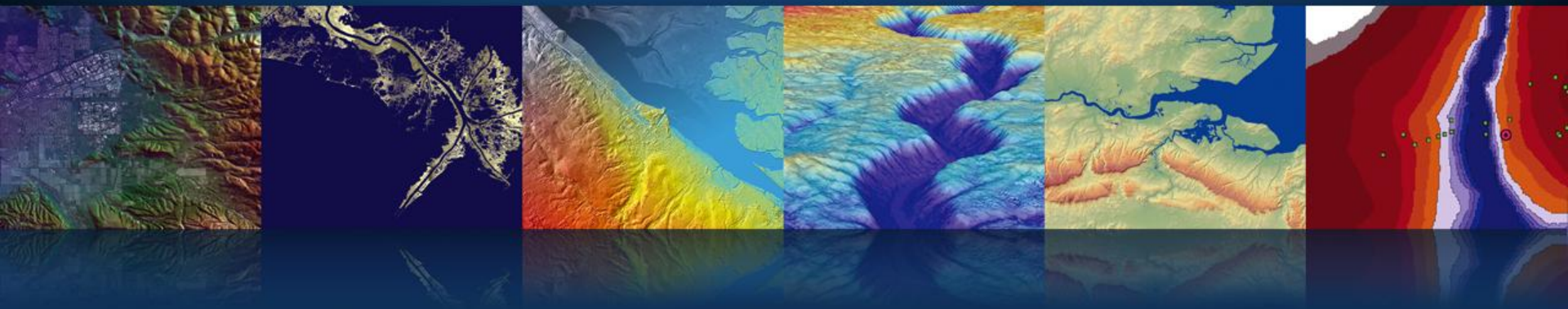
INTERMAP



Increasing the reliability of flood risk modeling by using adequate elevation data and topography

ICLR Toronto

February 2012

www.Intermap.com

Agenda

- Few words about Intermap and IFSAR
- Motivation ? Why do we need to understand better ?
- How and where elevation information can play a significant role in risk management
- Different views on the way how information and models can be accessed
- Conclusions

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Company History

- Intermap was founded in 1997 by a team of radar engineers and scientists
- Since then, we've consistently been recognized as a leading provider of 3D terrain solutions
- We are the world's first organization to collect, process, and deliver complete national 3D elevation datasets for the United States, Europe and parts of Asia Pacific

Intermap provides geospatial products and services to a wide range of customers.

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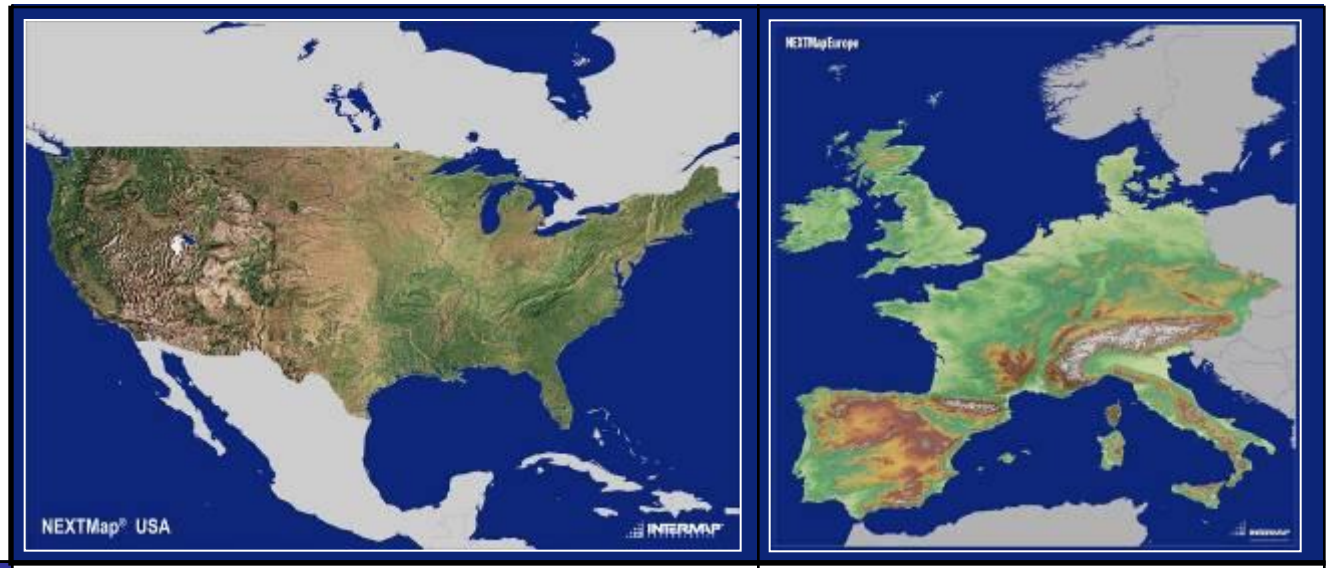
NEXTMap®



Counties	**USA: 50 States**	**Europe: 18 Countries**
Area Size	**8.000.000 km²**	**2.400.000 km²**
Blocks	**120**	**36**
Tiles	**55,150**	**19,556**
Population	**301 Million**	**373 Million**

- NEXTMap® is the world´s largest 3D Mapping campaign ever
- Covering 10.4 Mio. square kilometers in the USA and Europe

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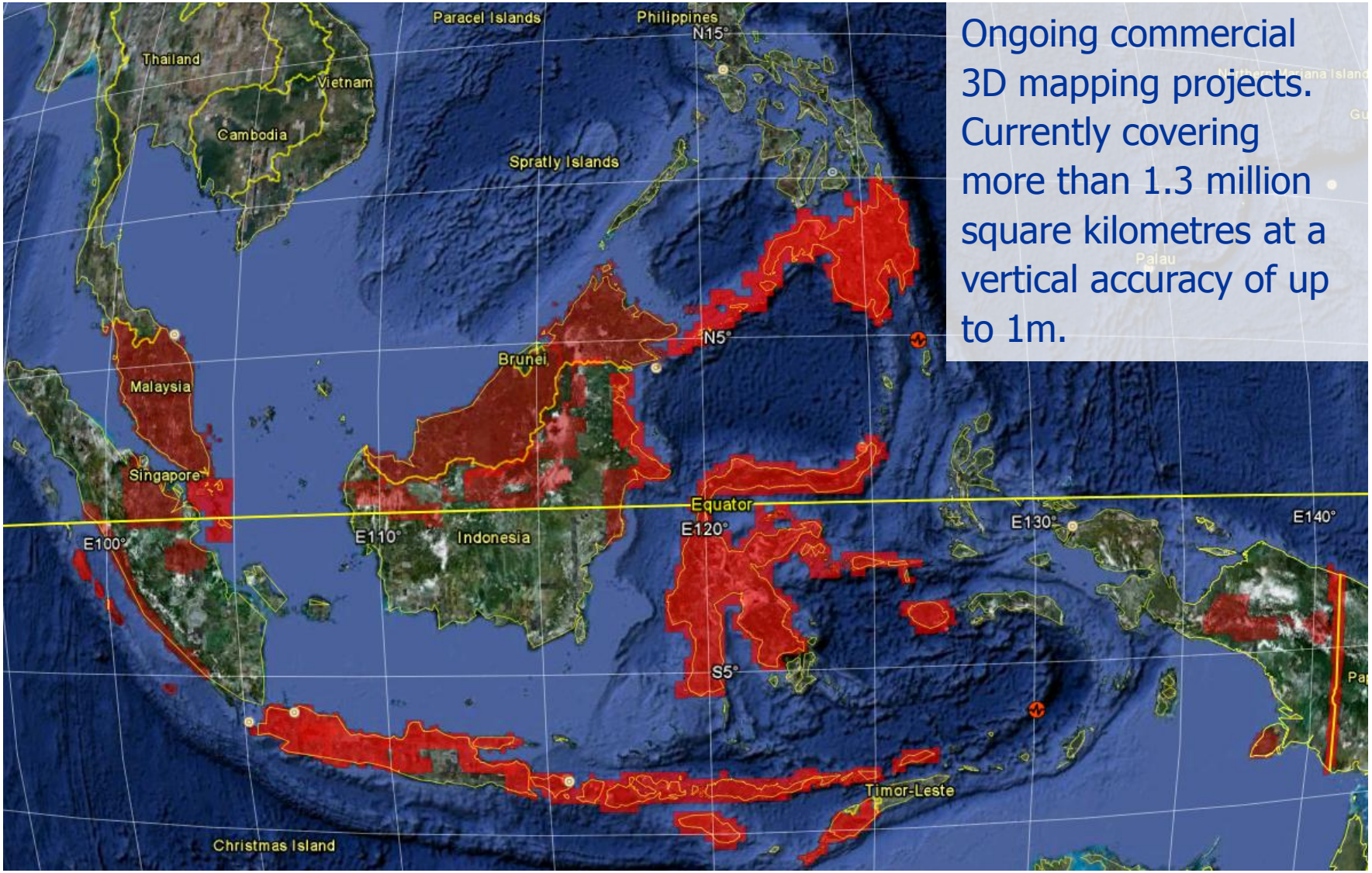
NEXTMap® - South East Asia and Pacific



Ongoing commercial 3D mapping projects. Currently covering more than 1.3 million square kilometres at a vertical accuracy of up to 1m.

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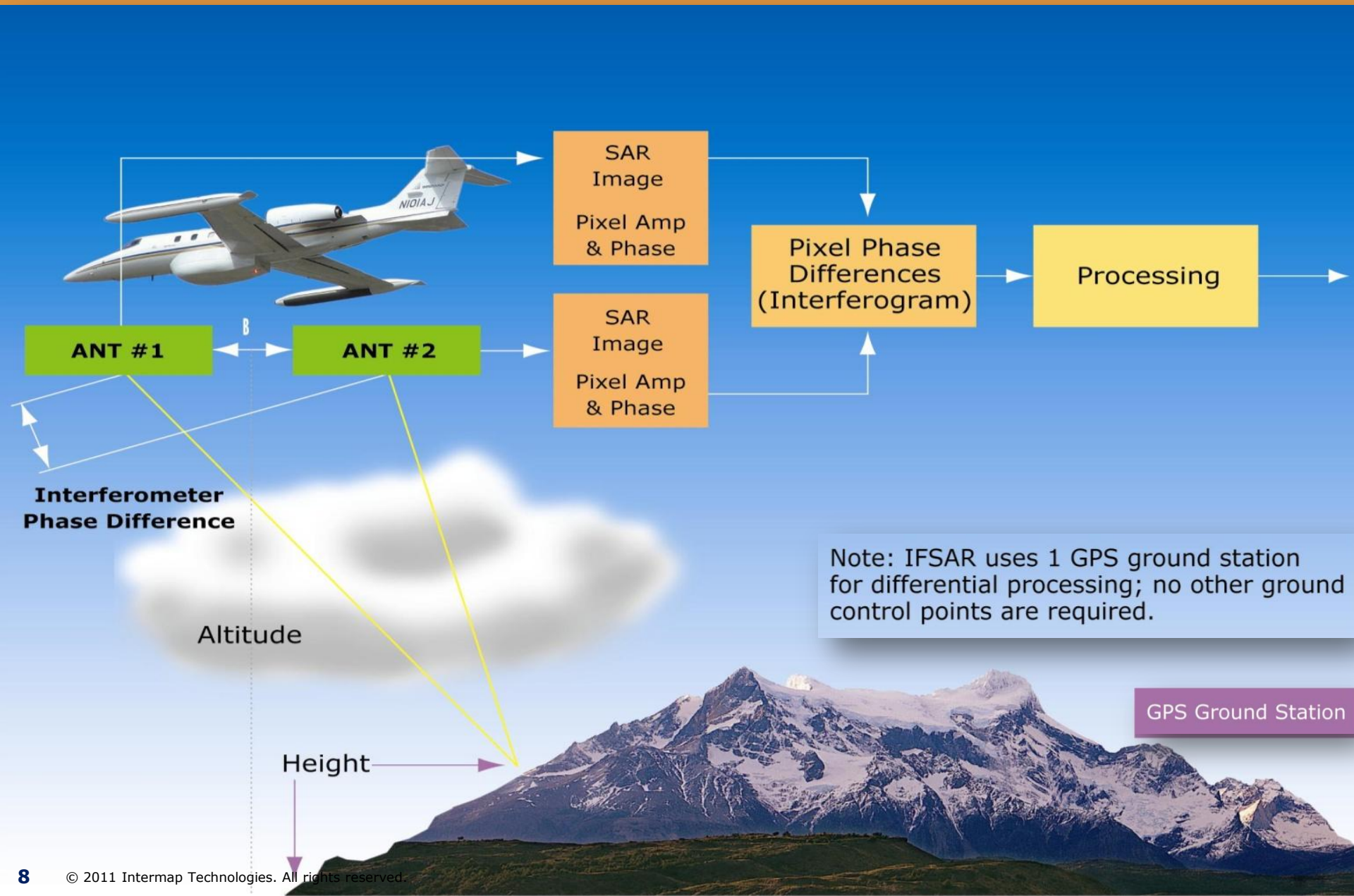
Global 3D Mapping Capabilities



