National Report @ CEOS WGCV-30: GERMANY

Albrecht von Bargen, DLR Space Agency

Ilhabela, Brasil, May 26th, 2009

Deutsches Zentrum
DLR für Luft- und Raumfahrt e.V.

Introduction

- Two-fold Motivation to participate on CEOS-WGCV
  - Growing importance of activity coordination in international context
  - Growing spread of National Earth Observation programme

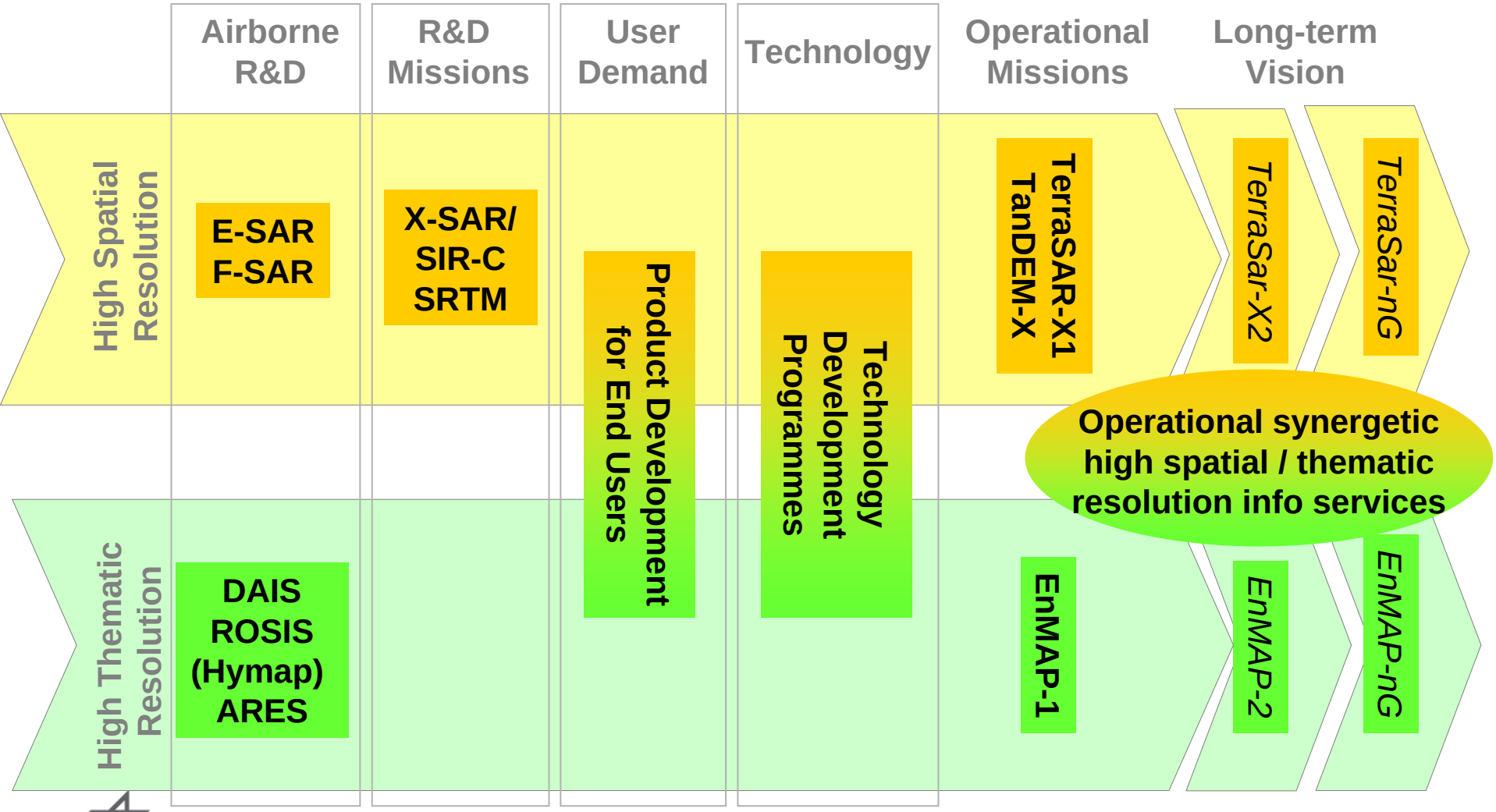
- Point of Contact for/to CEOS-WGCV
  Albrecht von Bargen, DLR Space Agency, Bonn

