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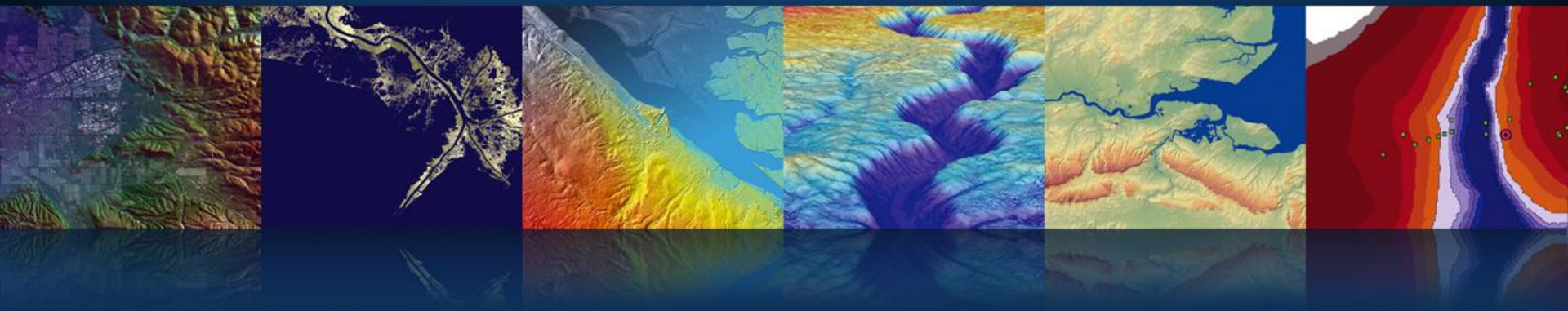
INTERMAP



SEAMLESS FUSION OF LIDAR, RADAR, AND OPTICAL TERRAIN DATA

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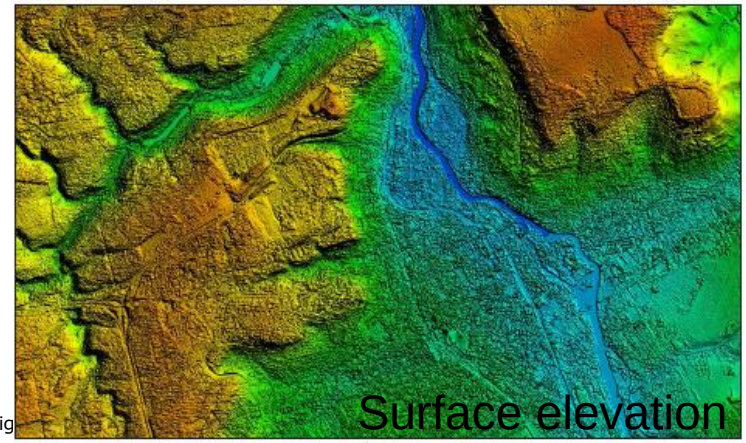
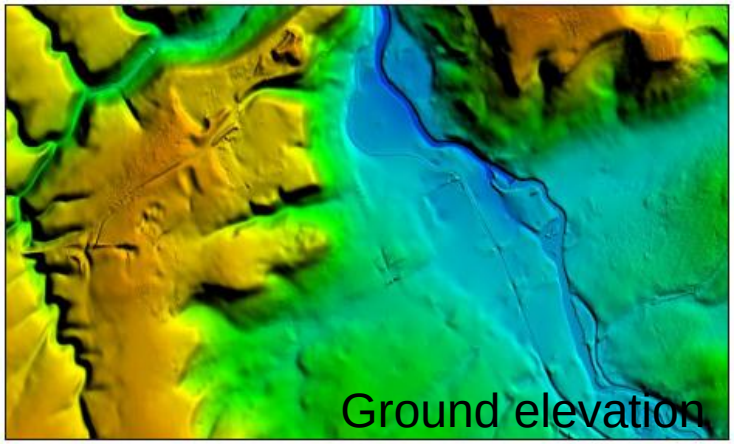
www.Intermap.com

Agenda

- NEXTMap Data
- DEM Technologies
- DEM Fusion Techniques
- Study Sites and Data Sets
- Methods
- Analysis
- Results
- Conclusions