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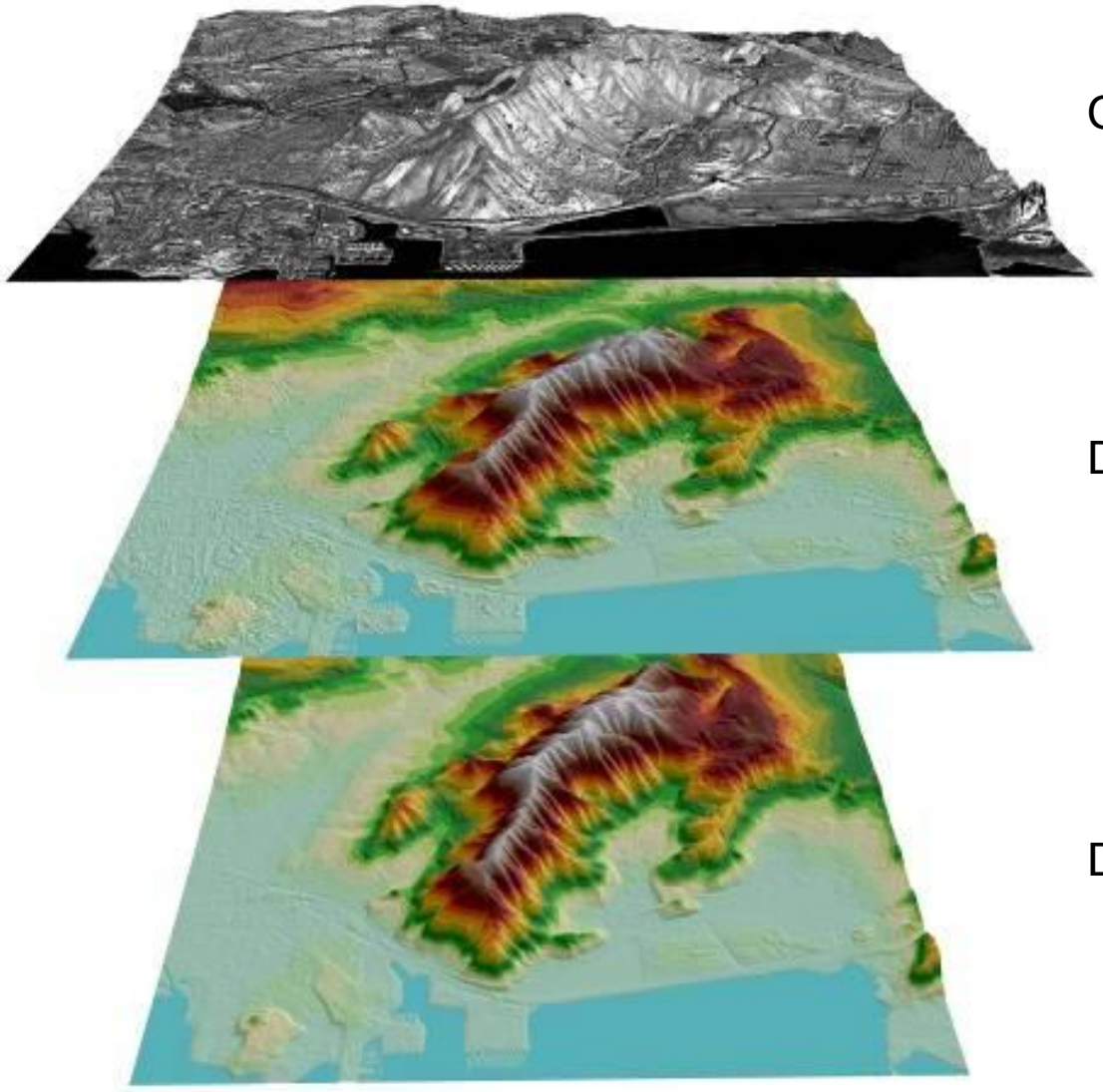
NEXTMap® Core Products



Orthorectified Radar Imagery (ORI)

Digital Surface Model (DSM)

Digital Terrain Model (DTM)

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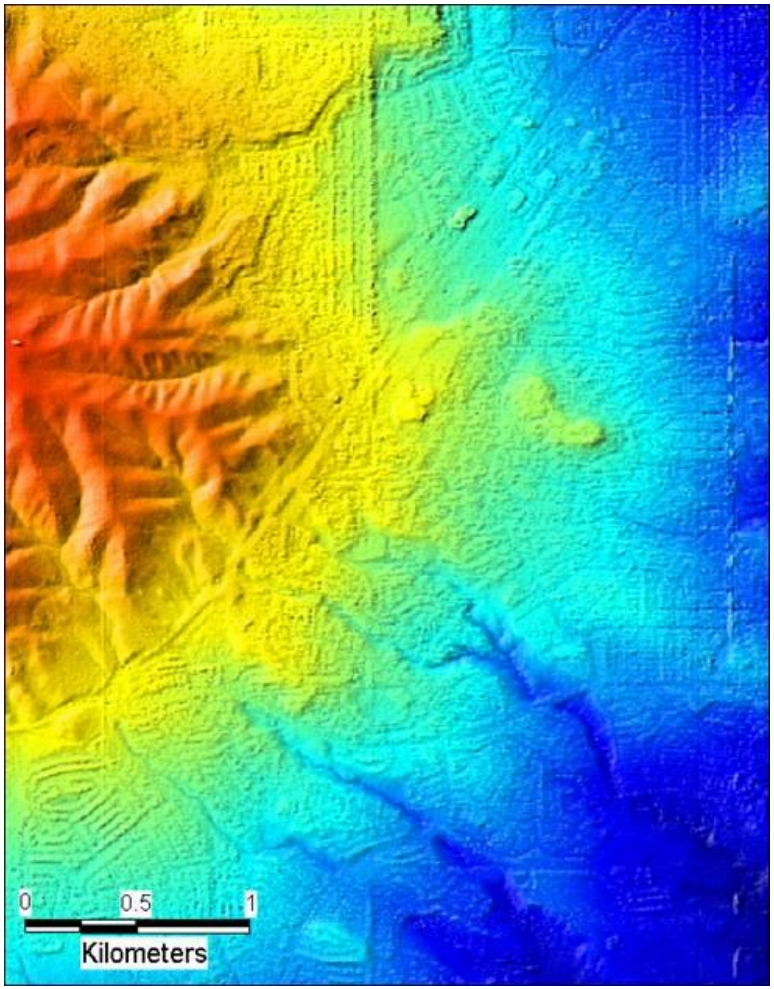
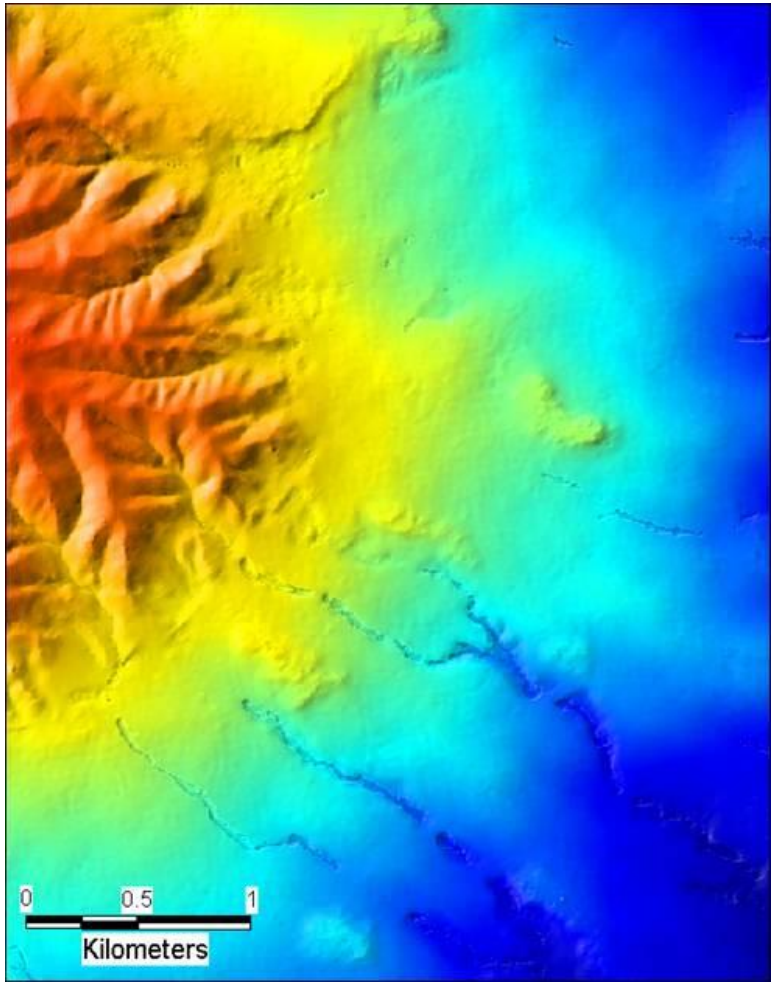
Digital Elevation Models

- Digital Surface Model



- Digital Terrain Model



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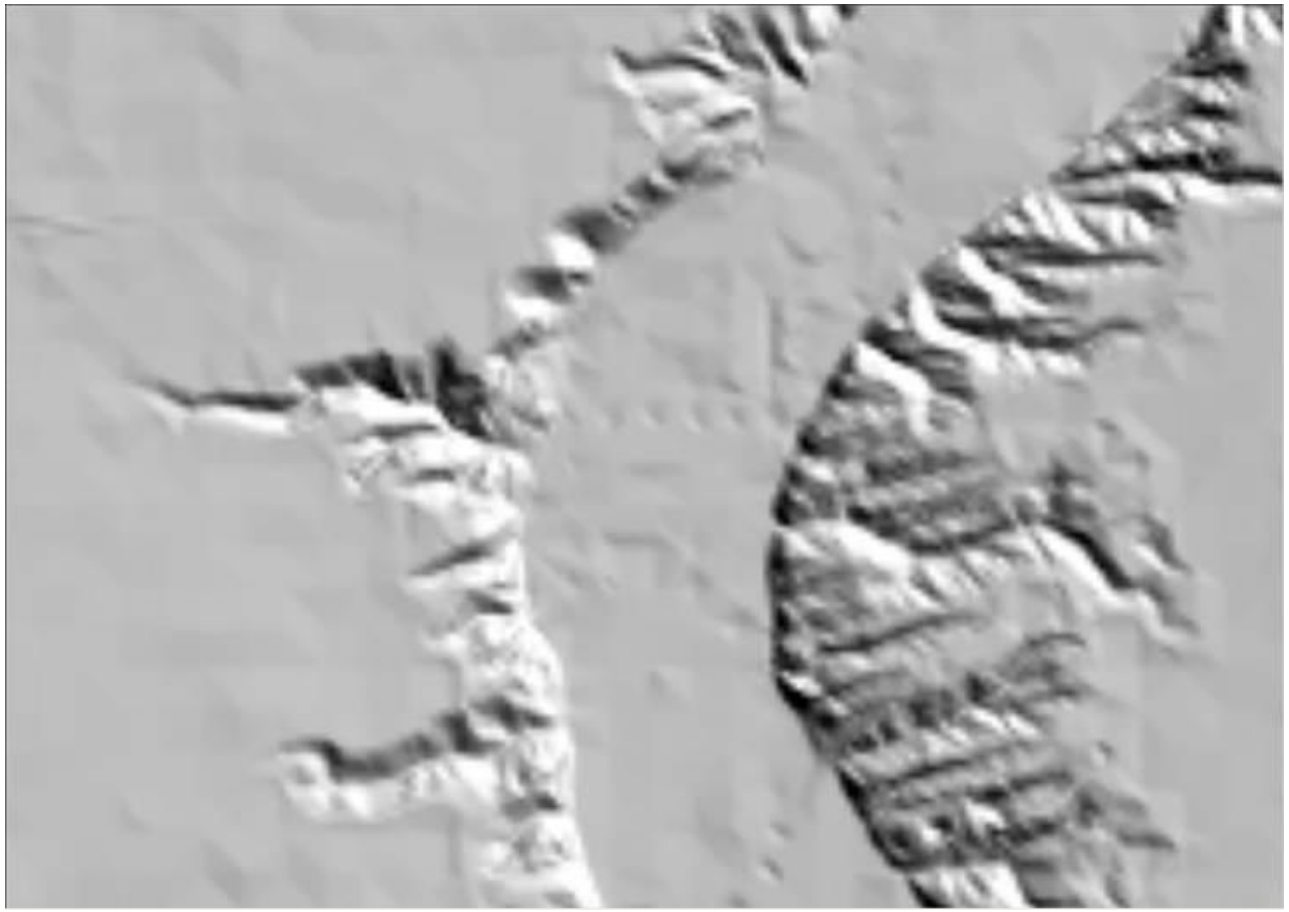
Traditional Photogrammetric DEM



30 – meter grid resolution

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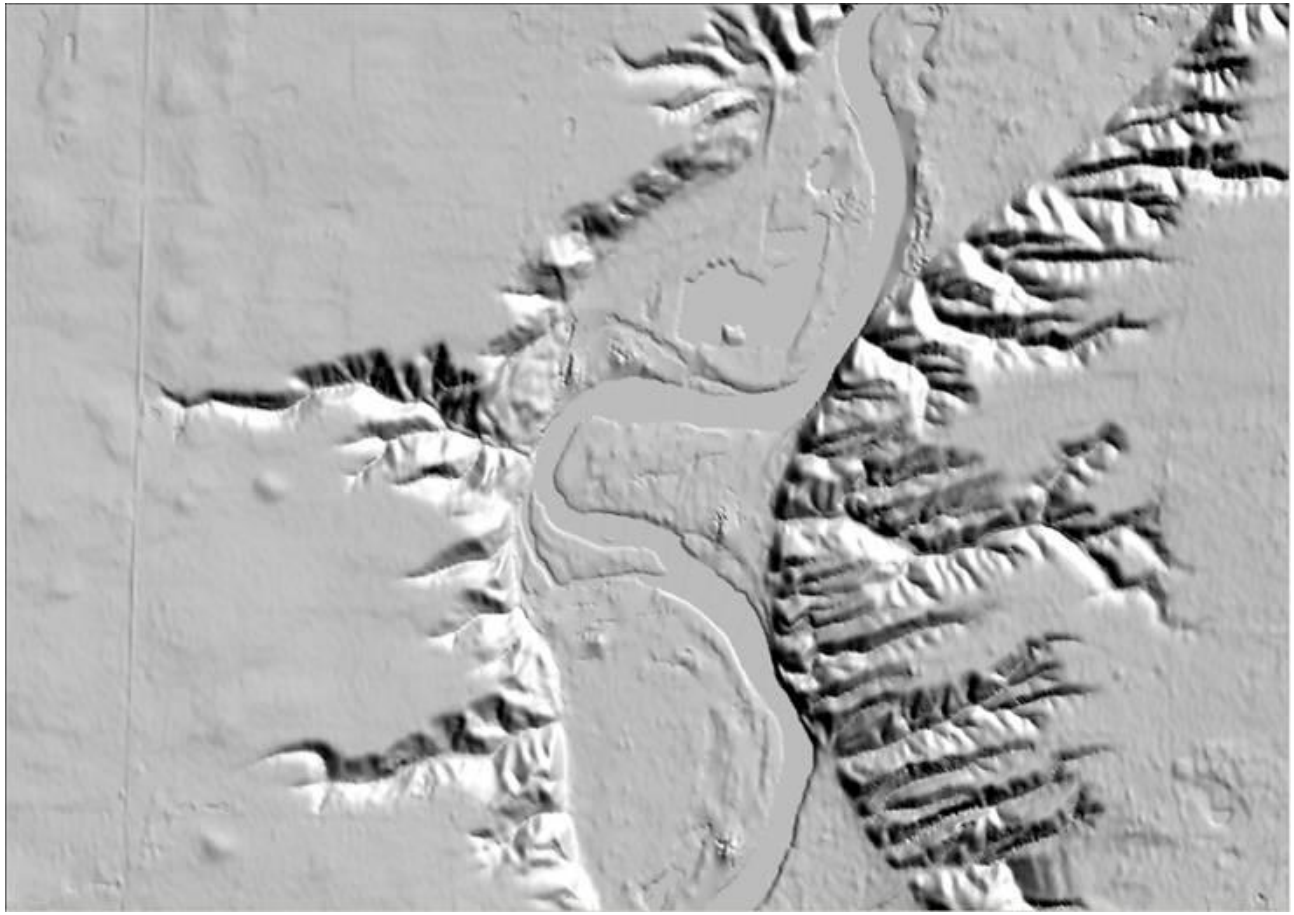
NEXTMap DEM



5 – metre grid resolution

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Orthorectified Radar Imagery

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Data Acquisition vs. Data Integration

- What are the challenges ?
  - We need to have the solutions available **„today"**
  - We can accept that the solution is not the most accurate today, but **will improve accuracy through upgrades over a time period**
  - **„Global coverage"** is key (or National, the World is getting more Global)
  - We want to use what have been already developed and **not „reinventing the wheel"**

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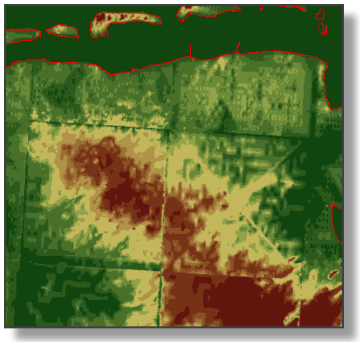
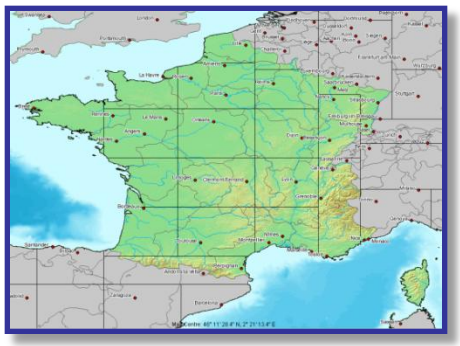
Why NEXTMap® data?