- Today: A brief view about the German National EO projects

Germany‘s Contribution to Earth Observation

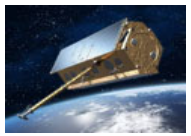
- Germany is currently the largest (financial) contributor to ESA’s EO programme.
- The national projects shall be understood as a complement/addition to
  - ESA’s EO projects
  - EUMETSAT projects
- Not only emphasis to two thematic lines (following slide), but also
- High involvement in other themes, e.g. climate, atmosphere, gravity etc.

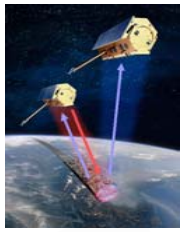
National Programme: Thematic Lines



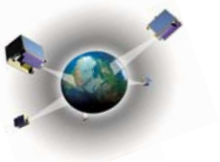
Earth Observation Missions (with German Contributions)

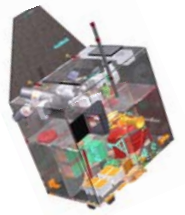
- **TerraSAR-X** — *Radar*
  - Launch Date: June 2007
- **TanDEM-X**
  - Launch Date: Oktober 2009
  - Tandem-Configuration mit TerraSAR-X





- **RapidEye** — *Multi- / Hyperspectral*
  - Launch Date: August 2008
- **EnMAP**
  - Start Phase C/D: November 2008
  - Launch Date: 2013
- **METimage**
  - Phase B until End of 2010
  - National Contribution for Post-EPS (ab 2018)