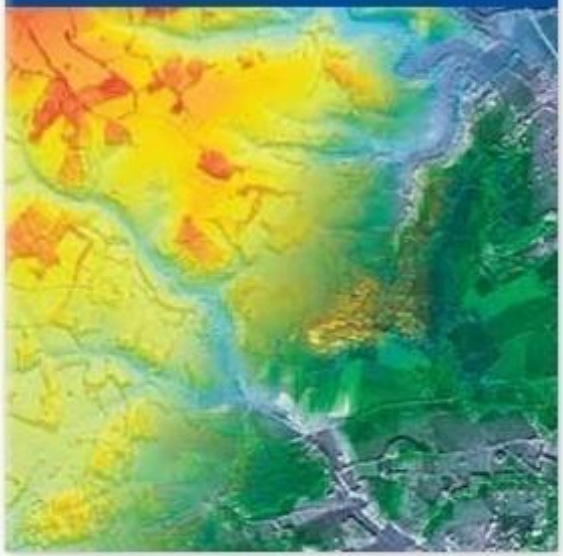


NEXTMap Product Architecture

INTERMAP

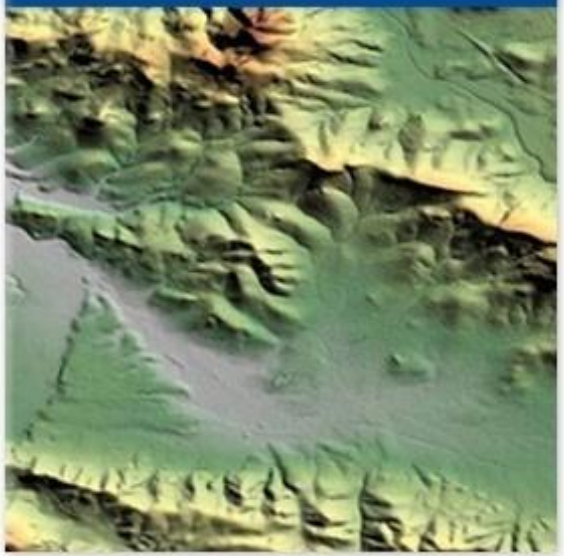
Digital Surface Model

5m post, 1m vertical accuracy



Digital Terrain Model

5m post, 1m vertical accuracy

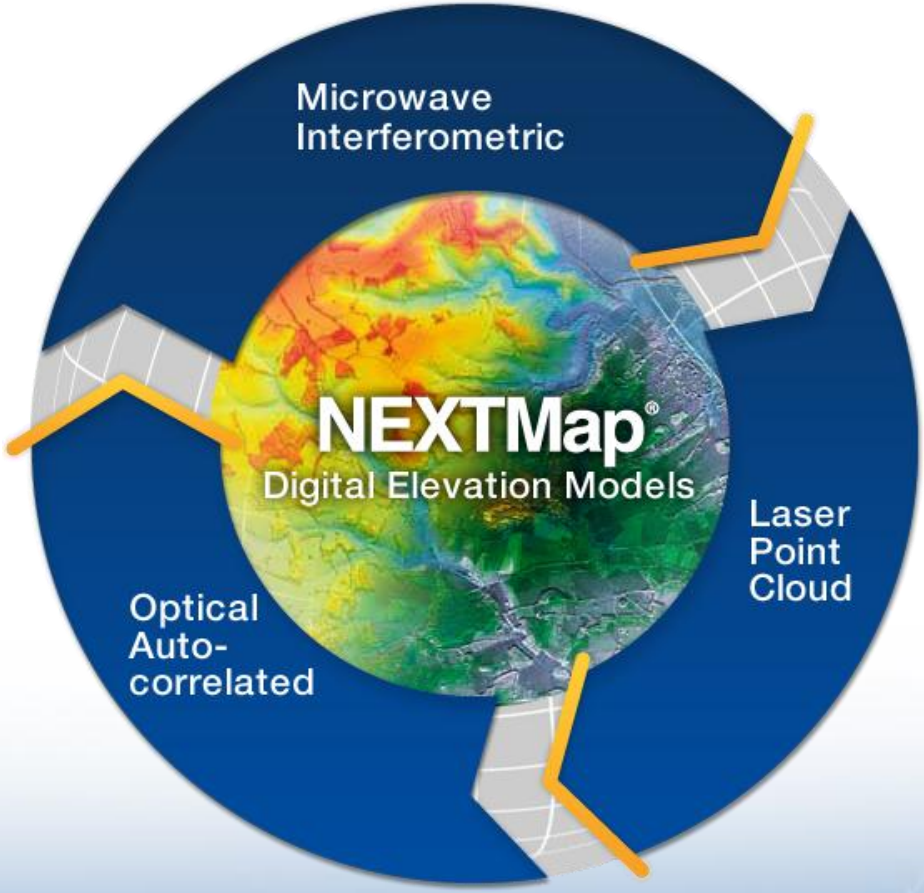


Orthorectified Radar Images

**1.25m pixel,
2m horizontal accuracy**

DEM Technologies (e.g. Stereo Images)

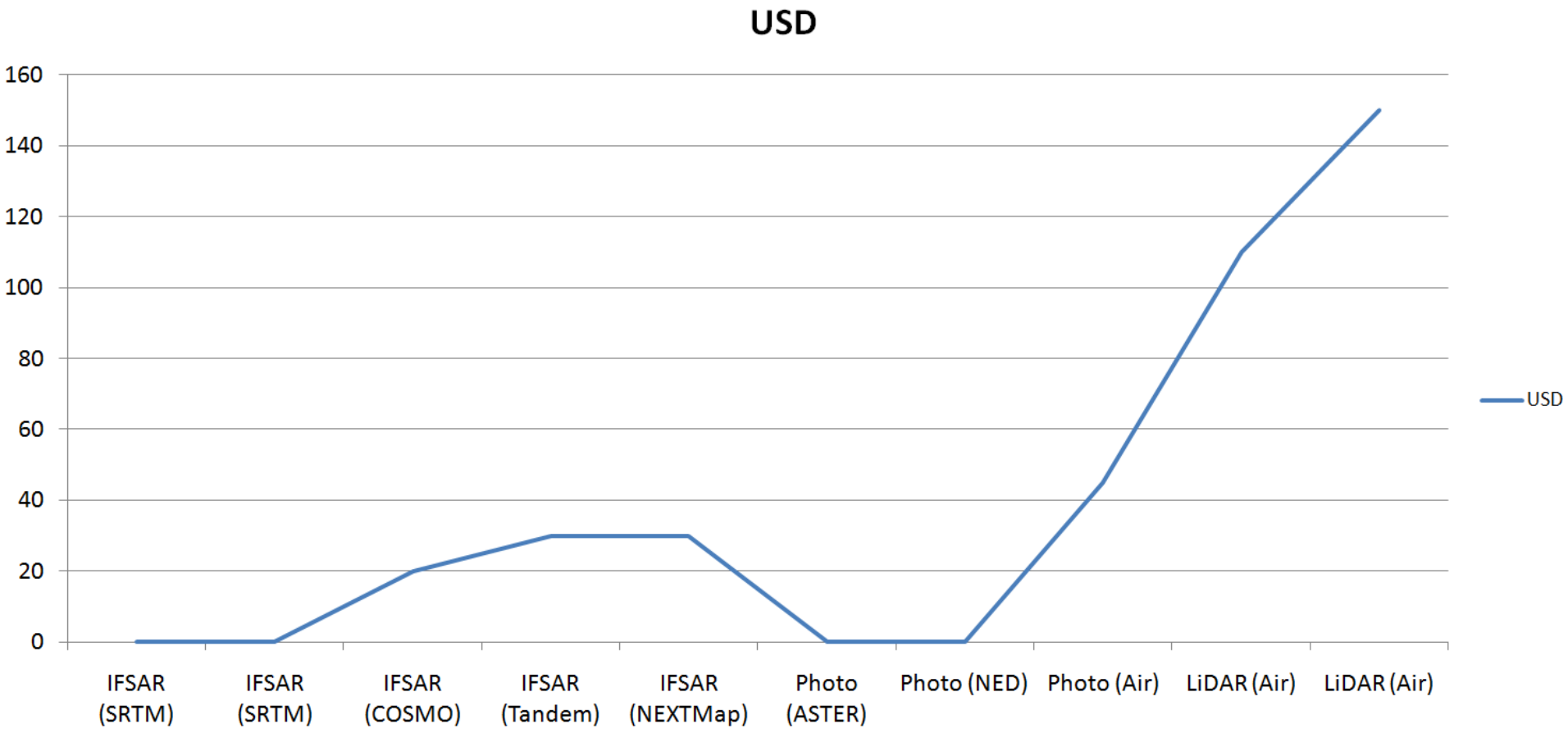
Multiple airborne and spaceborne technologies are available for the creation of digital elevation models:



- **Microwave Interferometric DEMs**
  - NEXTMap, TerraSAR-X, Tandem-X, COSMO Skymed
- **Laser Point Cloud DEMs:**
  - Airborne LiDAR systems, ICESat
- **Optical Auto-correlated DEMs**
  - Digital Globe, GeoEye, Astrium (SPOT), RapidEye, MS (Clearview30)

DEM Technologies

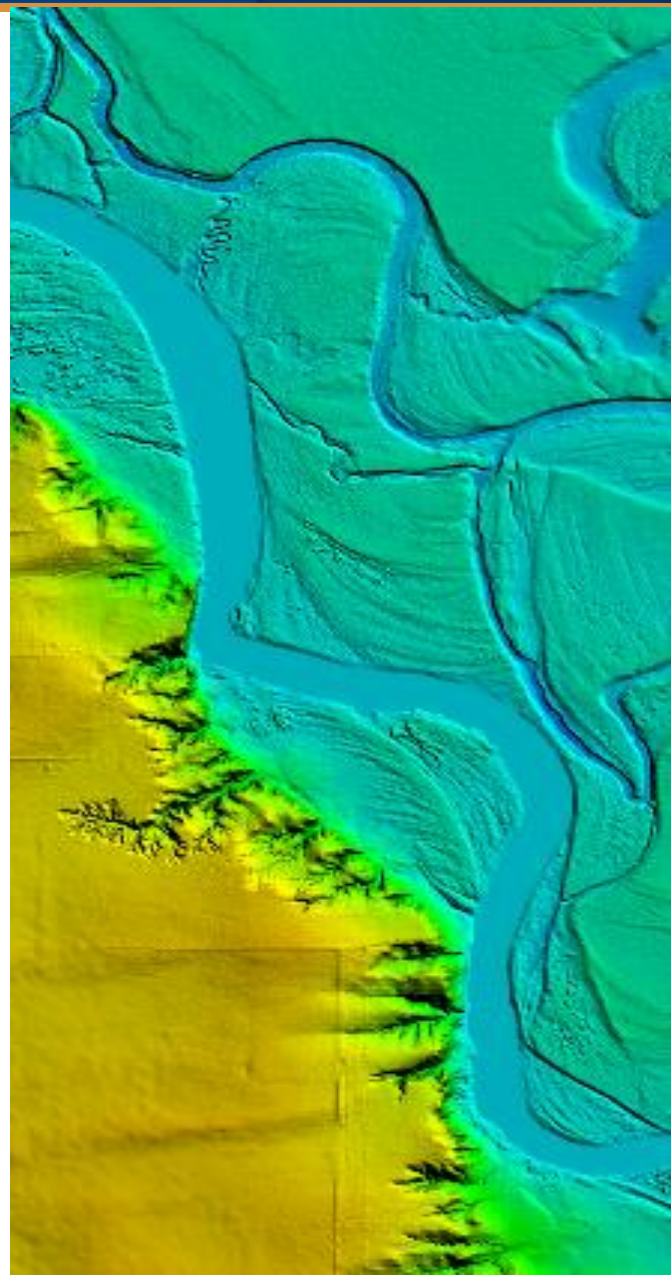
- Various airborne and spaceborne technologies are available for DEM generation.



Data Fusion Technique

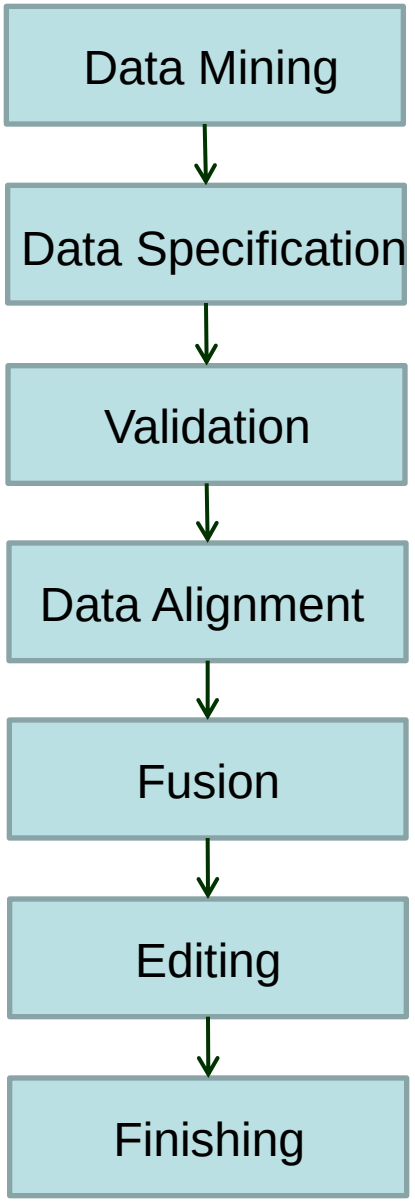
- Combines multiple Digital Elevation Models (DEM) from varying sources at varying accuracies and resolutions into one homogeneous product
- Alternate data can be blended or fused to more consistent foundational elevation data
- Data Fusion can improve vertical accuracy of DEM inputs and bring multiple external data sets to the same reference

Data fusion can blend disparate DEM data into a unified mapping elevation layer.