- **Shortcomings of current DTMs**
  - Visible map sheet divisions
  - Missing national homogeneity
    - Technology & Processes
    - Suppliers & QC-Standards
    - Data Age & Origin
  - Disconnect at national borders





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Data Acquisition vs. Data Integration

- So what can we do from mapping perspective?
  - Create a **reference Base layer** using not the most accurate technology but very efficient and highly homogenous (IFSAR)
  - For **urban and industrial** areas fuse in **more detailed** topography (LiDAR)
  - **Reusing** more detailed topography if available e.g.. From Local Government
  - Creating **Homogenous Integrated Dataset** (NEXTMap)

⇒ **Saving time, money and enabling rapid and efficient solution development**

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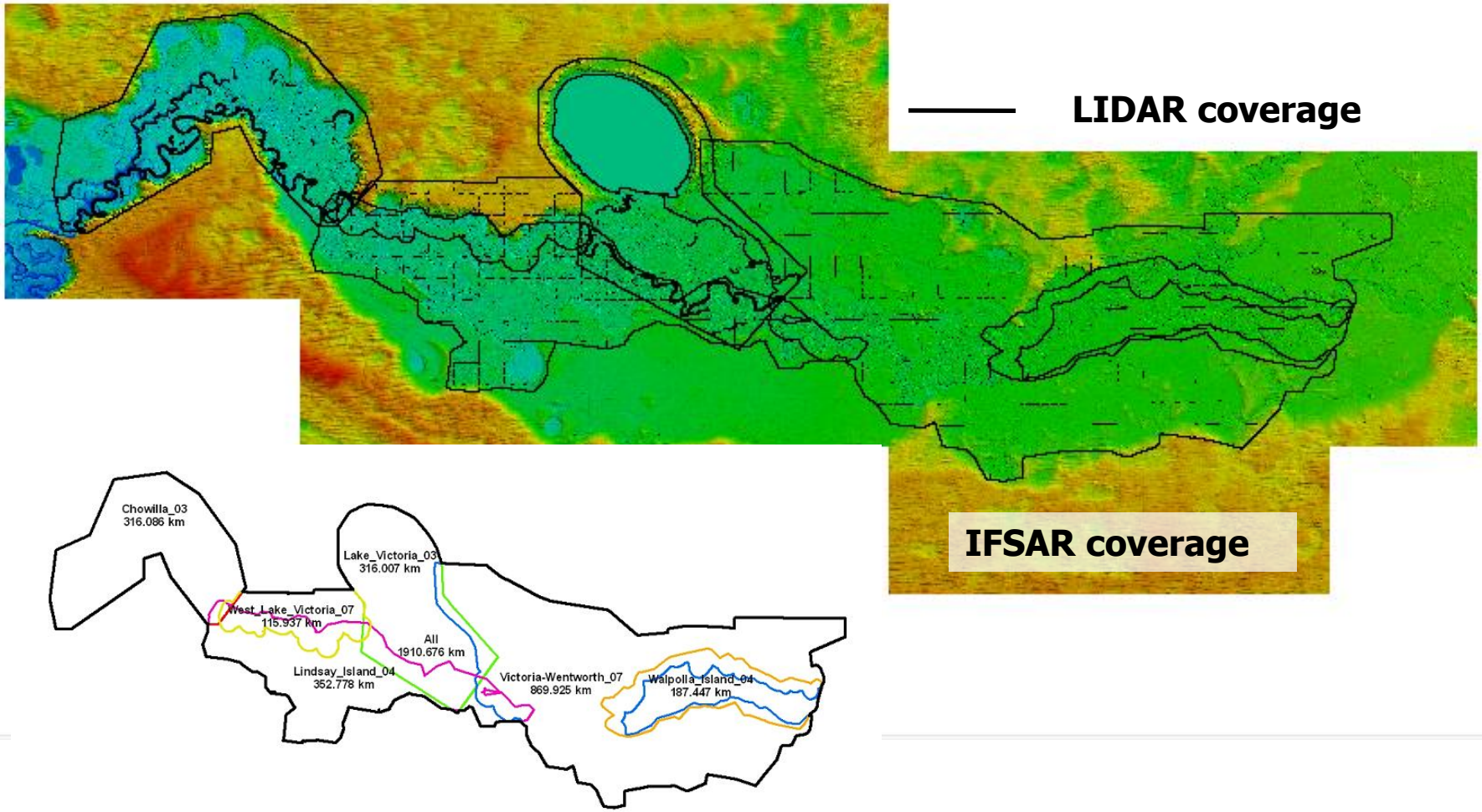
Murray-Darling River Basin (Australia)

- Project Area



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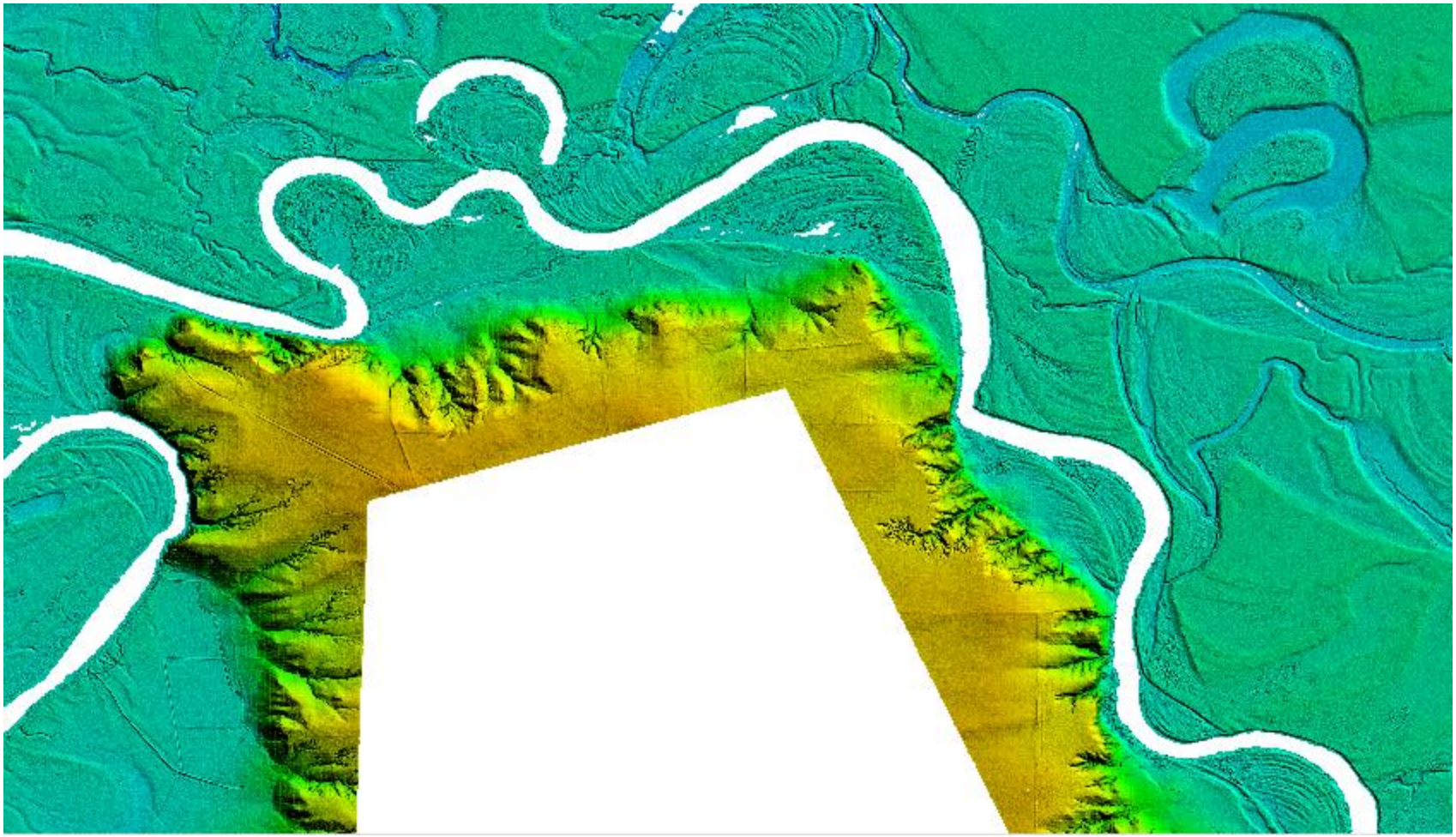
Murray-Darling River Basin (Australia)



Chowilla LiDAR 2.2 m Resolution

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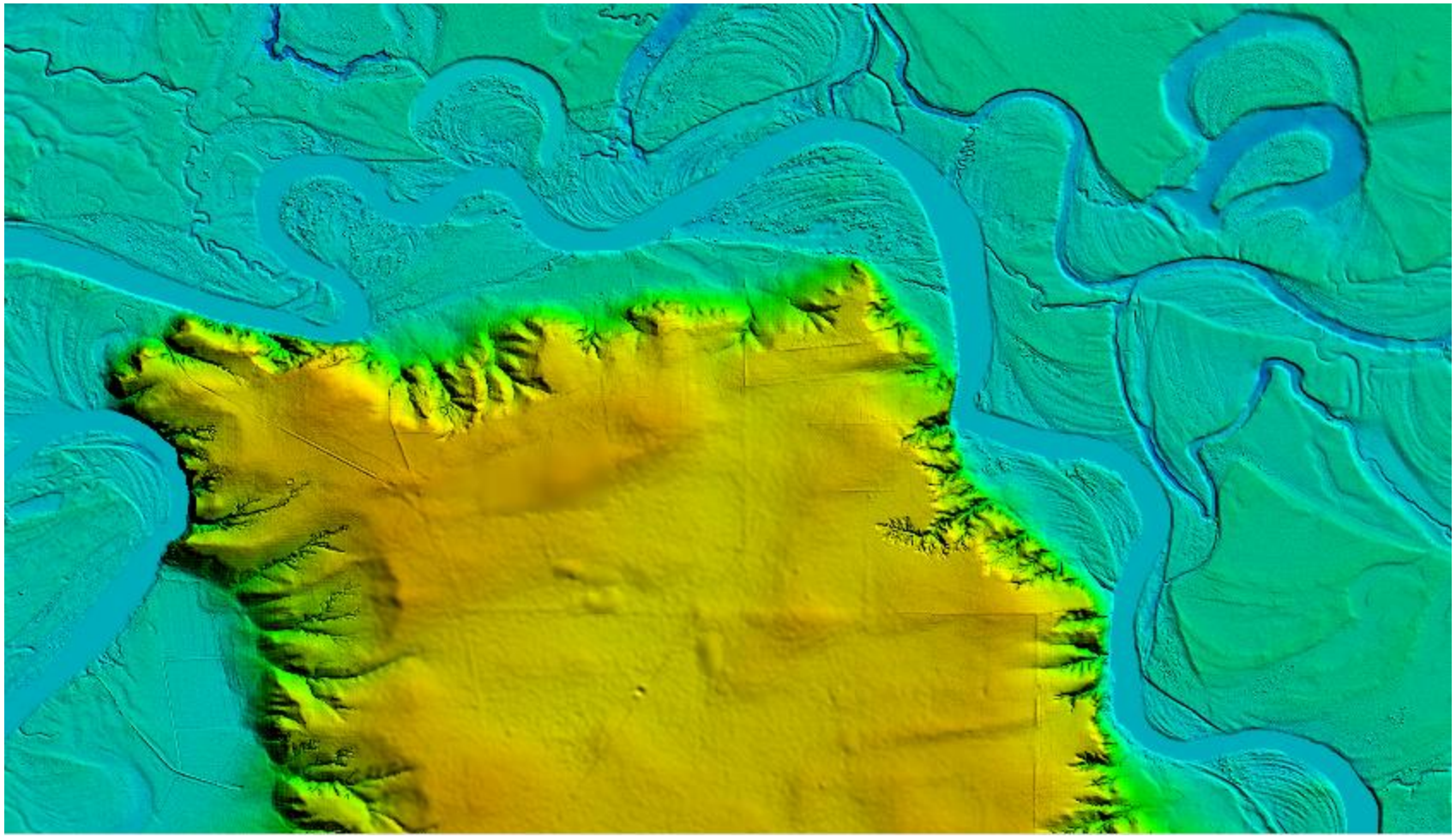
Murray-Darling River Basin (Australia)