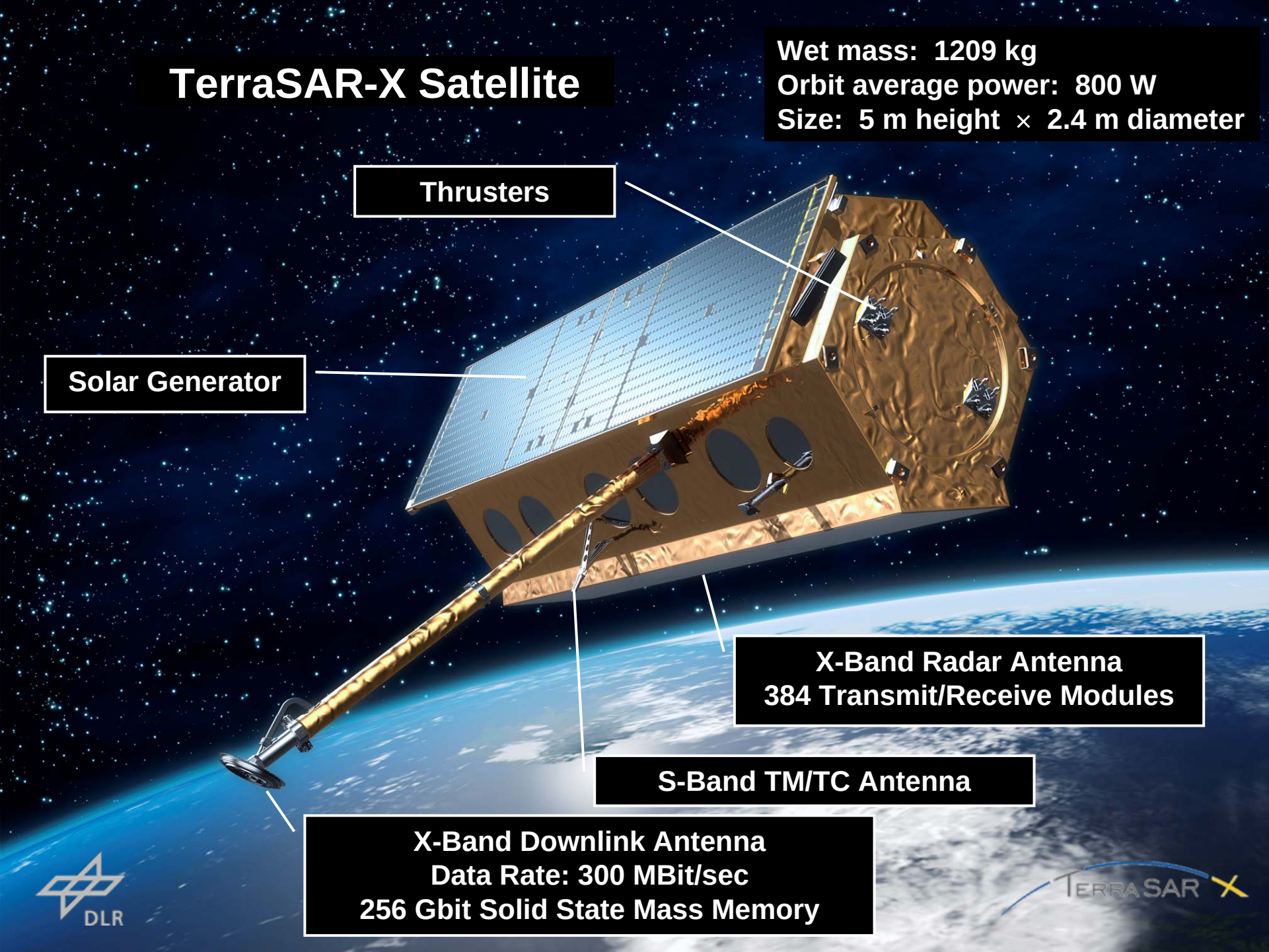




- **SCIAMACHY**, **CHAMP**, **GRACE**
  - Since 2002 — *Atmosphere / Gravity*

TerraSAR-X Satellite