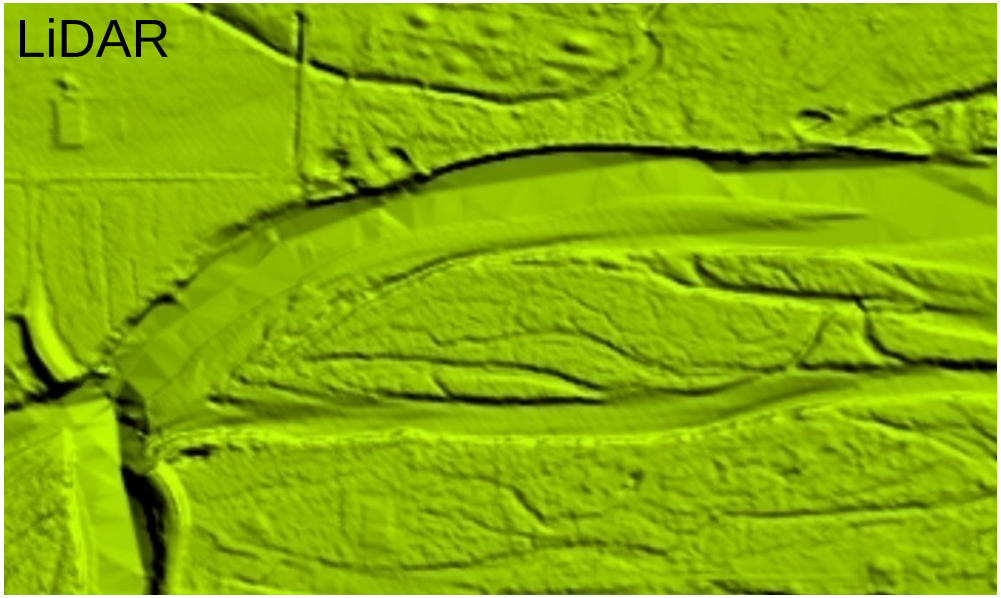
DEM Fusion Process

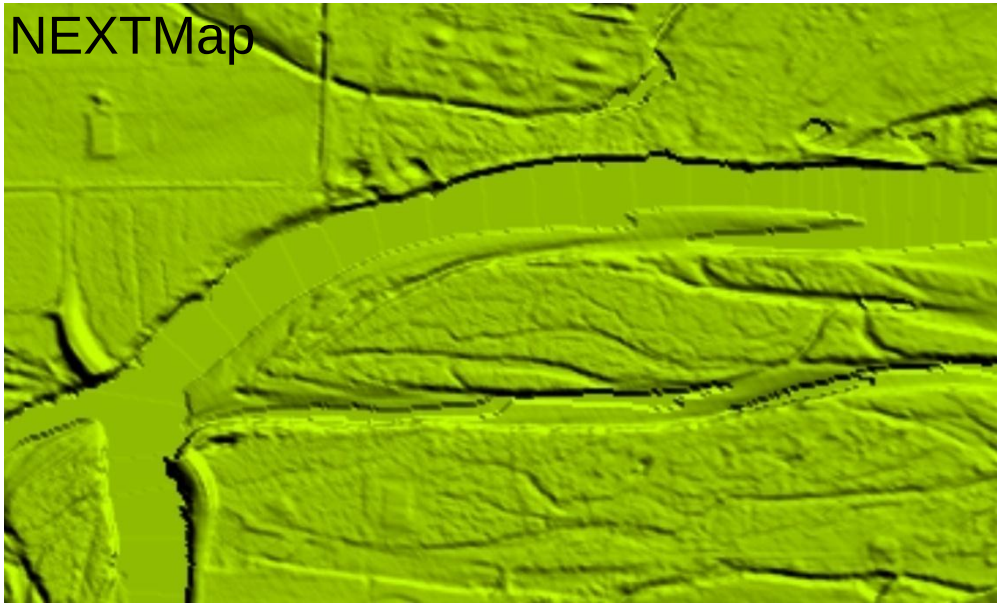
- Data Aggregation:
- Using the lowest resolution data supplied, or using the data required by the customer, our data engineers aggregate, validate, align, fuse and normalize all datasets to a consistent common terrain dataset
- Imagery is of assistance in validating what we see in the elevation data.



Data Specification

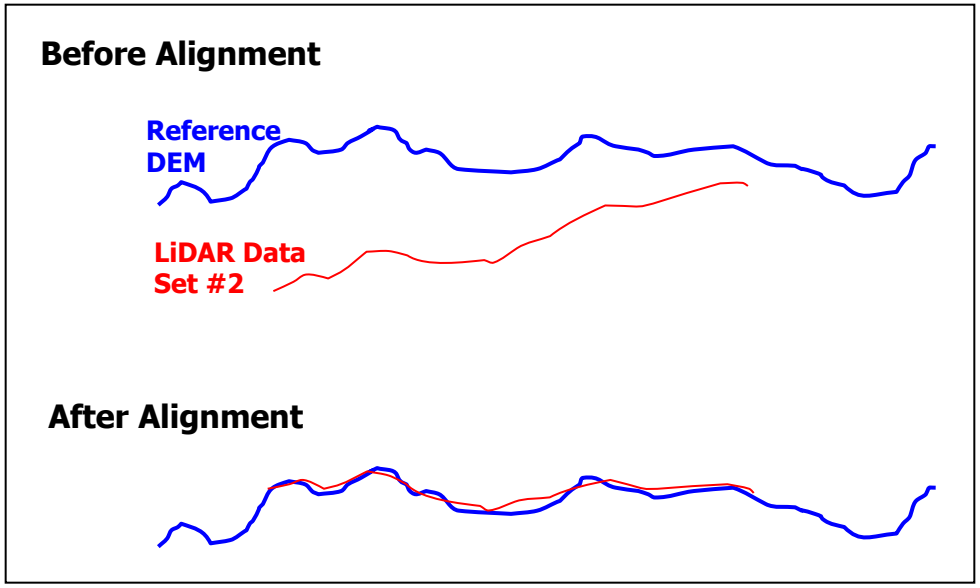
- Determination of what the final output data specification will be will drive the following data fusion processing steps:
  - Ground sampling distance
  - Hydro-enforced edit rules (e.g. water edits)
  - Seamless
  - Complete Coverage