Chowilla Fused 5m Resolution

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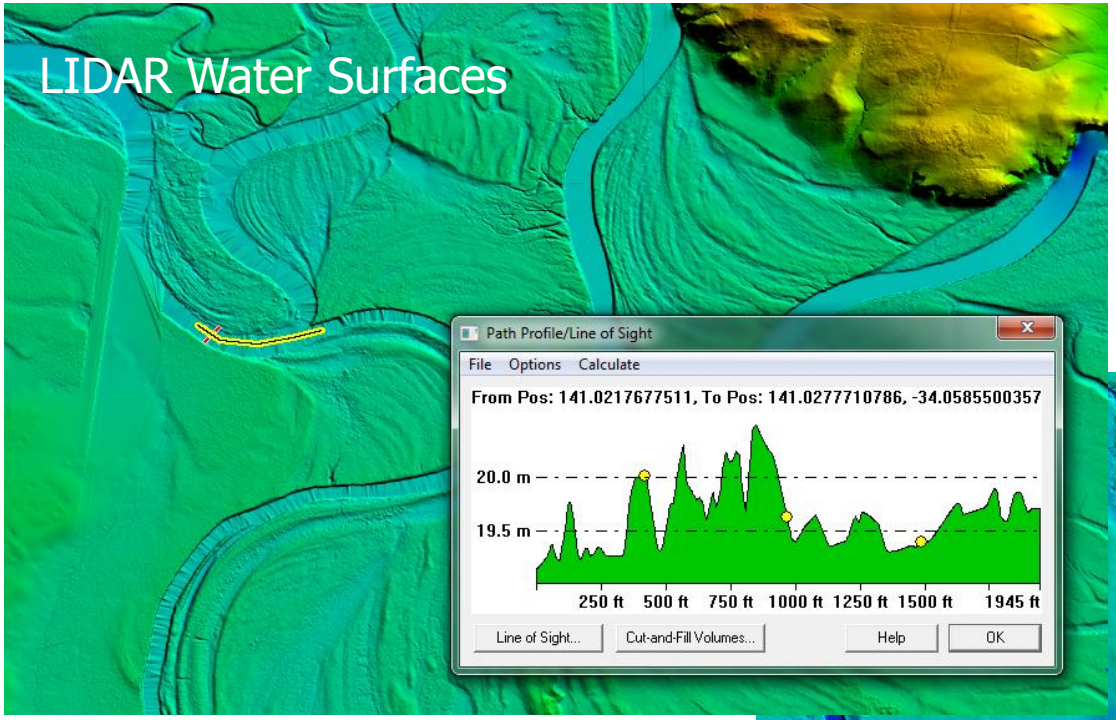
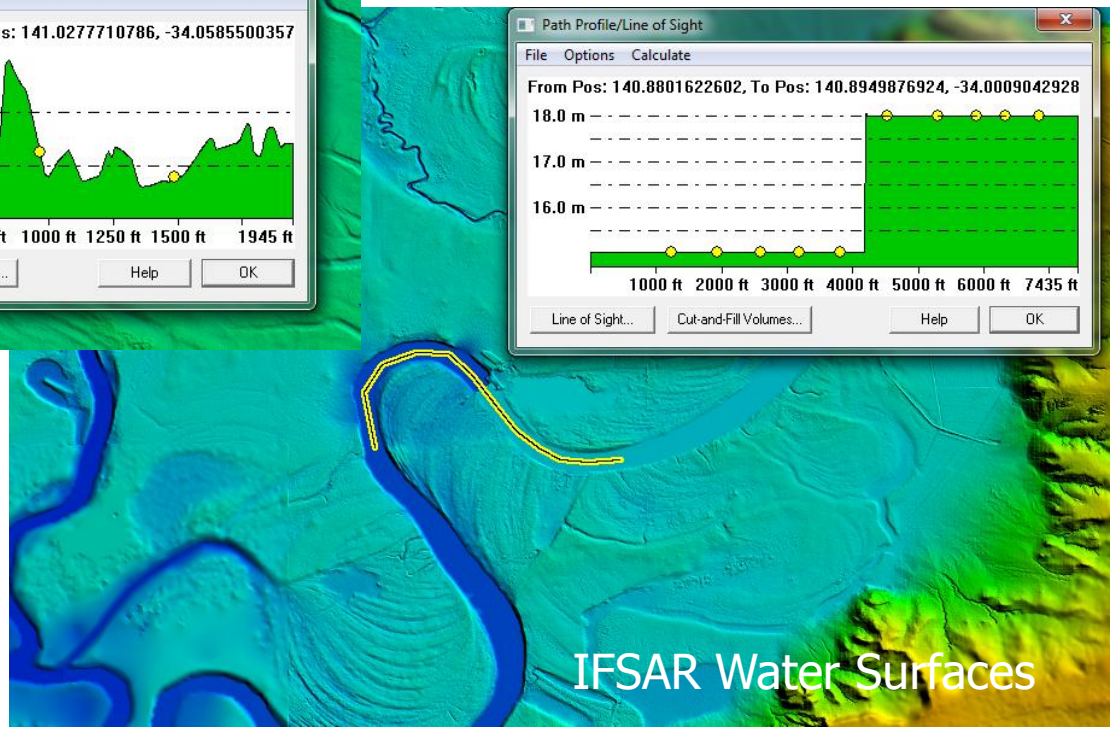
Murray-Darling River Basin (Australia)





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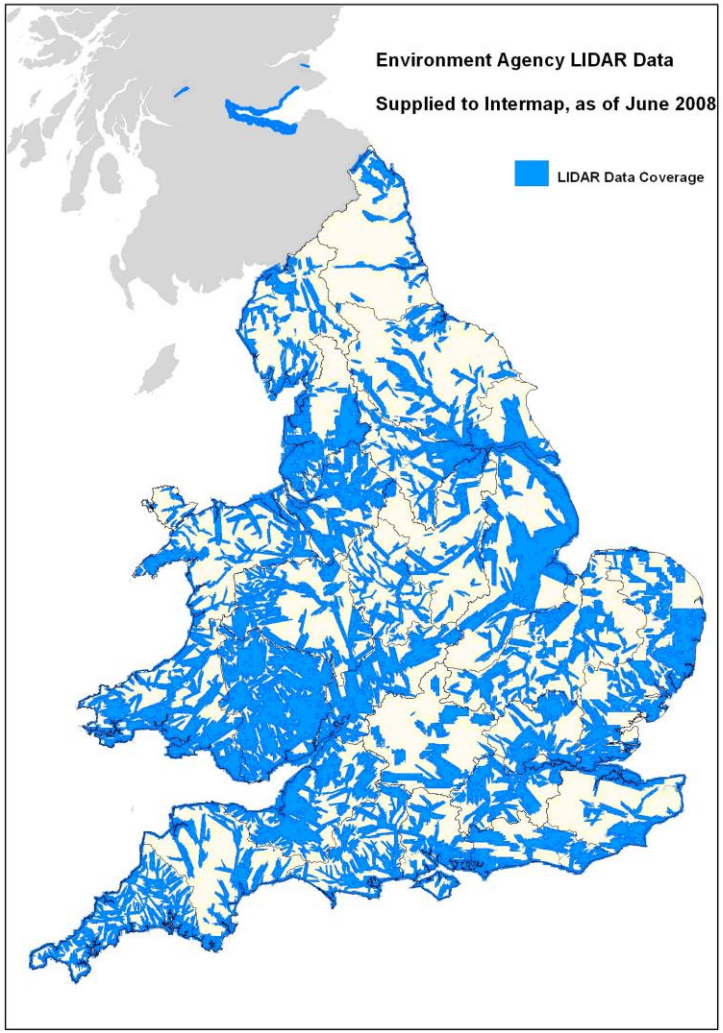
NEXTMap Britain DTM v2

- Scope
  - Seamless fusion of LiDAR data into NEXTMap Britain DTM for enhanced NEXTMap product for the British Government's Environment Agency



ENVIRONMENT AGENCY

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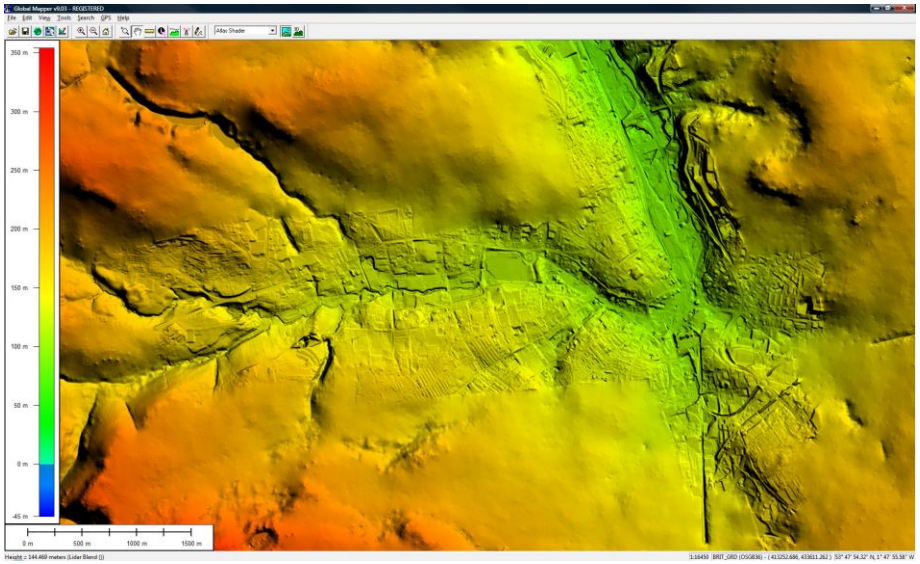
NEXTMap Britain DTM v2

- Result
  - Enhanced detail and accuracy, particularly along water courses and in urban areas
  - Excellent correlation
  - Temporal consistency
  - Complete coverage
  - Hydrologic corrected water courses and water body surface



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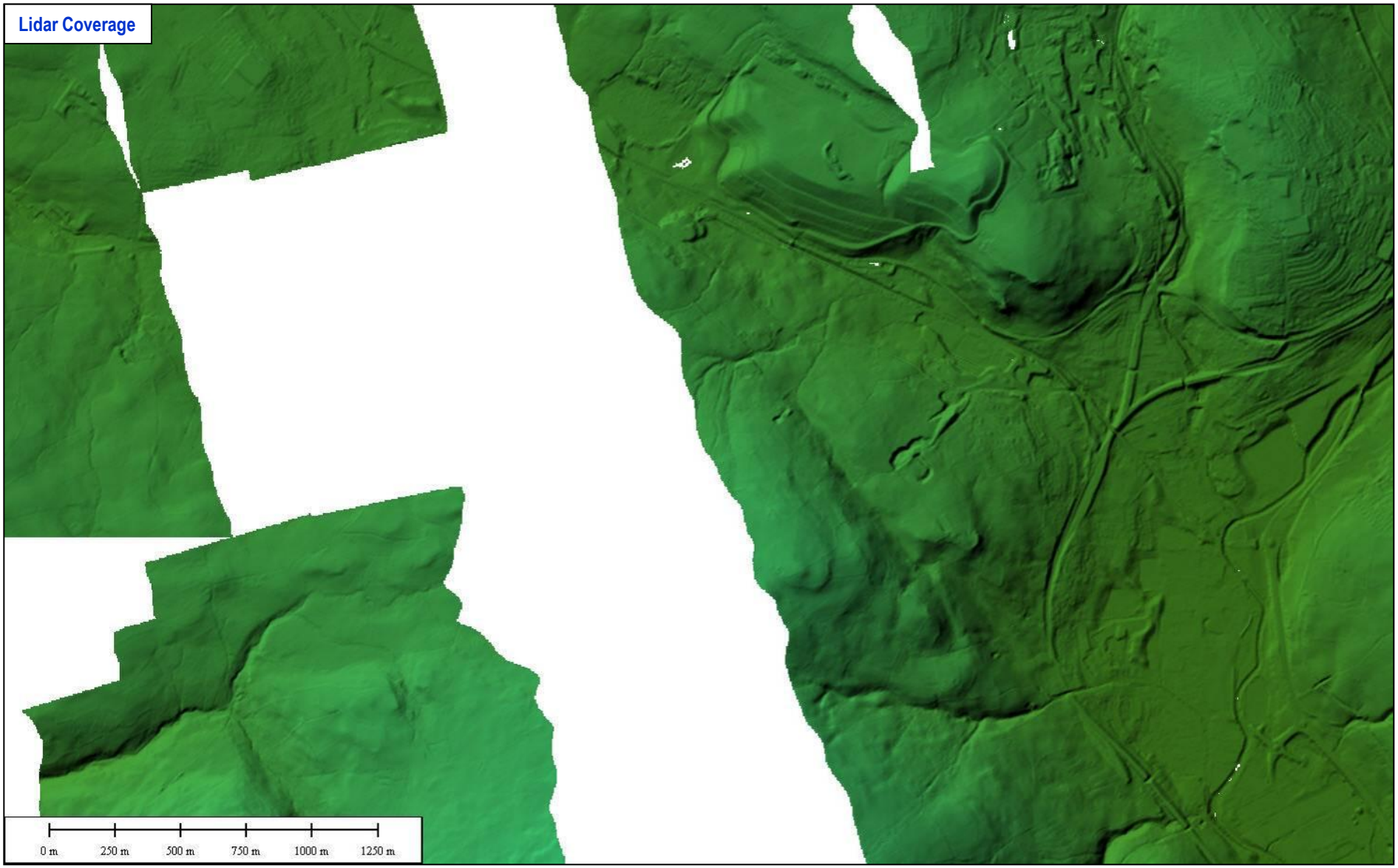
NEXTMap Britain DTM v2