Wet mass: 1209 kg
Orbit average power: 800 W
Size: 5 m height × 2.4 m diameter



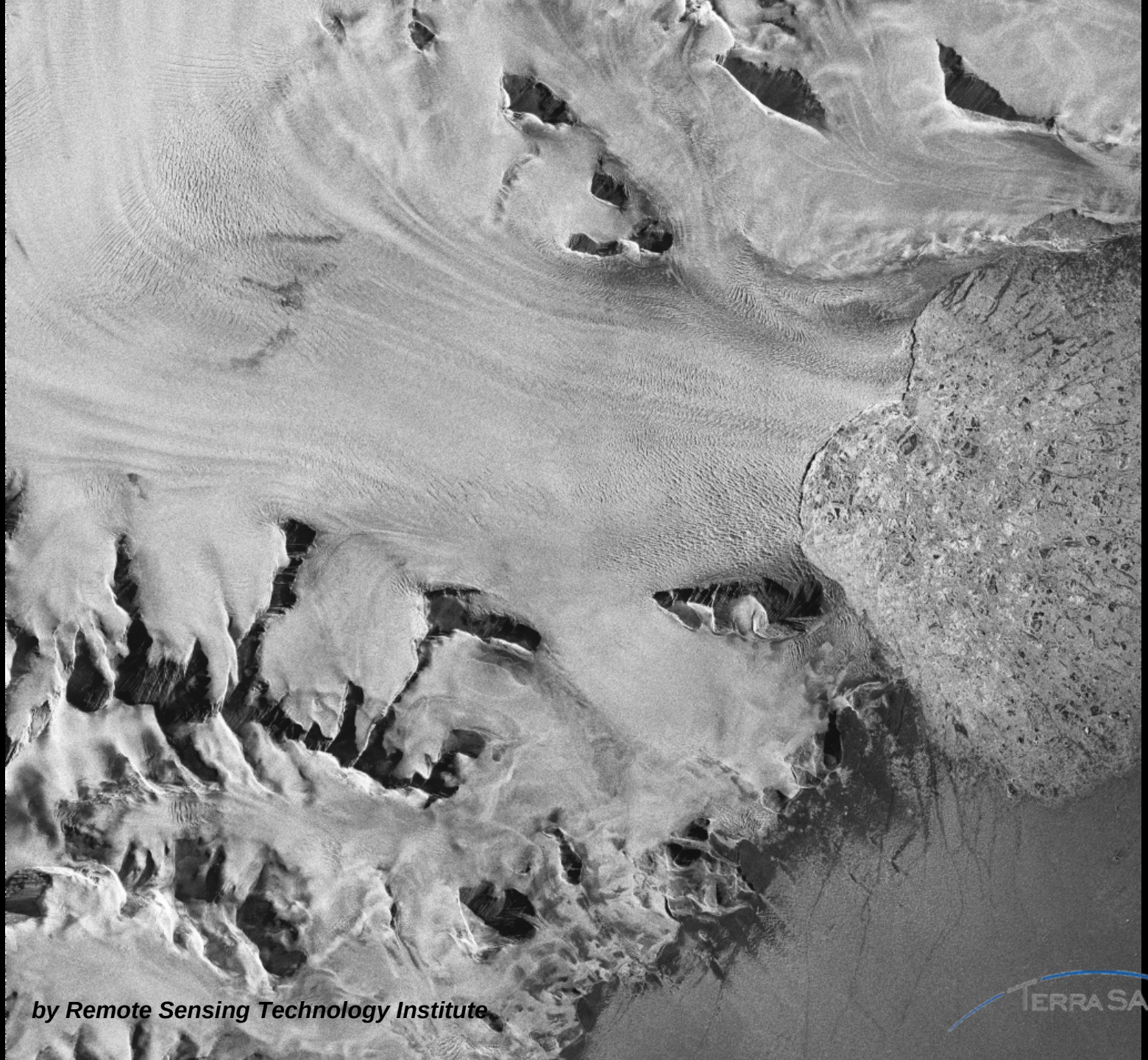
TerraSAR-X Mission Status (1)