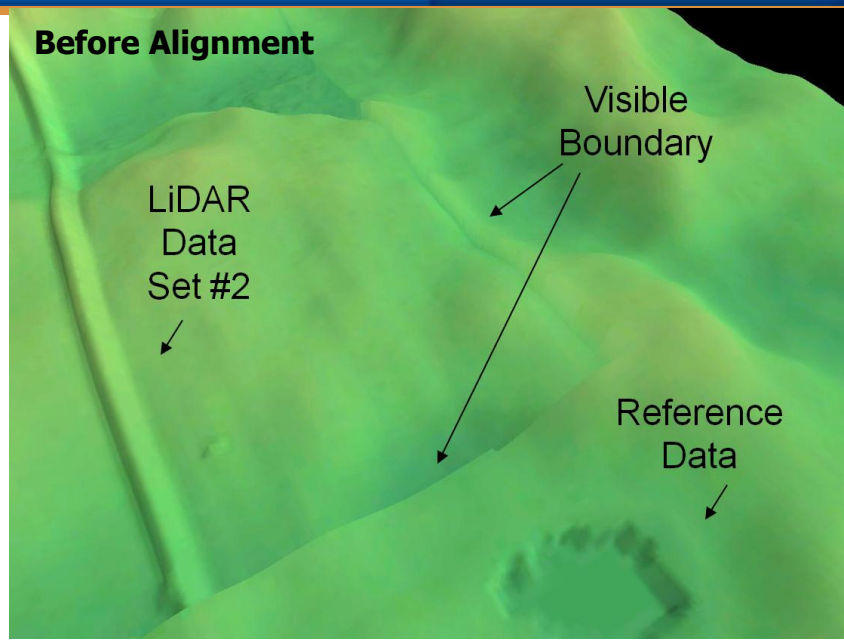


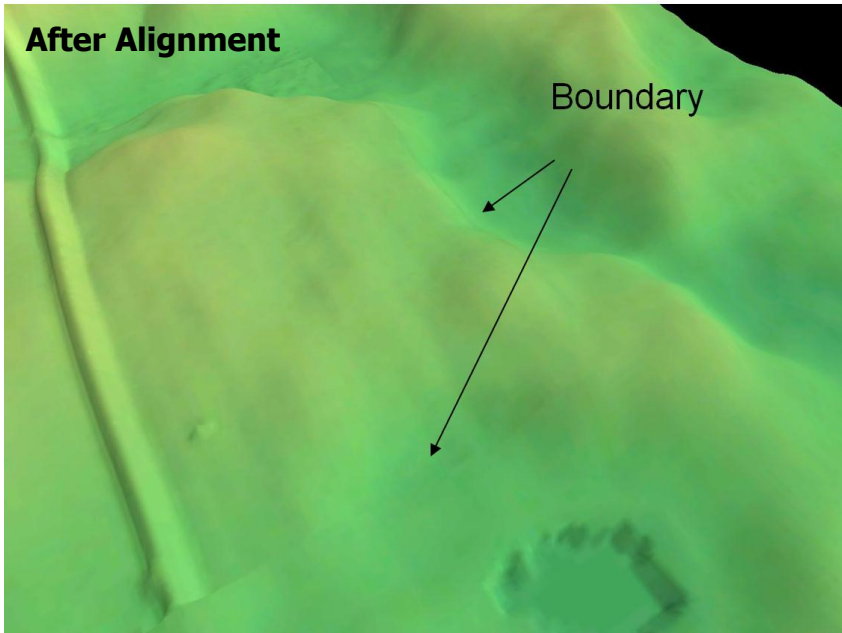


DEM Alignment Example

- DEM Alignment is made to the reference DEM with better absolute accuracies (not necessarily better resolution or precision) to correct for these systematic errors.