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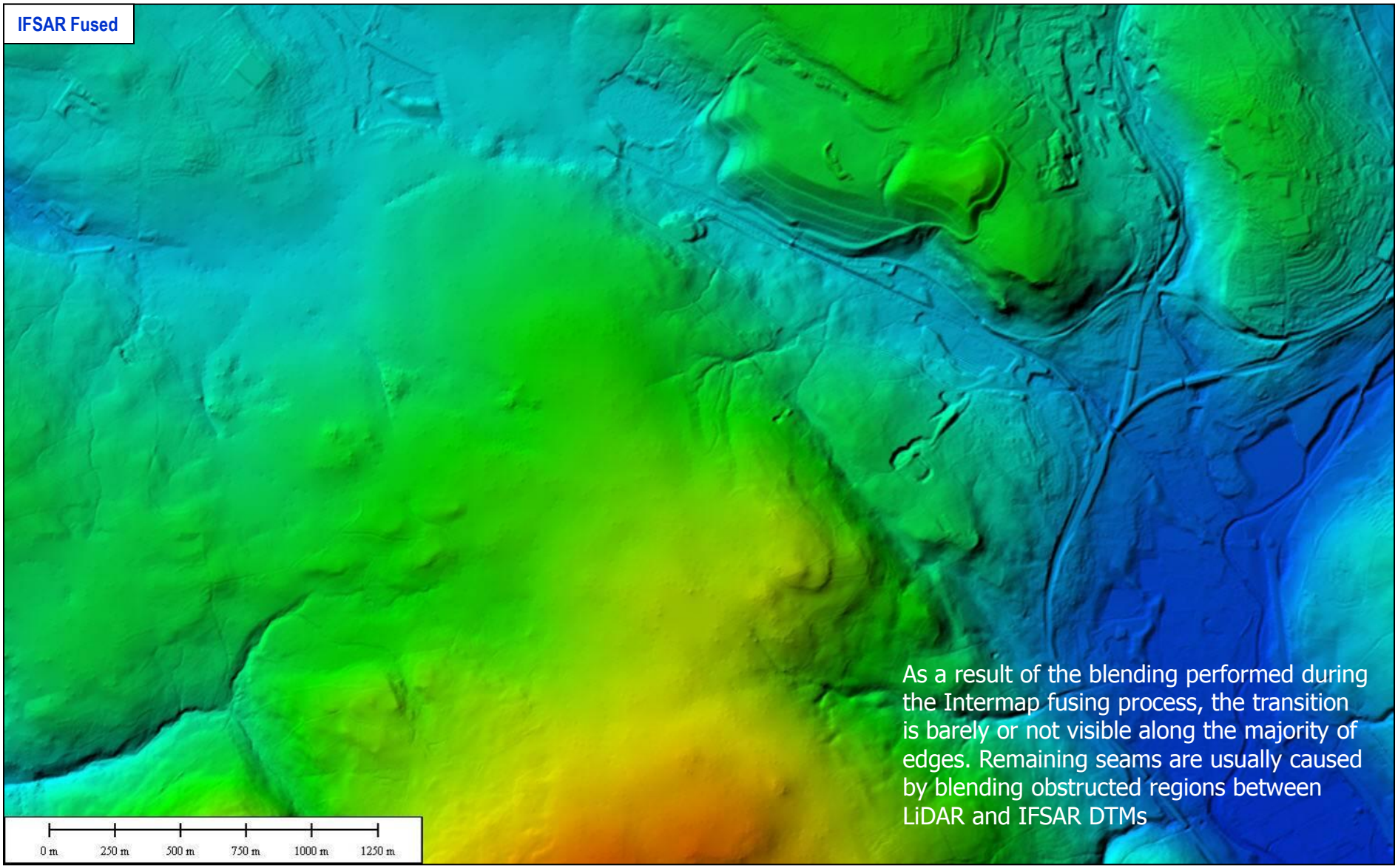
NEXTMap Britain DTM v2



As a result of the blending performed during the Intermap fusing process, the transition is barely or not visible along the majority of edges. Remaining seams are usually caused by blending obstructed regions between LiDAR and IFSAR DTMs

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What Hazard are we talking about ?

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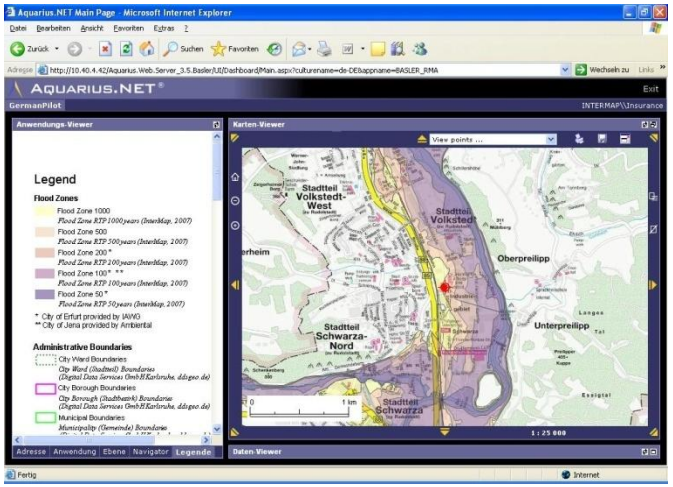
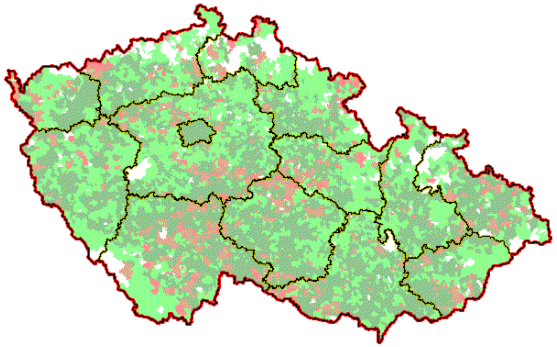
Natural Hazards

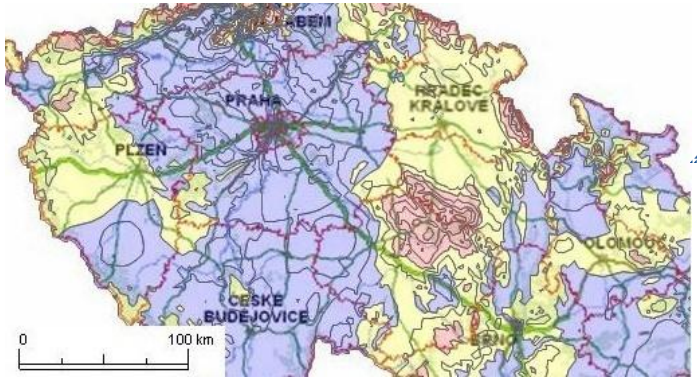
- Flood

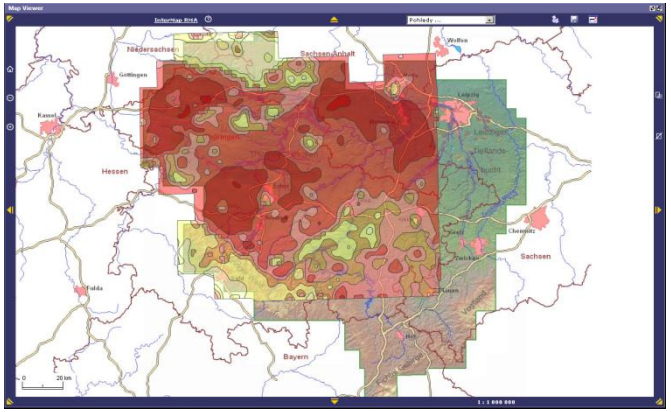


- Hail

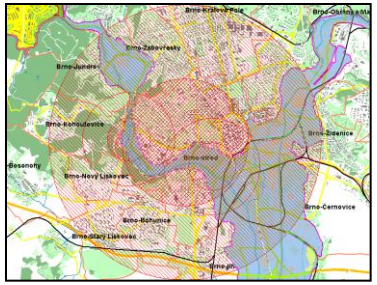


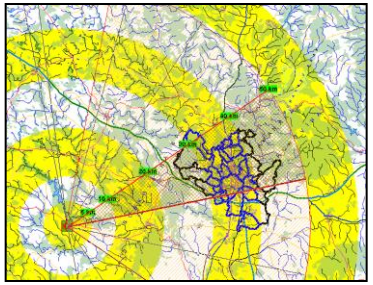
- Earthquake





- Windstorm





- Dispersion of Chemicals and Radiation

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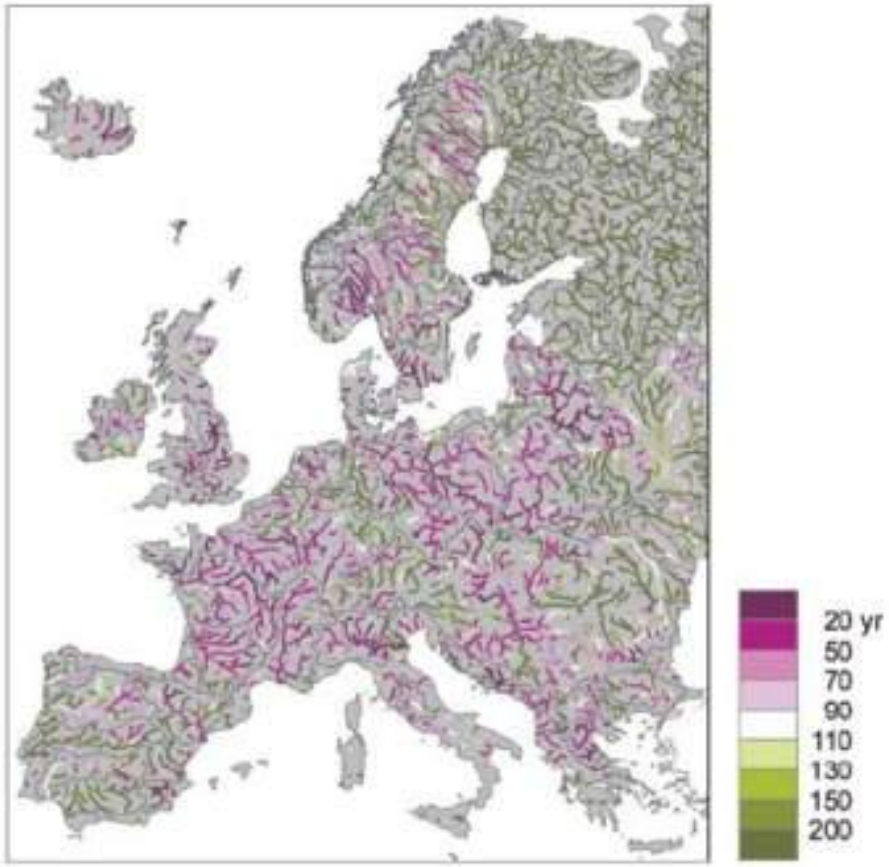
What is the Opportunity?

- Need for improved, geospatially accurate risk management products is dramatically increasing due to growing number of extreme cost natural disaster events.
  - 2007: 7th warmest year for globe and 2nd warmest for northern hemisphere
  - Worldwide economic loss USD 75bn, insured loss USD 30bn
  - Hurricane Kyrill – economic loss USD 10bn, insured loss USD 5.8bn
  - Flooding in UK – insured loss USD 6bn
  - Tai Flood 2011 – USD 15bn - the fifth costliest insured loss event in the past 31 years



*Change in recurrence of 100-year flood. In some rivers in the west, and in parts of Eastern Europe, for example, 100 year floods could occur every 50 years or less (source JRC)

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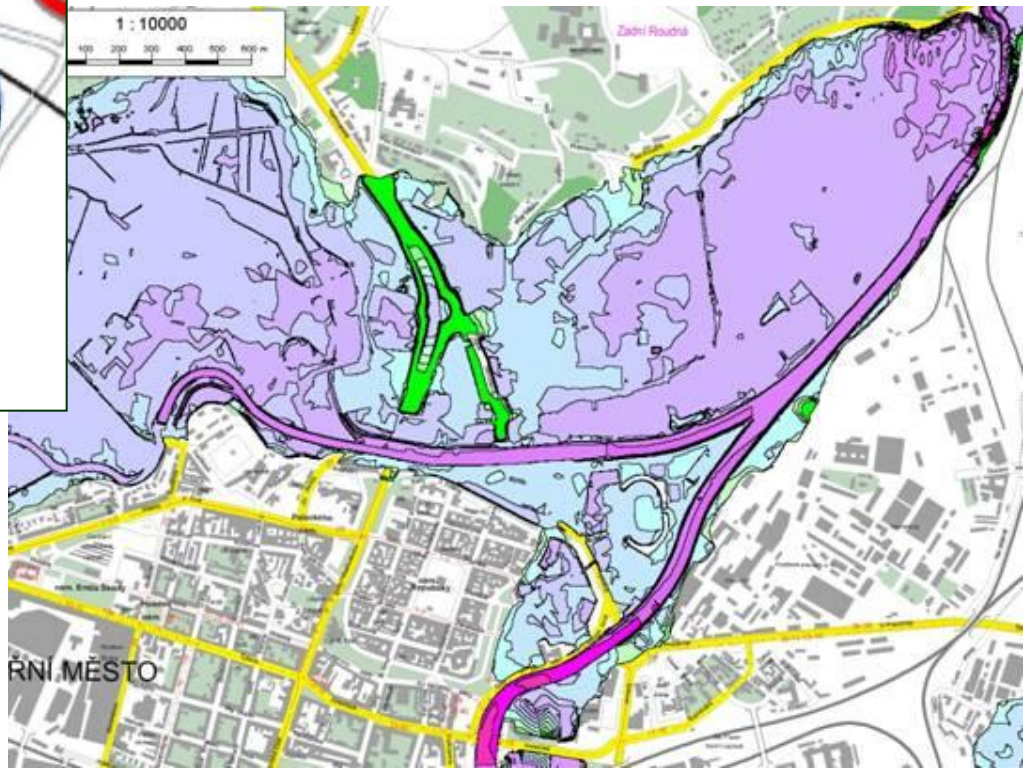
Flood Risk Zones – Water depth

Flood Hazard map – Flood outlines

Depth of flooding map



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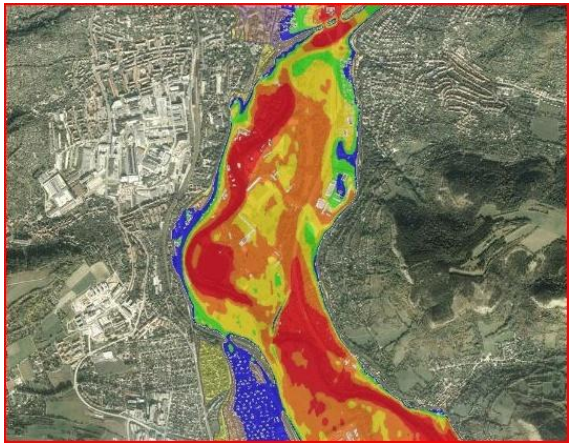
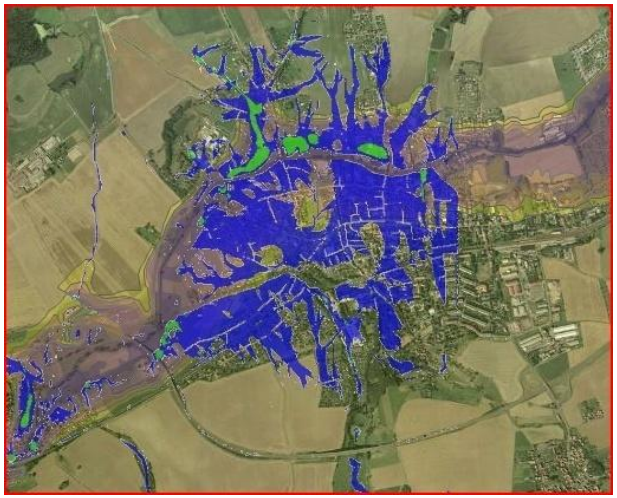
River flooding, but also the other ...