- **Spacecraft and ground segment are fully operational since January 7, 2008**
- Image products (Spotlight, Stripmap, ScanSAR) are calibrated and released.
- Product quality within initial specification or better!
- The usability of TerraSAR-X data was demonstrated for geo-scientific applications, oceanography, disaster monitoring, etc.

TerraSAR-X Mission Status (2)

- **Extremely stable and satisfying performance parameters:**
  - radiometric stability: 0.14 dB over 1 year (!)
  - *absolute* radiometric accuracy: 0.6 dB
  - pixel location accuracy: 0.3 m in range / 0.53 m in azimuth
- **TOPS mode was demonstrated, implementation is pending**
- **Dual Receive Mode (DRA) implementation is underway**
  - Quadpol and along-track-interferometry were demonstrated
- **Ground Segment upgrade for TanDEM-X mission is underway**

Drygalski Glacier Oct 2007 – July 2008



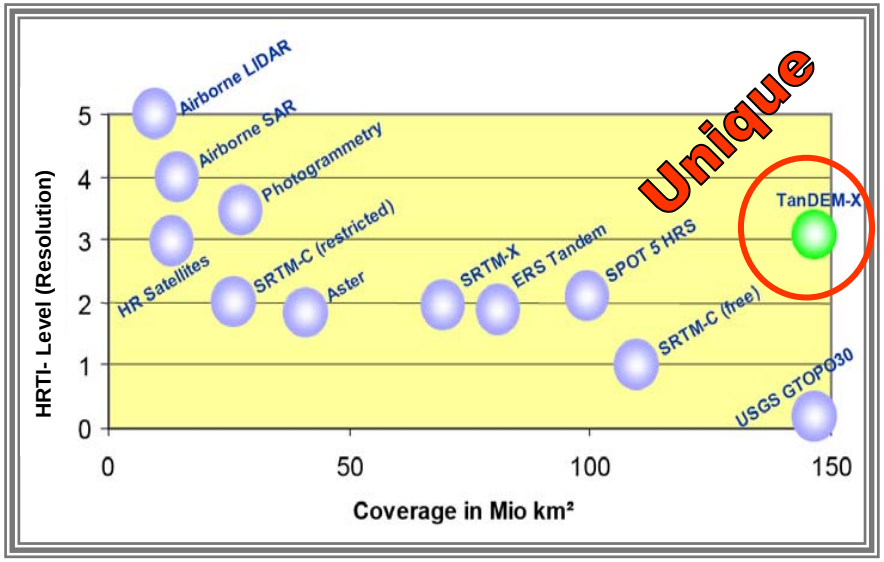
DLR

by Remote Sensing Technology Institute

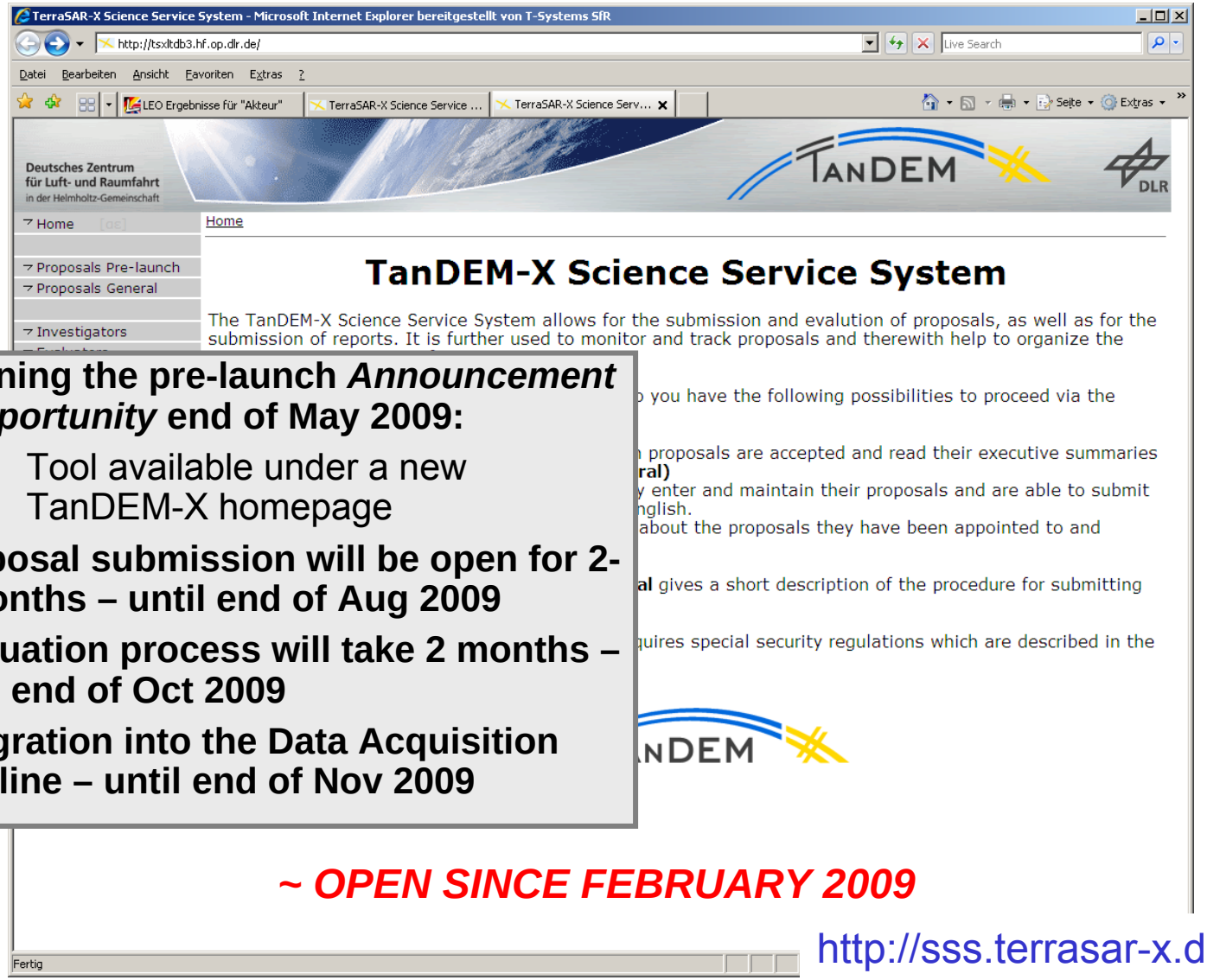
TERRA SAR X

TanDEM-X
TerraSAR-X Add-On for Digital Elevation Measurements

- First bi-static Radar-interferometer (formation fliying with TerraSAR-X)
- Mission goals:
  - Acquisition of global DEM according to HRTI-3 standard
  - Generation of local DEMS with HRTI-4 like quality
  - Demonstration of innovative bi-static techniques and applications
- TerraSar-X replica
  with some TanDEM-X adaptations
  5 years nominal life time
- New complex ground segment
  embedding TerraSAR-X
- Launch Date: October 2009



