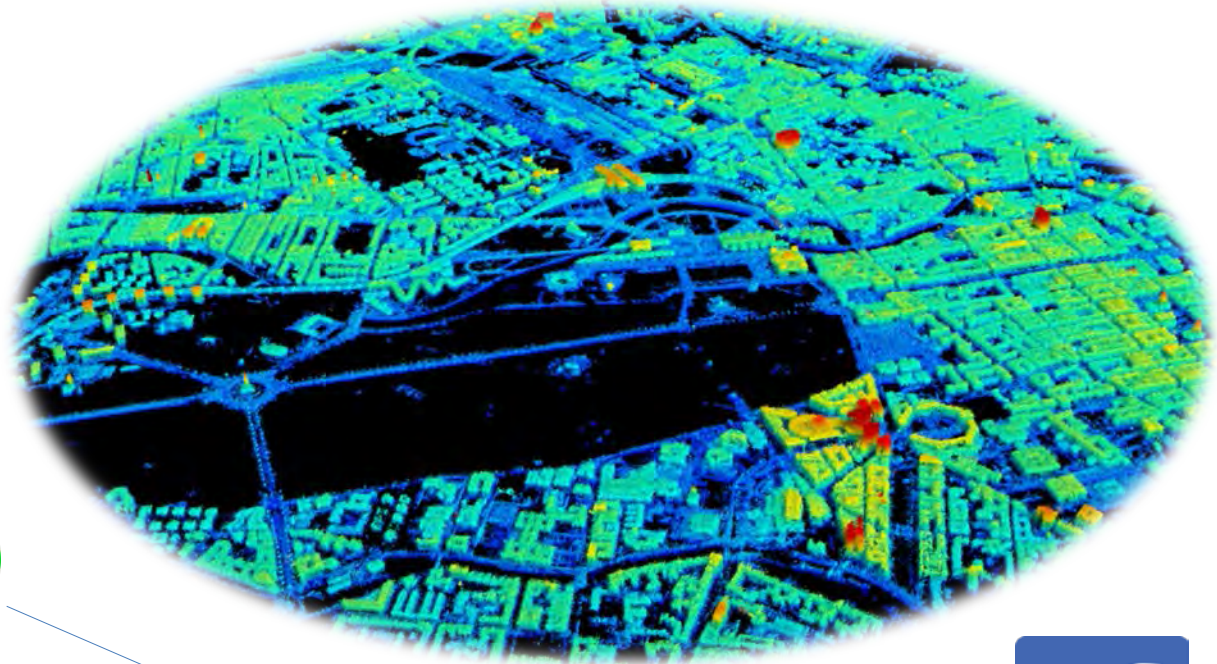
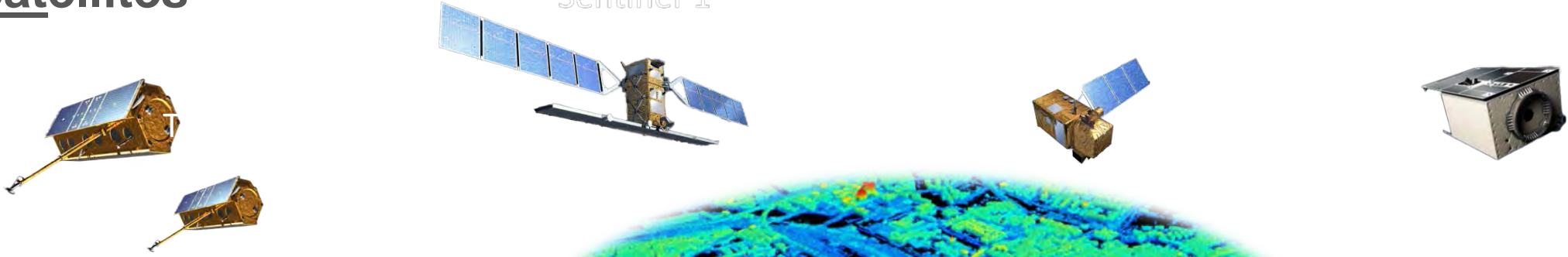
Building Height [m]





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

Sentinel-1





# 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)

The screenshot shows the top section of the TEP Urban website. On the left is the logo, which consists of a red square with a white bar chart icon and the text 'urban tep' below it. To the right of the logo is a horizontal navigation bar with six items, each with a red icon and a label: 'Background' (lightbulb icon), 'Use Scenarios' (target icon), 'Quick Start' (hand pointing to a document icon), 'Demos & Tutorials' (laptop icon), 'Publications & Media' (document with pencil icon), and 'Partners' (group of people icon). Below the navigation bar is a large banner image showing a satellite view of urban footprints. Overlaid on this image is the text: 'Global Urban Footprint (GUF) layer now available' in bold, followed by 'Discover DLR's new Global Urban Footprint (GUF) data at the Urban TEP platform and inspect the urban and rural human settlements pattern in a so far unique precision and consistency'. A 'Browse GUF' button is located at the bottom left of the banner. Below the banner is a row of four service categories, each with a red icon and a label: 'Data & Products Showroom' (magnifying glass icon), 'Visualisation & Analytics Center' (bar chart and pie chart icon), 'Earth Observation Processing Services' (gears icon), and 'Communication Hub' (group of people icon).

This banner features a background image of a busy city street with many pedestrians. The text reads: 'TEP Urban Products & Services Portfolio' in bold, followed by 'The TEP Urban products and services portfolio is specifically designed to serve the (geo-)information needs of stakeholders from urban and environmental science, planning, and policy.' A 'Learn more' button is positioned at the bottom left of the banner.

This banner has a background image of a green, textured satellite-like view of a city. The text reads: 'High Altitude Pseudo Satellites (HAPS) demo data available' in bold, followed by 'Simulated products for urban applications of HAPS integrated in U-TEP'. A 'Discover HAPS' button is located at the bottom left of the banner.



# TanDEM-X Elevation Modell



**Thank you for your attention.**

**Prof. Dr. Hansjörg Dittus**