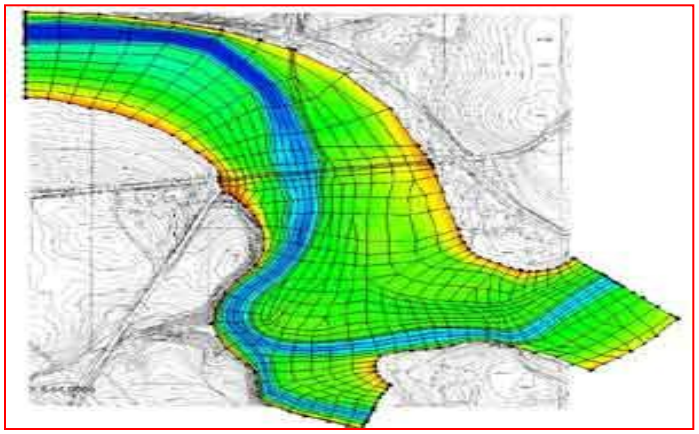
Water depth mapping





Flash Floods

Very detailed 3D hydraulic modeling



Coastal Surge

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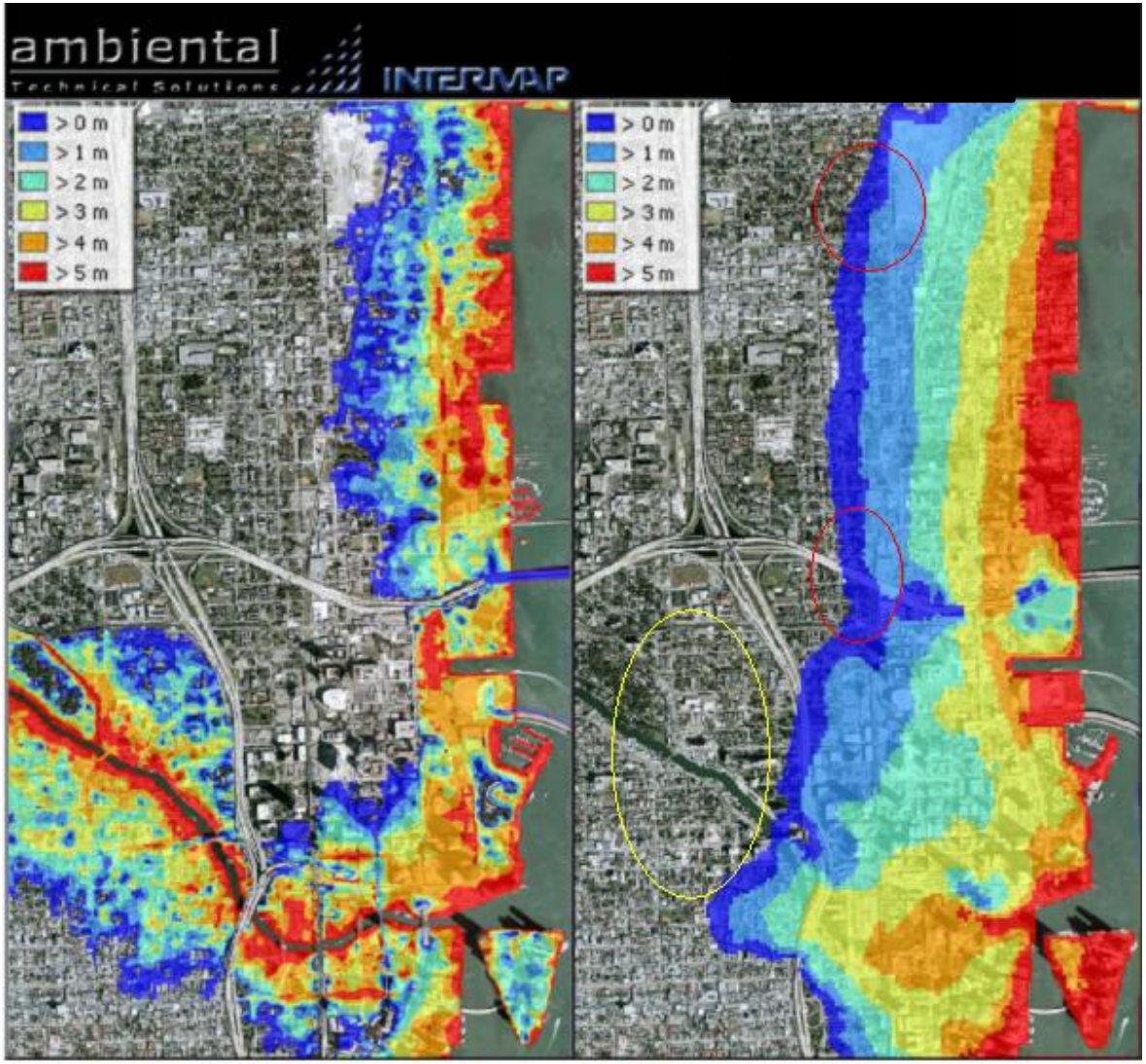
Flood Modeling – Importance of DTM



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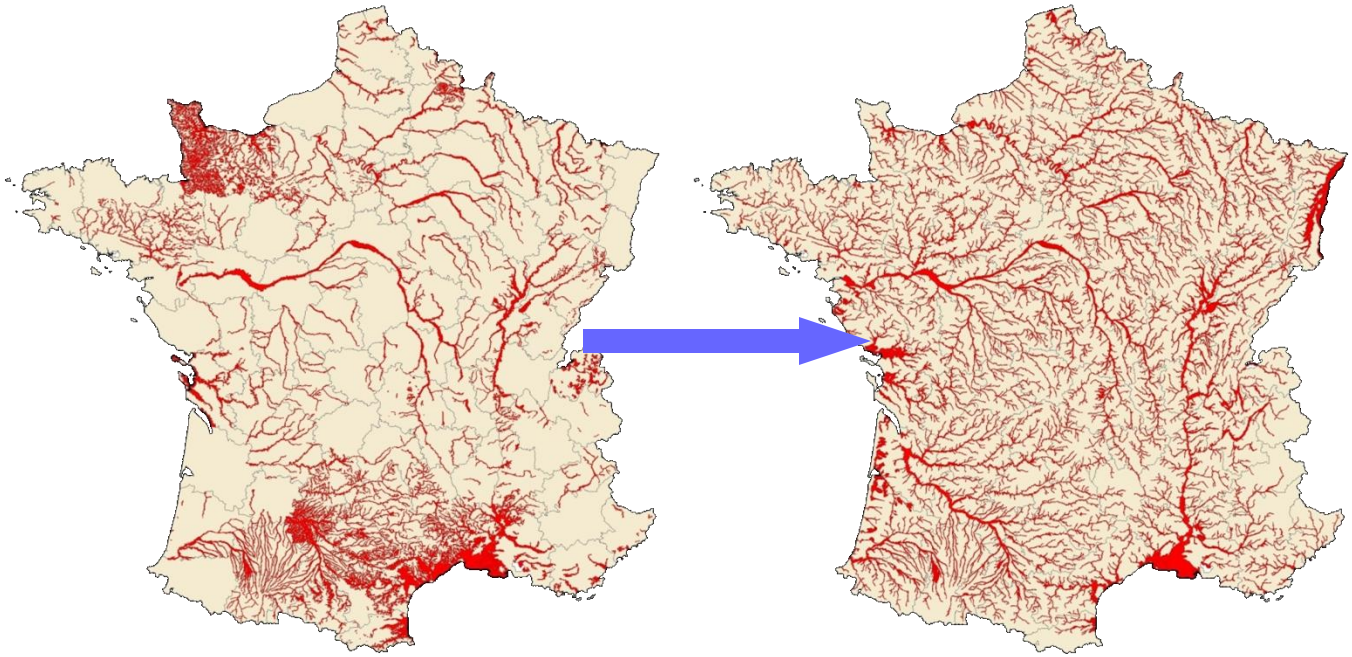
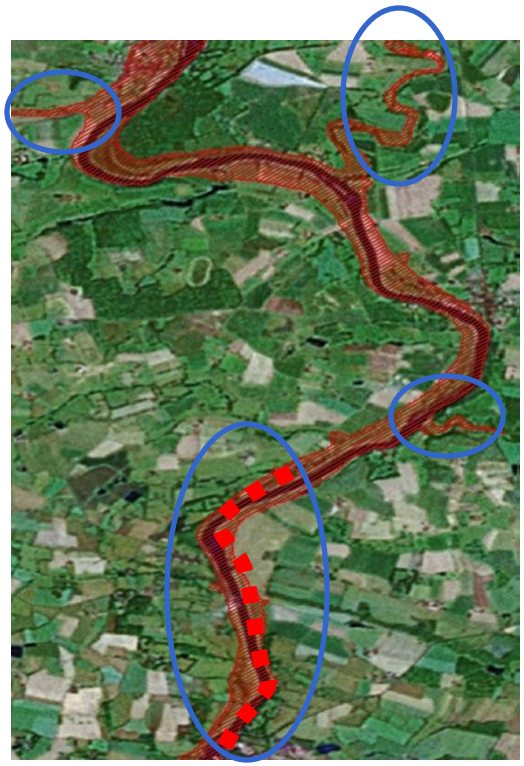
National Flood Hazard Maps: France

- In cooperation with Guy Carpenter and JBA Consulting
- Most detailed and homogenous river flood hazard maps for France
- Based on NEXTMap France DTM, combined with sophisticated 2-D hydraulic modeling
- Covering 80,000 river km
- Flood hazard Maps for return periods of 1 in 10, 25, 50, 100, 250 and 1000 years
- Additional modelling of several flood defence scenarios
- Water depth grids to estimate flood severity / damage potential



Old existing national flood hazard map

NEXTMap based product



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National Flood Hazard Maps: UKFloodMap™

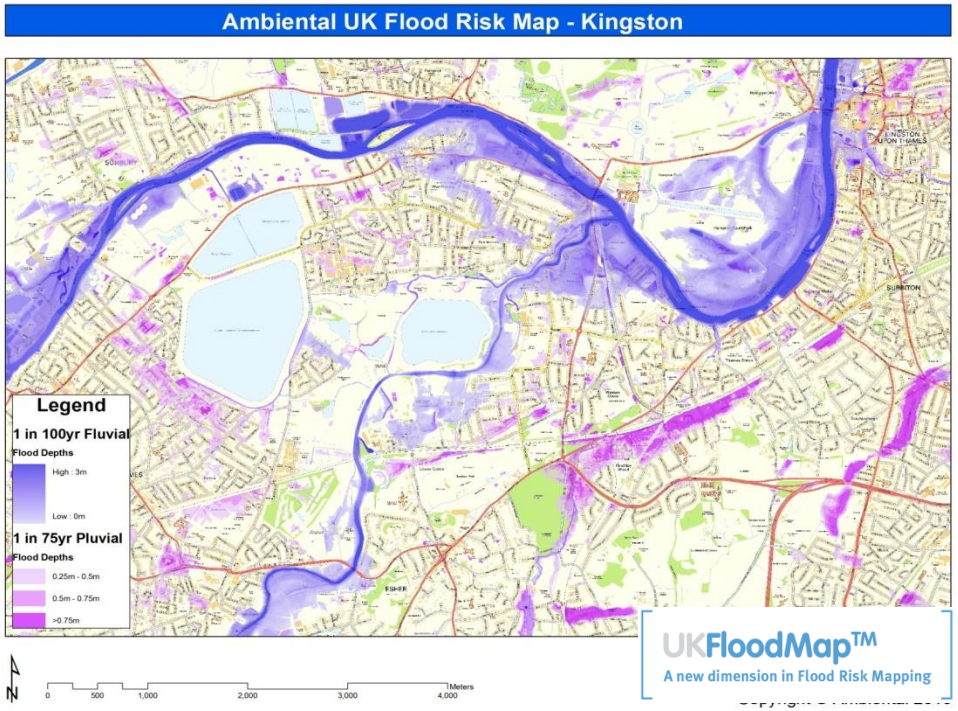
- In cooperation with Ambiental Ltd.
- Most current, and consistent flood hazard maps for UK
- Based on NEXTMap Britain DTM v2, combined with sophisticated 1-D and 2-D hydrodynamic modeling
- 3 flood perils (fluvial, pluvial, tidal)

Pluvial flood hazard

- For all urban areas in England, Scotland and Wales
- modeled using the 75-year return period, in alignment with the ABI statement of principles

River & Tidal flood hazard

- for England and Wales
- Delineation of the 1 in 100, 250, 500 and 1000 year return period flood zones
- flood severity / damage potential information provided in the form of banded water depth grids.