TanDEM-X Data Proposal Submission



- **Opening the pre-launch *Announcement of Oportunity* end of May 2009:**
  - Tool available under a new TanDEM-X homepage
- **Proposal submission will be open for 2-3 months – until end of Aug 2009**
- **Evaluation process will take 2 months – until end of Oct 2009**
- **Integration into the Data Acquisition timeline – until end of Nov 2009**

~ OPEN SINCE FEBRUARY 2009

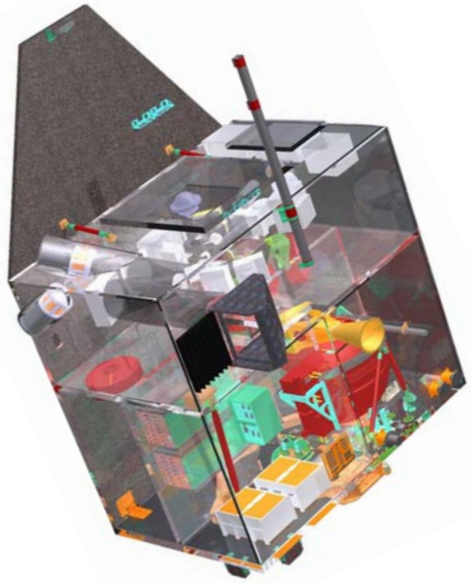
http://sss.terrasar-x.dlr.de/

Environmental Programme (I)