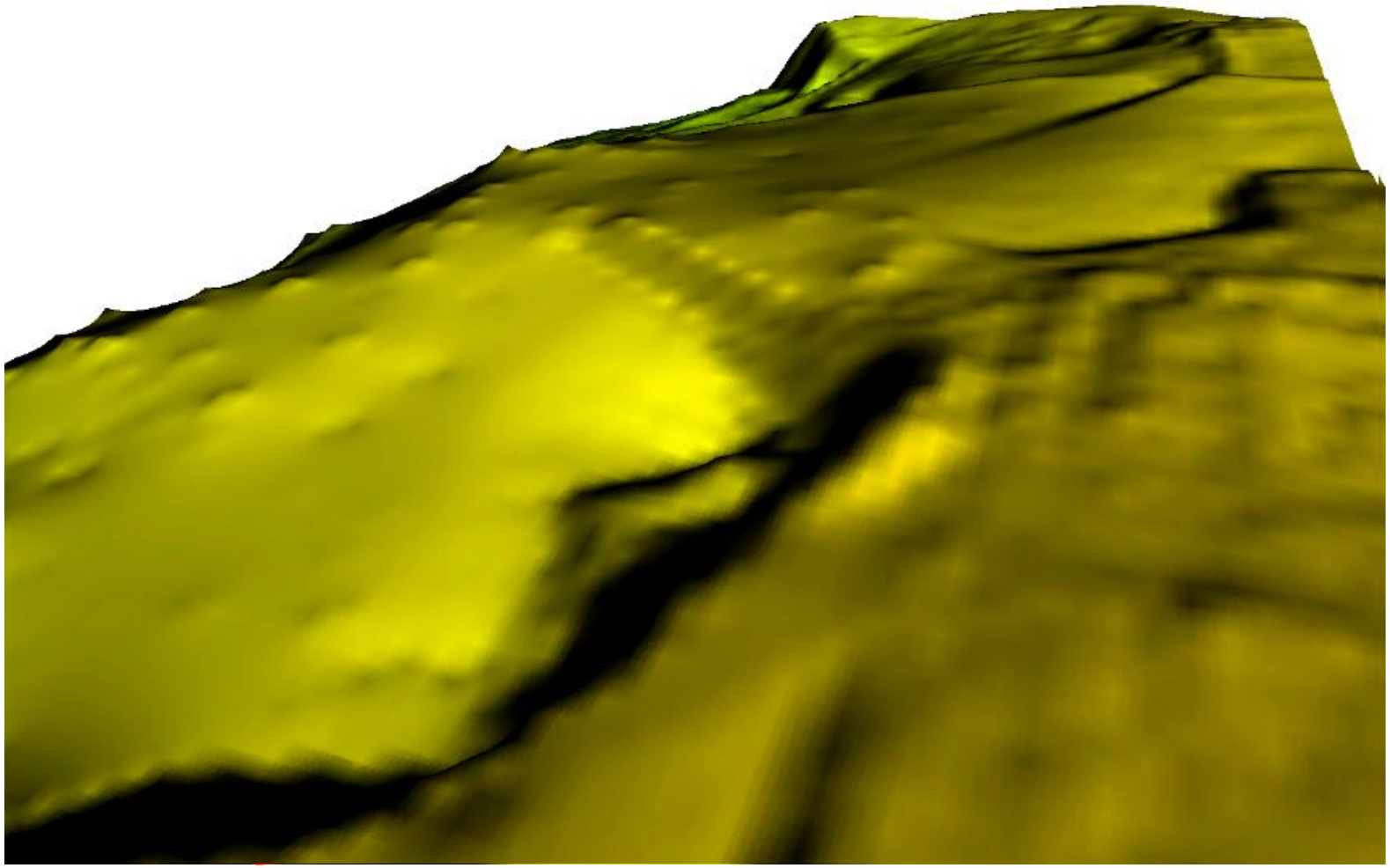






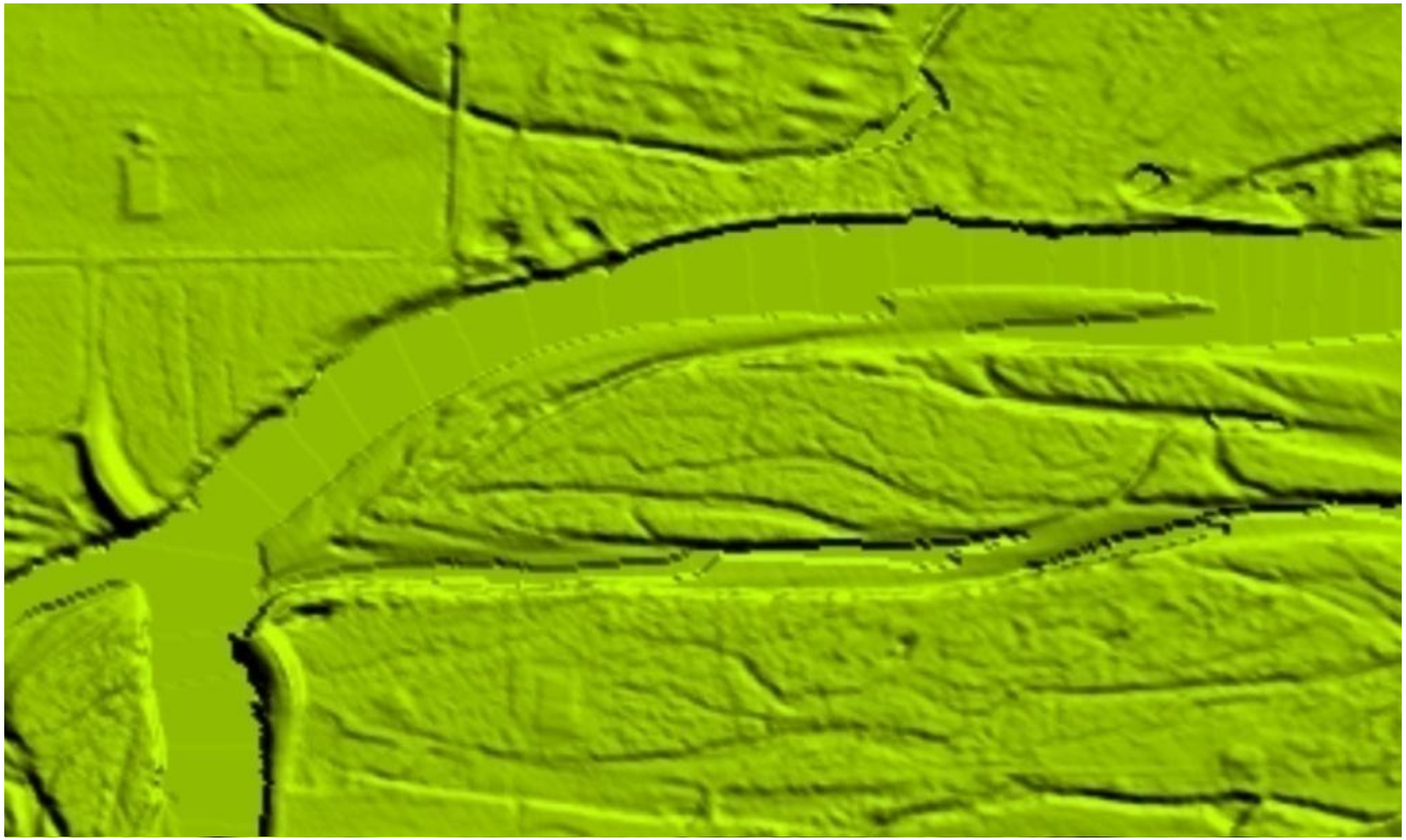
DEM Fusion Example

- After the DEMs are aligned, the boundary between the two is blended (fused) together to produce a seamless single DEM.