Background Mapping: Ordnance Survey © Crown copyright and database right 2010

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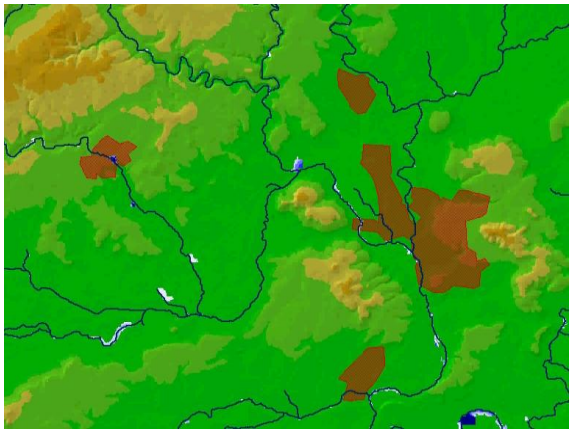
Flood Zoning x Event Model

Zoning Model – Risk Assessment

- Defines zones with certain probability of being flooded
- Used for risk management and UW / Flood Risk Assessment

Event Model – CAT Modeling

- areas affected during one event
- Loss caused by flood – PML
- Used for Reinsurance purposes



=> Exactly the same data used for pricing and exposure modeling together with more transparent approach is bringing key difference to the user

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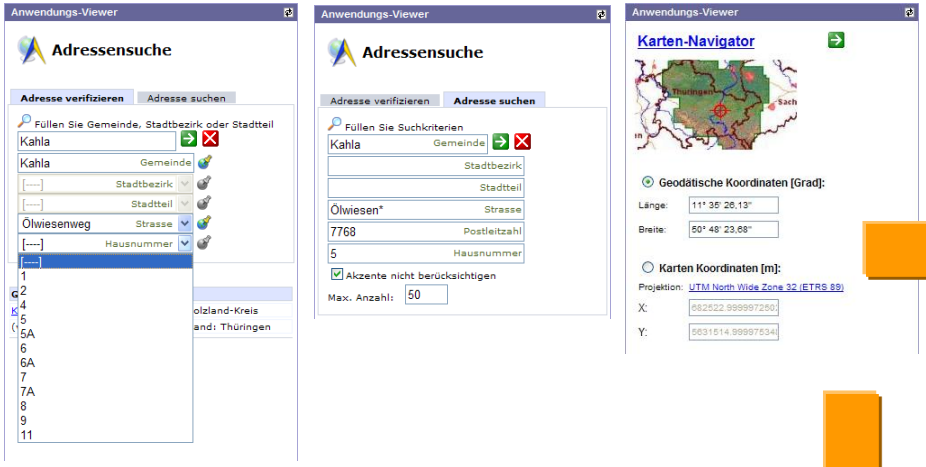
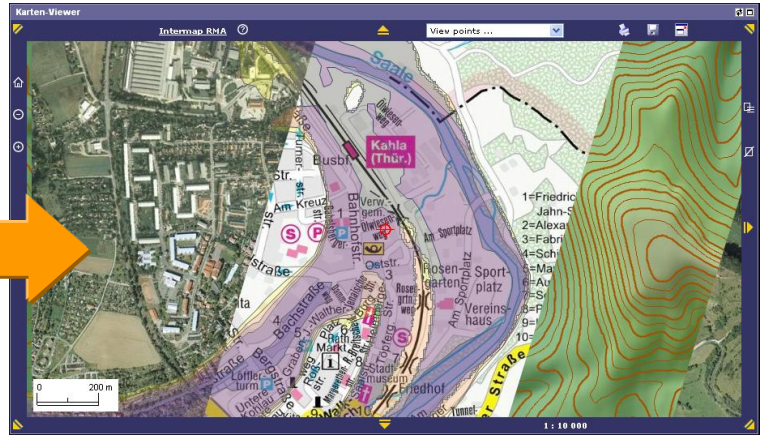
Geo-Coding & Visualization, Risk Assessment

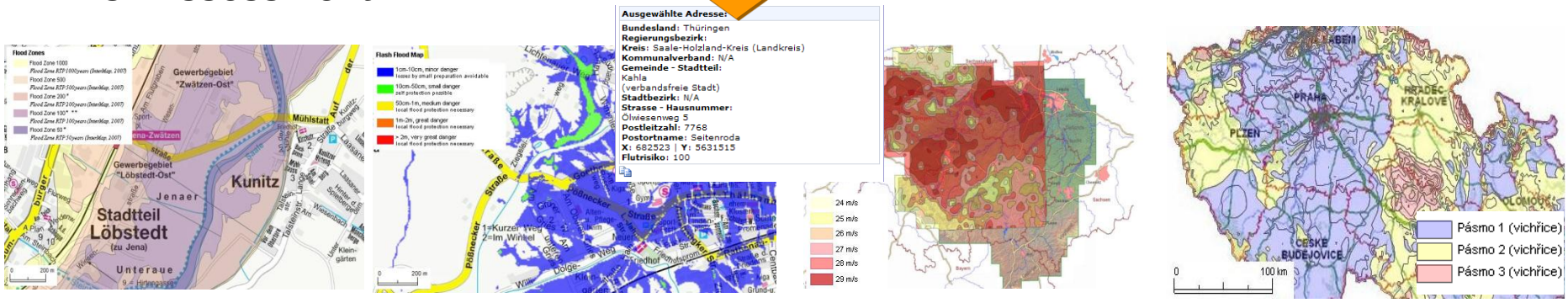
- Address Search / Coordinate Search



- Geo location and 2D Visualization



- Risk Assessment



e.g. Flood, Landslides, Windstorm, Earthquake, ...

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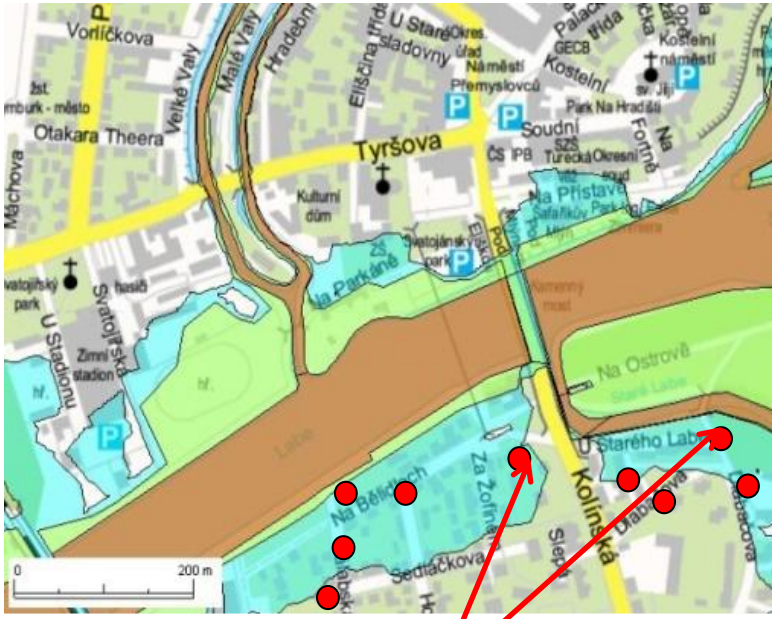
Geo-coding as part of the Solution



Geo-coding accuracy

Lower accuracy
(e.g. street)

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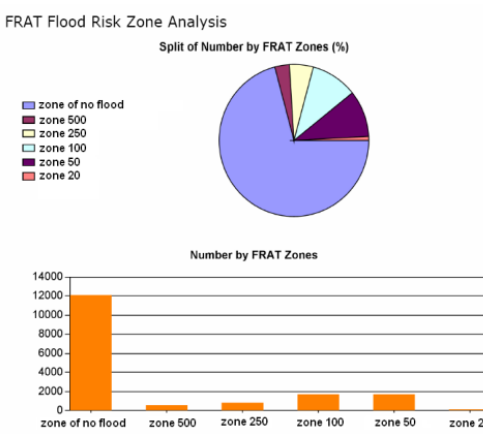
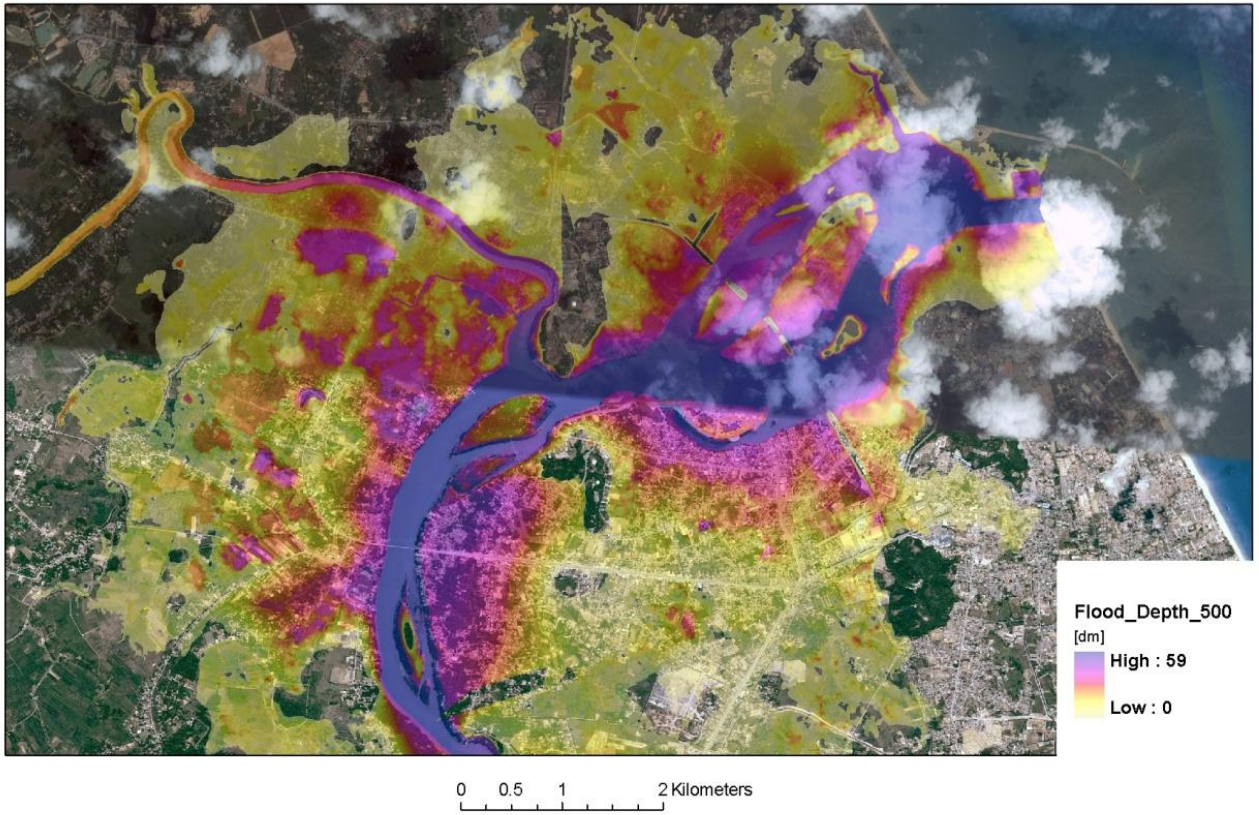
Scenario Based Analysis





- Assessment of affected territory under defined scenario
- Understanding the number of properties/citizens/value exposed to risk

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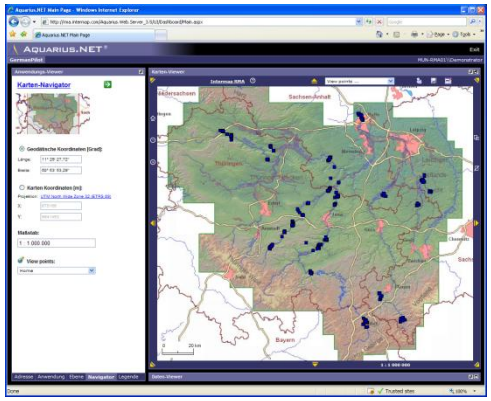
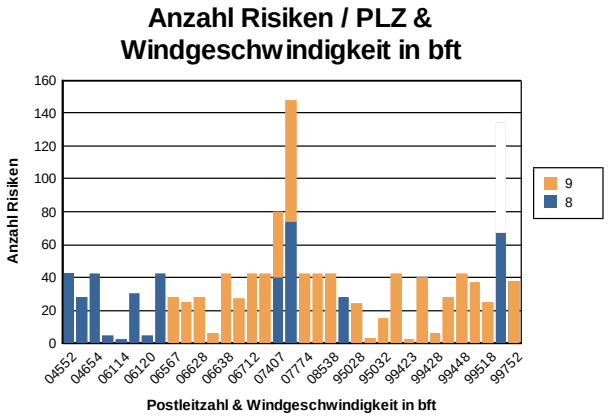
Delivery: RMA - Underwriting analysis / Accumulation

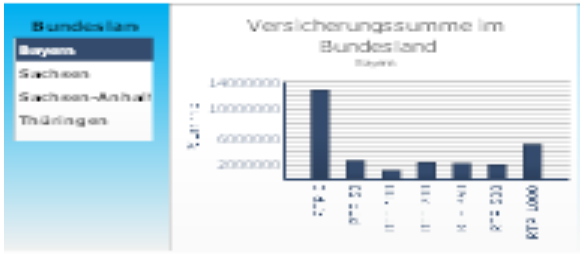
Portfolio Upload



Risk Distribution and Accumulation Statistics



Dashboard generation



Reporting

ID	Straße	Haus-nummer	Postleit-zahl	Stadt	Risikozone Über-schwemmung	Wieder-kehrperiode Über-schwemmung	Wind-geschwin-digkeit m/s	Wind-geschwin-digkeit bft	Versicherungs-summe
155	Leipziger Str.	163	4552	Borna Stadt	0	0	20,33	8	525.389
624	Breite Str.	1	4552	Borna Stadt	0	0	20,33	8	80.222
616	Abtsdorfer Str.	32	4552	Borna Stadt	4	100	20,35	8	398.348
617	Abtsdorfer Str.	34	4552	Borna Stadt	4	100	20,35	8	393.978
618	Bahnhofstr.	22	4552	Borna Stadt	4	100	20,34	8	525.389
619	Bahnhofstr.	23	4552	Borna Stadt	4	100	20,34	8	475.056
620	Bahnhofstr.	26	4552	Borna Stadt	4	100	20,34	8	368.778
726	Markt	14	4552	Borna Stadt	5	50	20,34	8	327.939
156	Leipziger Str.	165	4552	Borna Stadt	0	0	20,33	8	475.056
727	Am Breiten Teich	10	4552	Borna Stadt	4	100	20,34	8	950.123
154	Leipziger Str.	161	4552	Borna Stadt	0	0	20,33	8	777.618