EnMAP Hyperspectral Imager

Mission Objectives

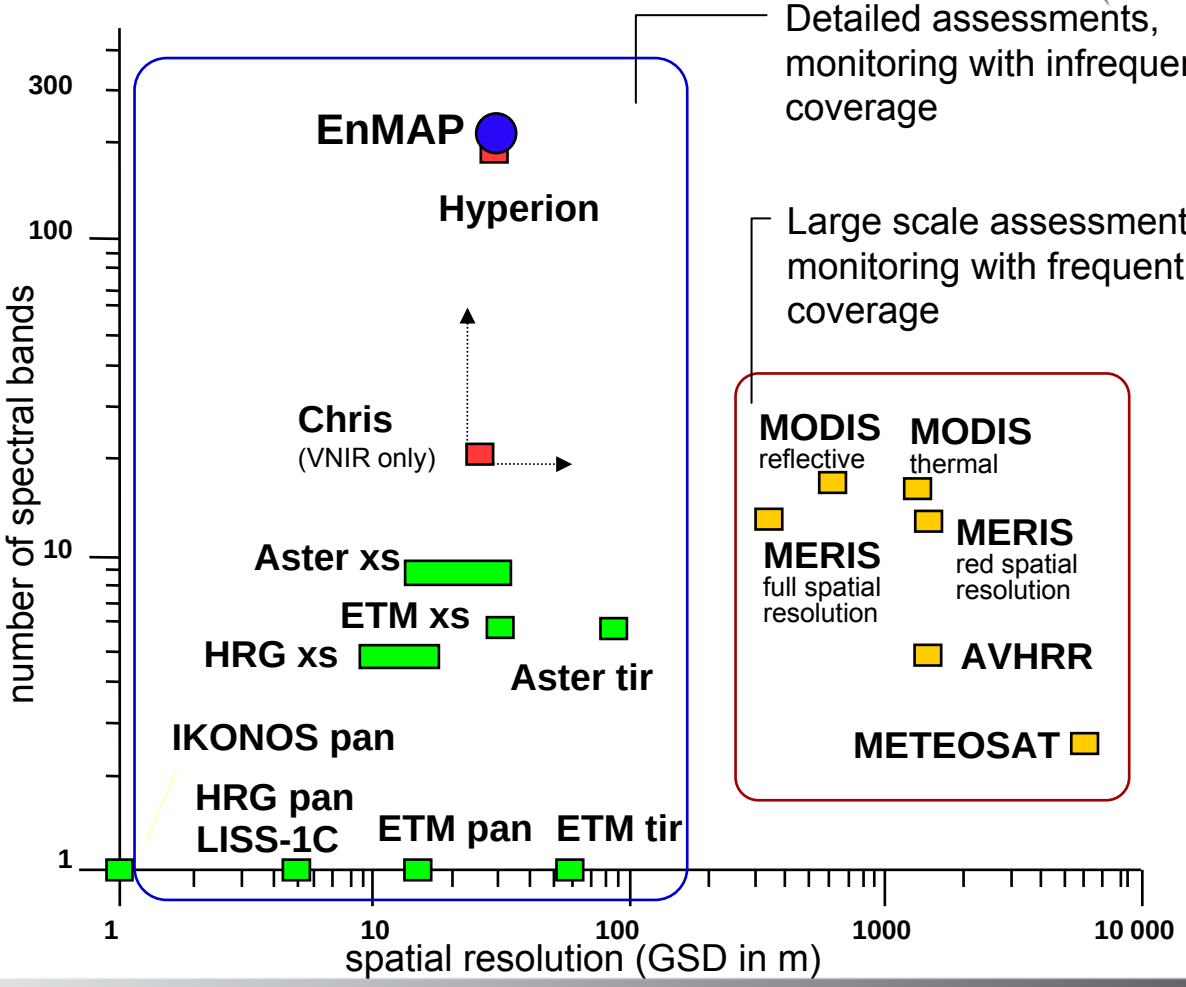
- To provide high-spectral resolution observations of bio-geochemical and geo-physical variables
- To observe and develop a wide range of ecosystem parameters encompassing agriculture, forestry, soil/geological environments and coastal zones/inland waters
- To enable the retrieval of presently undetectable, quantitative diagnostic parameters needed by the user community
- To provide high-quality calibrated data and data products to be used as inputs for improved modelling and understanding of processes in bio-sphere & geo-sphere



Environmental Programme (II)

EnMAP Hyperspectral Imager

SNR (VNIR)	500:1
SNR (SWIR)	150:1
Spectral range / nm	420-2450
Spectral sampling	6.5 / 10 nm
Spectral accuracy	< 0.5 / 1 nm
Spectral stability	< 0.5 nm
Radiometric acc.	< 5%
Radiometric stability	< 2.5 %
GSD	30 m
Swath width	30 km
Swath length	5000 km



Environmental Programme (III)

EnMAP Hyperspectral Imager

Current Status

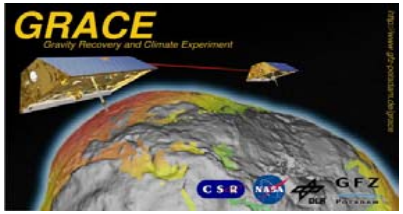
- Phase C/D started in November 2009
- Launch in 2013

The Gravity and Climate Change Observers in Space

SCIAMACHY

- Tri-national AO on ENVISAT
- Launch in 2002
- Trace gas measurements
- Nadir, Limb, and solar occultation looking

- Operational products @ ESA
- Currently several new products in the validation chain



GRACE

- NASA mission with German contributions
- Formation flying: Tom & Jerry
- Launch in 2002