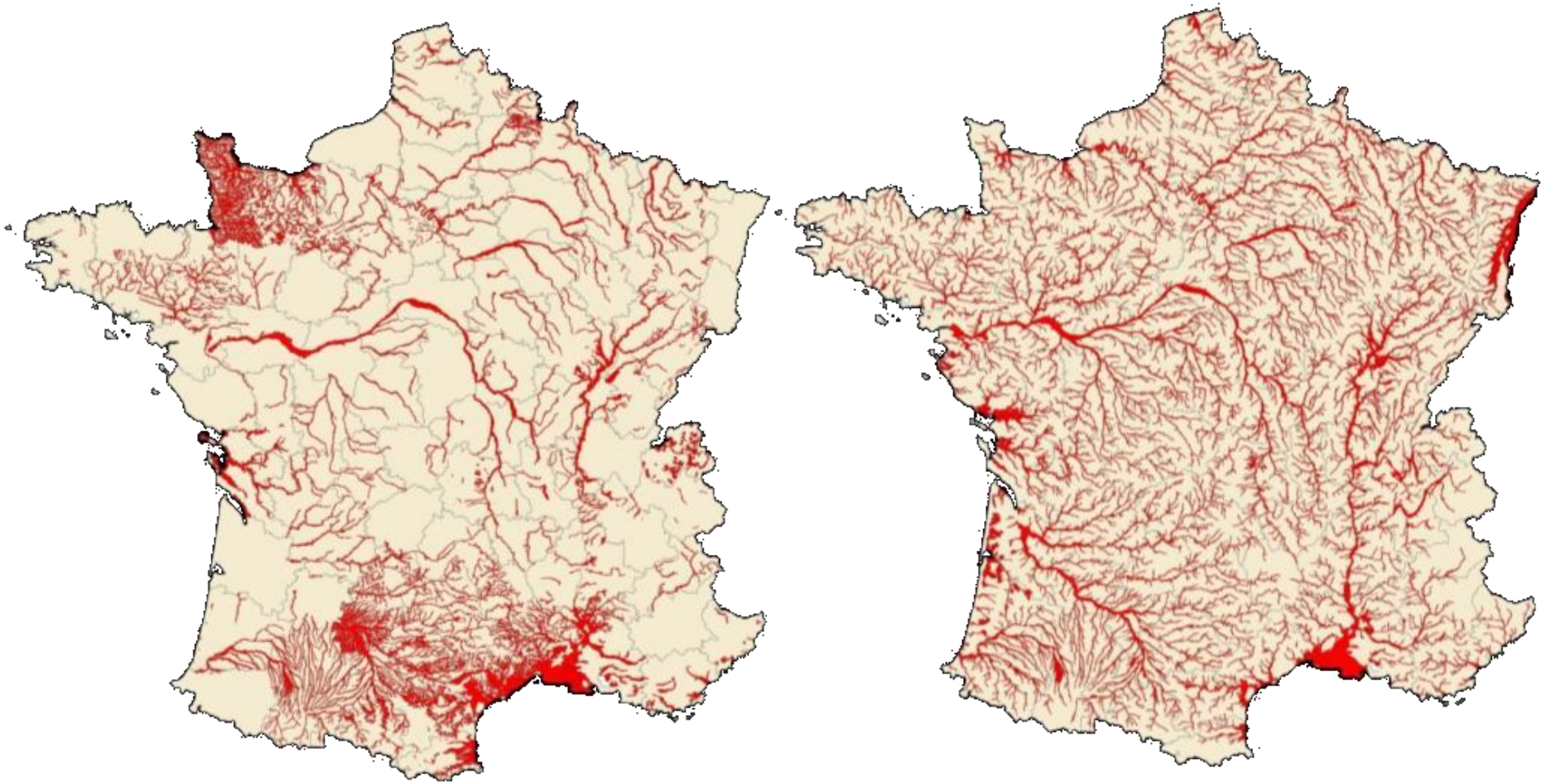
Hydro-enforced Terrain

- Terrain datasets may need to be hydro enforced (or monotonic - all watercourse features flow downstream, and all standing water bodies are flat through our editing process).



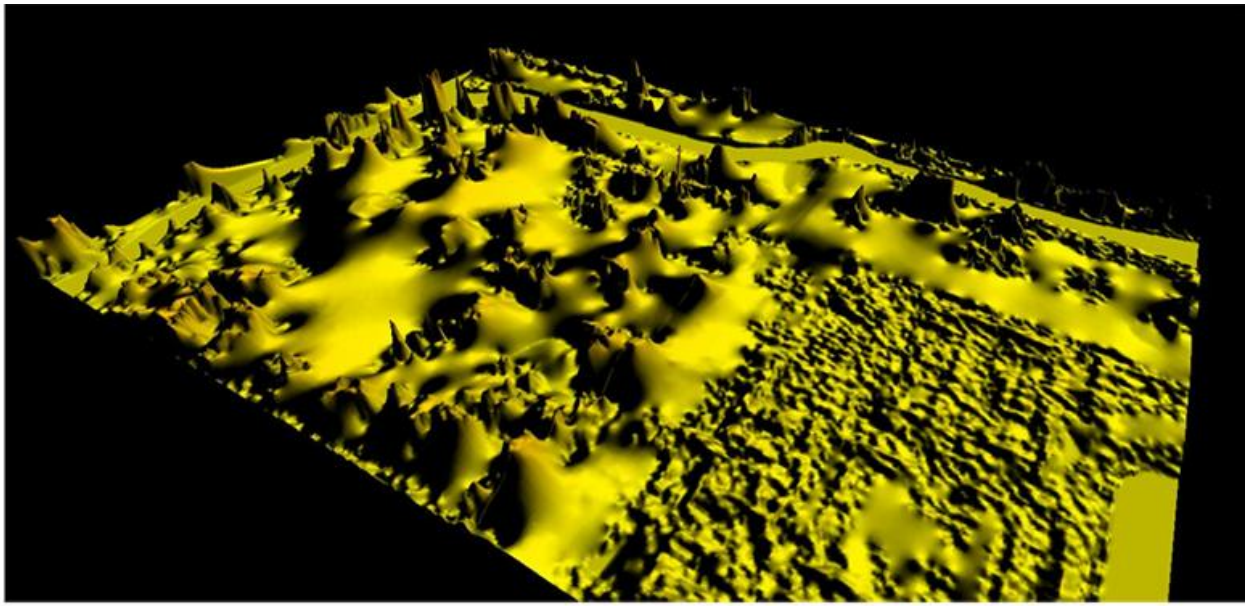
Water Management Applications

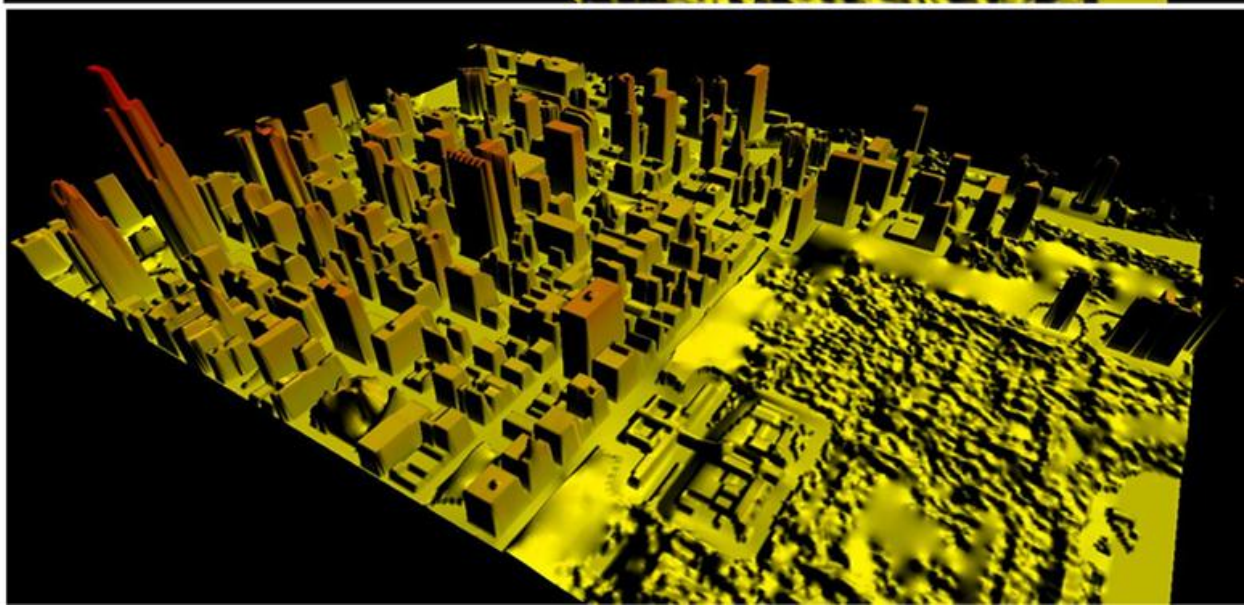
- Water management, may require data over political boundaries or over large areas require consistent elevation data for water management practices.