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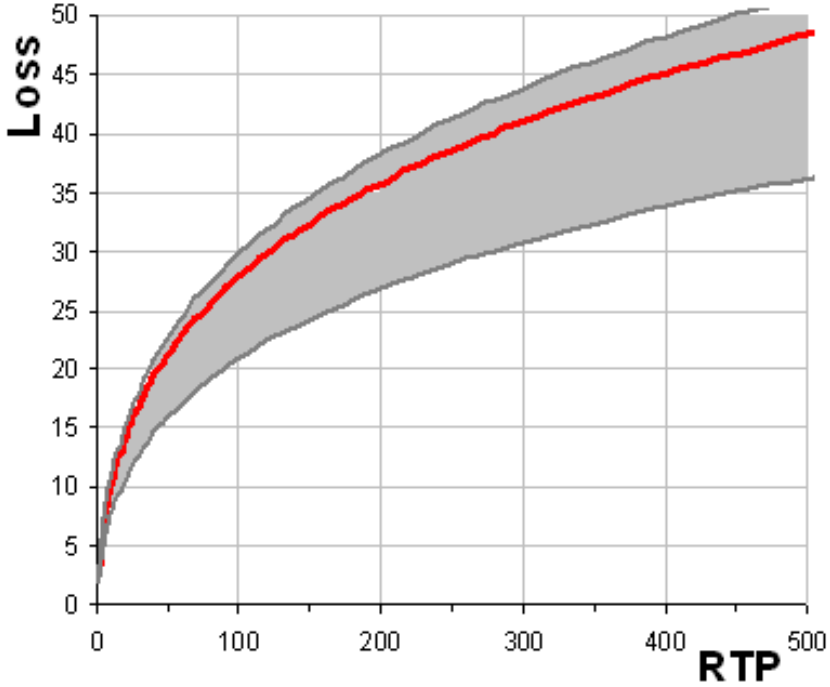
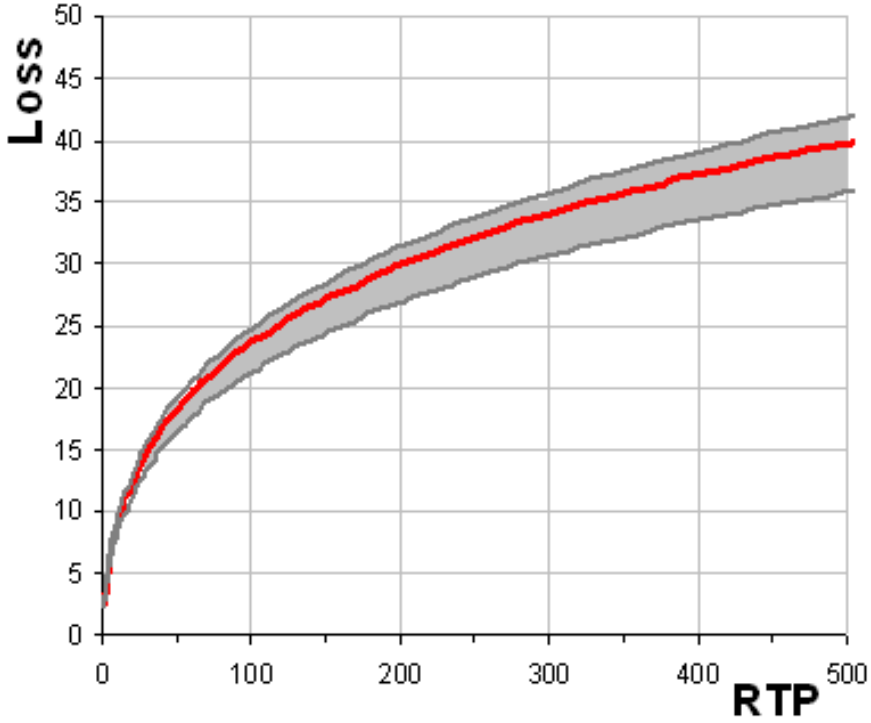
Reliability of the result

- Influence of data accuracy and geo-coding quality on Loss Exceedance Curve (LEC) estimate error





- Lower geo-coding exactness

Higher geo-coding exactness

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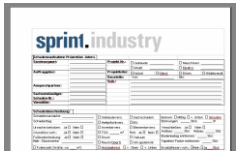
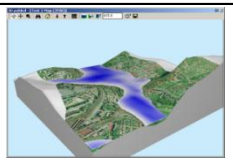
Prevention planning, Early Warning Systems

1. Risk Identification

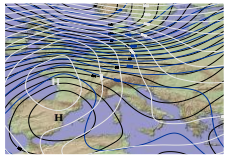
2. Detailed Risk Assessment

3. Prevention Planning





4. Warning



5. Performing Prevention Plan

6. Renovation

7. Documentation

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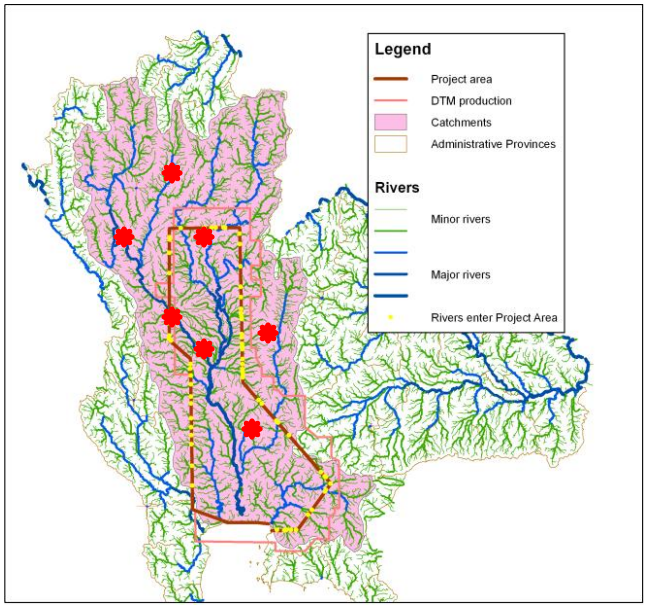
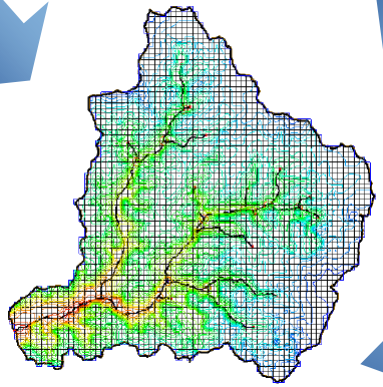
Flood Impact Forecast, Early Warning

- Flow/Gauge stations information

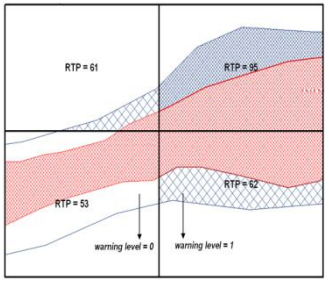


- Flood Hazard Zones

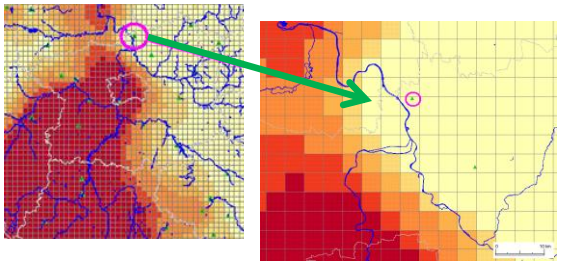
- Hazard v. event comparison



- Locations at risk:
  - Automatic warning
  - Loss estimation



- Synthetic event set



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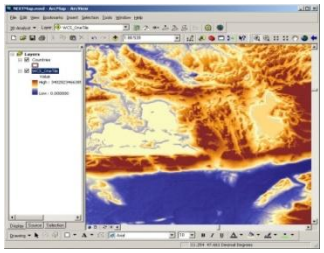
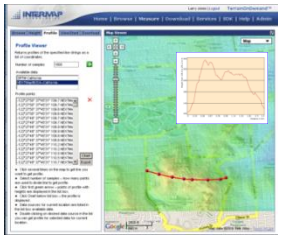
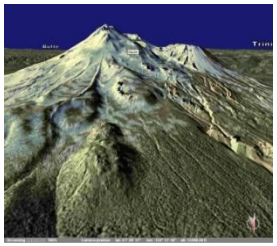
Risk Application Platform

GIS Tools | Analysis | 3D View | Risk Management | Mobile Apps

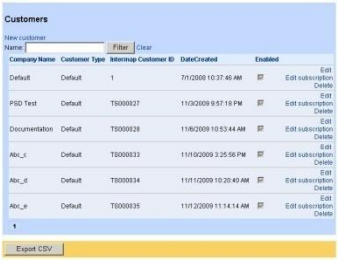
Access Control, Journaling

WMS | WCS | Get Height | Get Profile | MLP | 3D Streaming | Risk analysis

Aquarius.NET Server

Data Storage

Access Management, Security, Classified



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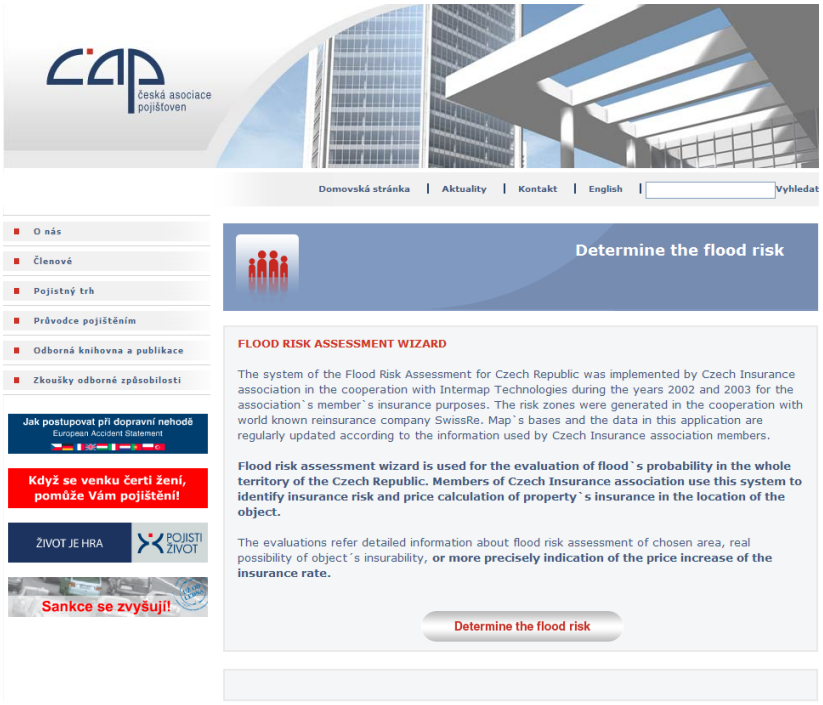
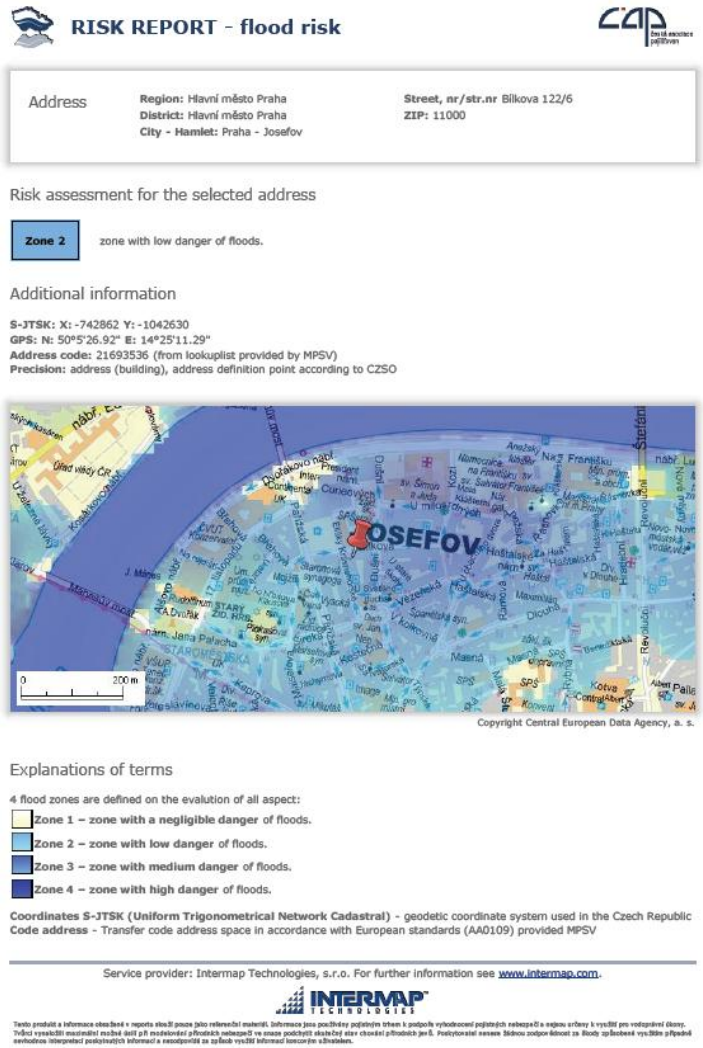
Public Flood Risk Portal Czech Republic

- B2C Risk management application
- Provision of house based flood risk reporting
- Launched to the public at January 13 2009
- Huge trafic through the flood period in May 2010





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Conclusions

- Current, highly accurate and homogenous elevation data allow for more detailed and accurate flood hazard mapping and modeling.
- Evaluate flood risk not only on a property-by-property basis, but also at a portfolio level for large territories.
- Ultimate value through usage of the same underlying hazard information for single property risk assessment (underwriting/pricing) and for portfolio flood exposure modeling (reinsurance).
- All different industries can benefit from having access to such an information. Not talking only about Insurance and Reinsurance industry, but telecommunication, transportation, housing, lending/morgage, ..., public.

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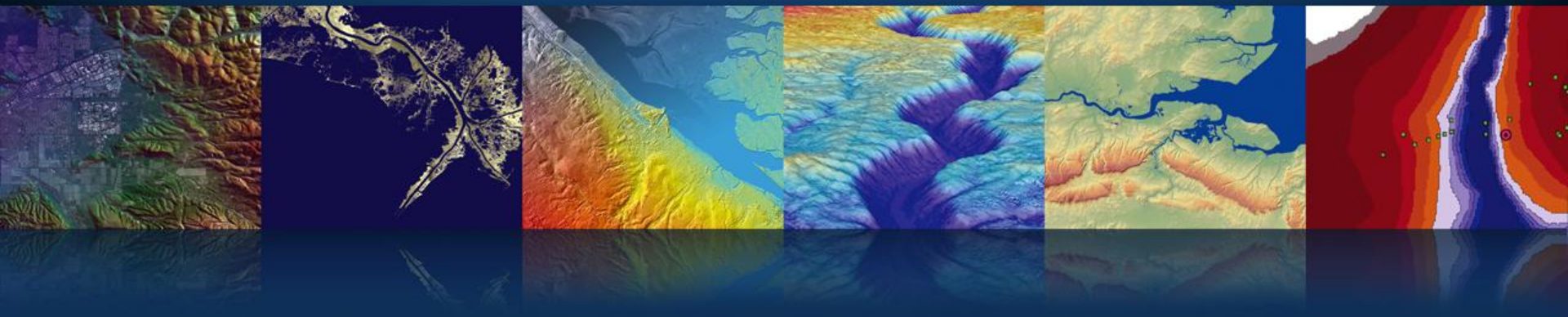

Thank You

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