WorldDEM™
Reaching New Heights
WorldDEM™
Standardised Global DEM
TanDEM-X WorldDEM Mission

- **TanDEM Mission**
  - First configurable SAR interferometer in space
  - Bi-static operation: one of the two satellites emits radar signal, backscatter by both
  - Double-helix formation flying (DLR innovation): 200 meters distance between satellites – at a speed of 28,000 kilometers per hour

- **WorldDEM**
  - **3 years to cover entire globe** (specific time windows – otherwise standard imaging requests performed by both satellites)
  - **DTED/HRTI Level 3 (global)**
  - Consistent, seamless global coverage

- **Secondary Mission Goals**
  - HRTI Level 4 DEM acquisition (local)
  - Further scientific experiments

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**Nominal Data Acquisition 3 (+?) Years**

<table>
<thead>
<tr>
<th>Year</th>
<th>5 months</th>
<th>1 year</th>
<th>1 year</th>
<th>6 months</th>
<th>≥ 3 months</th>
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<td>2013</td>
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</tr>
<tr>
<td>2014</td>
<td></td>
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</table>

- **Commissioning Phase**
  - 1 global DEM acquisition with small baselines
  - 1 global DEM acquisition with larger baselines
  - DEM data takes for difficult terrain with different viewing geometry
  - Customized DEMs with large interferometric baselines
WorldDEM™ Global Coverage - Unprecedented Quality - Unique Accuracy

- **Coverage**
  A standardised DEM for any spot on Earth at the same quality

- **Quality**
  Allows you to close gaps in areas where no adequate DEM exists to date and extend to areas missing so far (cf. SRTM) with high accuracy

- **Accuracy**
  Improve the performance of today’s globally operating navigation systems and applications

- **Availability**
  Offers you easy and instant access to DSM basic due to an automatic order process and the global dataset being available, ensuring immediate delivery

The unique and unrivaled combination of **Coverage**, **Quality**, **Accuracy**, and **Availability**, setting a new standard in global elevation modeling.
What can the WorldDEM™ be used for?

- National and thematic mapping
- Air and surface based system navigation
- Airport landing approach mapping (ICAO)
- Air Traffic Management (ATM)
- Engineering and infrastructure design
- Flight planning in 3D and simulation
- Improved crisis intervention planning
- Insolation and surface runoff mapping
- Intelligent Transportation Systems (ITS)
- Management of oil and gas fields
- Mission planning
- Mobile telecommunications engineering
- Orthorectification of aerial or satellite imagery
- Modeling water flow or mass movement
- 3D visualisation
- Terrain and target analysis, line-of-sight analysis
Detailed and Precise Terrain Knowledge for Military Operations

WorldDEM™ is the perfect foundation layer for all intelligence data and products

- Aviation security
- Aircraft and cruise missile mission planning and navigation (low-altitude flight, line-of-sight analysis)
- Landing approach planning
- Training and simulation operations (flight simulation)
- Accurate geo-referenced base for “Intelligence Dossier”
- 3D picture of terrain
- Planning and assessment of operations in the field: threat evaluation, target detection and location, damage assessment
- Accurate and uniform geospatial reference data for headquarters and joint forces
Accurate Height Information for Topographic Mapping

WorldDEM™ provides standardised homogenous seamless large-area coverage

- Multi-scale mapping: topographic maps
- Orthorectification of any other imagery (VHR optical data)
- Maps as basis for prevention measures (e.g. flood modelling) or post-event activities (e.g. flood maps, damage assessment maps)
- Standardised quality control and validation on the basis of a consistent dataset like WorldDEM™
Worldwide Elevation Information for Geological Prospection

WorldDEM™ is a homogeneous global DEM for any location - no matter how remote or difficult

- Feasibility Studies
  - Scouting
- Exploration
  - Scouting
  - Input into geophysical processing / modelling
  - Orthorectification of multi-source geodata
  - Integration into topographic mapping
- Development
  - Airport planning (terrain, flight approaches)
  - Infrastructure planning
    - Roads, supply units, accommodation
    - Pipelines
    - Oil- and gas processing facilities
- Preparation of seismic measurements
WorldDEM™ - Reaching New Heights

- First worldwide available DEM product at HRTE3 level
- Homogeneous, seamless DEM covering the entire Earth’s land mass (150 Mio km² pole-to-pole)
  - Data acquisition within 3 years only (one unique source)
  - Acquired by TerraSAR-X and TanDEM-X flying in a very close and precise formation
  - Based on radar interferometric technology
- WorldDEM™ will be available commercially from 2014
- WorldDEM™ will be part of the GEO Elevation product suite
WorldDEM™ DSM basic

Digital Surface Model includes heights of all objects (natural and man-made)

Editing steps and rules:

- Removal of radar-typical artefacts (single pixel: “spikes” and “wells”)
- Interpolation of small voids (smaller or equal 8 pixels)
WorldDEM™ DSM hydro

Digital Surface Model includes heights of all objects (natural and man-made)

Extraction of water body features derived from radar image

Editing steps and rules:

- Lakes & reservoirs are set to a single elevation
  - Water bodies: width: >50m, length: >150m

- Rivers & canals are flattened with monotonic flow
  - Water bodies: width: >50m, length: >300m

- Ocean elevation is set to 0m

- Coastal infrastructure features and bridges are removed

Sample figure: Elevation10 DSM hydro
WorldDEM™ DTM

Digital Terrain Model represents bare earth

Editing steps and rules:
Based on radar image and DSM hydro
- Trees & forests are removed
- Man-made objects (e.g. buildings) are removed

Procedure: measurement of object’s height
- Detailed terrain information
- Revealing small-scale terrain structures covered by vegetation
## WorldDEM™ Specifications

<table>
<thead>
<tr>
<th>Products</th>
<th>DSM basic, DSM hydro, DTM</th>
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<tr>
<td><strong>Vertical Accuracy</strong></td>
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<tr>
<td>Abs.</td>
<td>&lt;10m (LE90)</td>
</tr>
<tr>
<td>Rel.</td>
<td>&lt;2m (slope ≤20%) (LE90)</td>
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<td>&lt;4m (slope &gt;20%) (LE90)</td>
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<tr>
<td><strong>Horizontal Accuracy</strong></td>
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<tr>
<td>Abs.</td>
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<td>Vertical reference datum: EGM2008</td>
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<td>Data Acquisition Mask, Interpolation Mask, Filling Mask, Editing Mask, Water Body Mask</td>
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<td>Amplitude Mosaic Image</td>
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</table>
Visual assessment - Minnesota

SRTM 3"
SRTM 1"
TanDEM-X 0.4"

TanDEM-X DEM processed by DLR

TanDEM-X SAR amplitude
Statistical assessment vs. LiDAR - Minnesota

TanDEM-X „urban“

- 273.65m
- 287.19m

LiDAR DSM „urban“

- 274.42m
- 288.29m

TanDEM-X DEM processed by DLR

WorldDEM is extremely precise - Building structure is clearly visible
WorldDEM™
Product Availability
WorldDEM™ Product Availability

Availability of:
- Sample Data
- Final Product

Data Acquisition

- Second coverage completed
- WorldDEM™ sample data
- Commercial launch of WorldDEM™ products
- Third and fourth coverage
Gracias por su atención