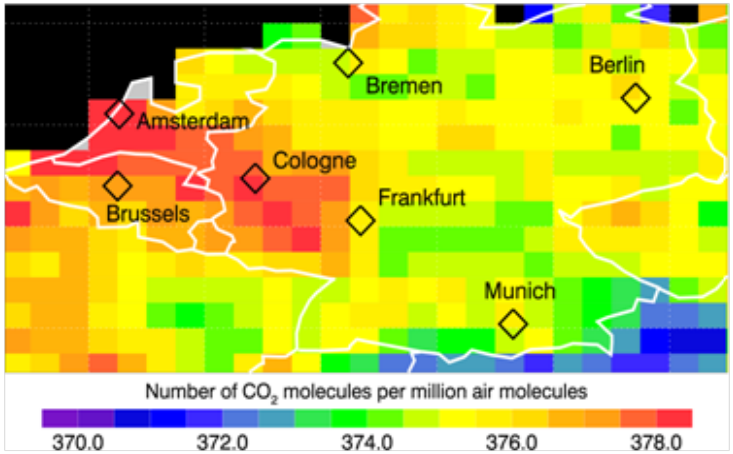
CHAMP

- Gravity mission
- Launch in 2000

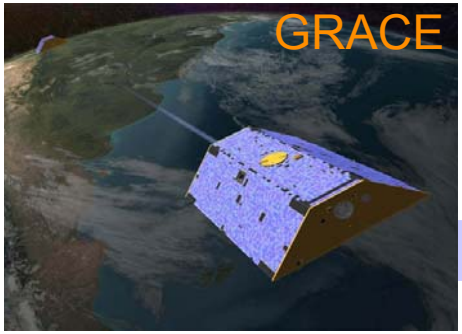
Global Change and Climate

→ Trace Gas O_3 …

e.g. CO_2 sources



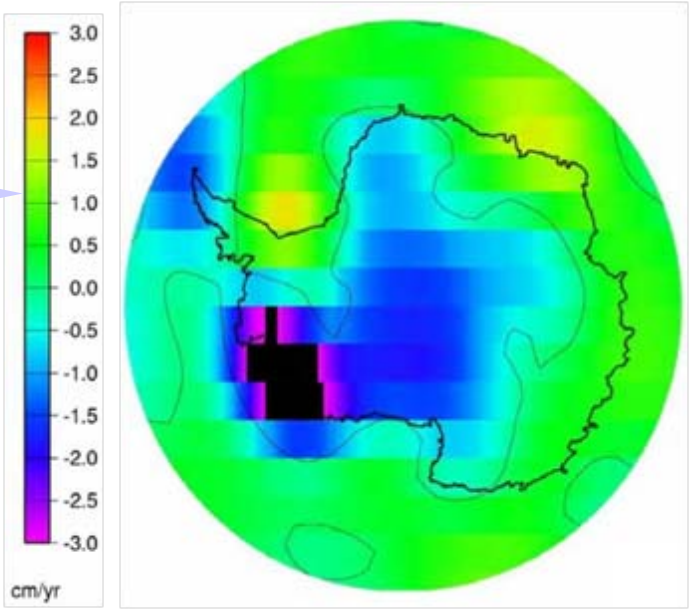
M. Buchwitz, University of Bremen

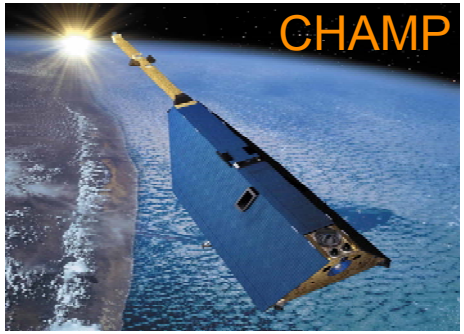


→ Mass movements scales the continents,

e.g. Antarctica

↗ Glacier melt
> 100 Gt per year





→ Mass distribution and earth magnetic field

↗ As lower the orbit as higher the accuracy

↗ Re-entry
≈ Beginning of 2010

B. Tapley, Center for Space Research, University of Austin

Resume

Germany‘s Earth Observation programme comprises

- Thematic lines to initiate synergetic operational services
- Strong contributions to ESA / EUMETSAT missions with AO instruments as SCIAMACHY or METImage supporting atmosphere and climate research
- Successful cooperation with other nations in specific missions (SCIAMACHY, GRACE)
- Stimulant for national commercial EO missions (RapidEye)
- Promotion of technologies for space applications
- An orientation on the user demand by supporting higher level applications

Acknowledgements

- TerraSar-X / TanDEM-X
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  H. Bovensmann, M. Buchwitz (both University of Bremen)
  A. Friker
- GRACE and CHAMP
  A. Friker

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