Urban Planning Applications

- Improvement in DSM data in urban cores by fusing LiDAR and IFSAR (NEXTMap) DSM data.
- Better delineation of buildings and road network.

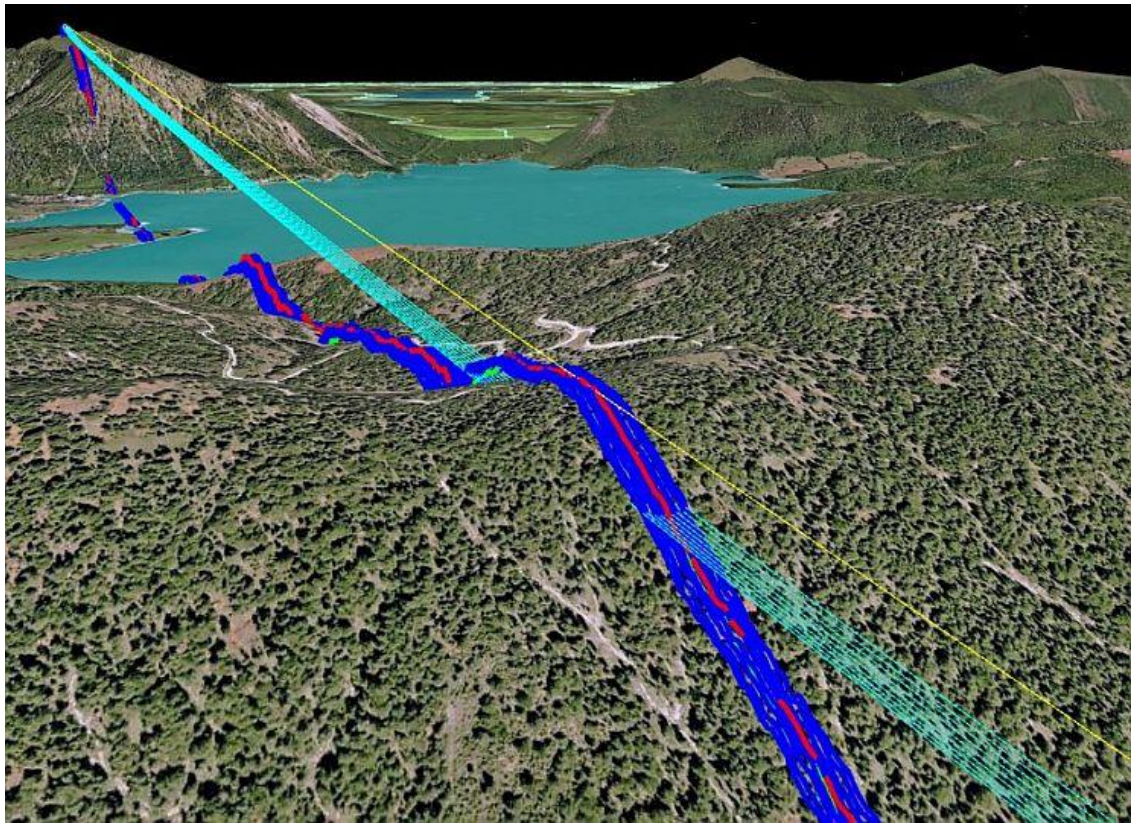


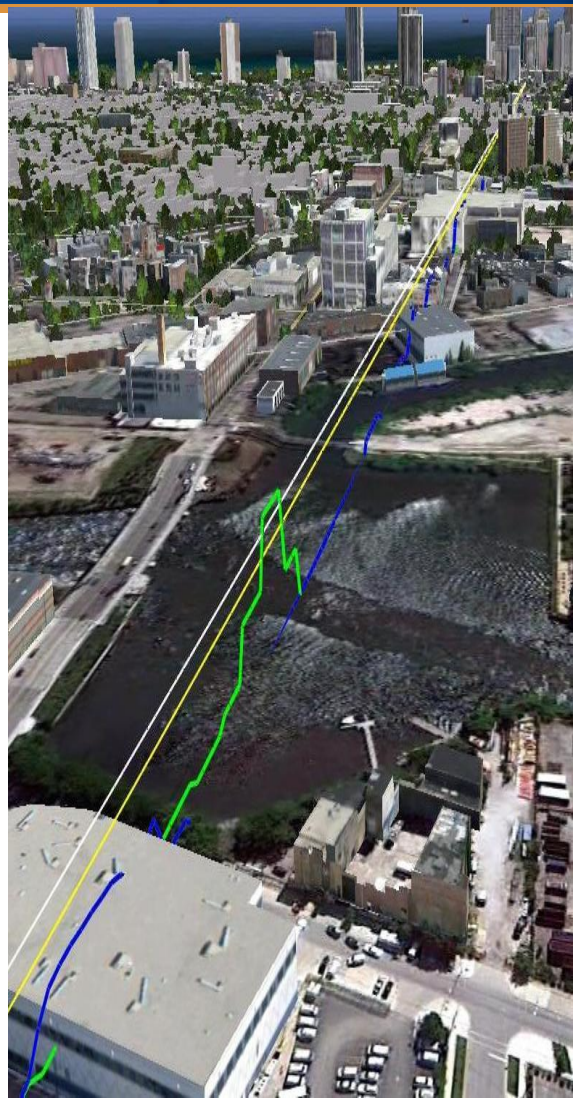


Telecommunications Application

- 3D terrain and surface elevation profiles help optimize placement of microwave transmission and reception towers.

- High resolution elevation data set in urban core (from 1m LiDAR and 5m IFSAR) compared to a 30m IFSAR DSM elevation data set; Coarser resolution data satisfied rural regions.



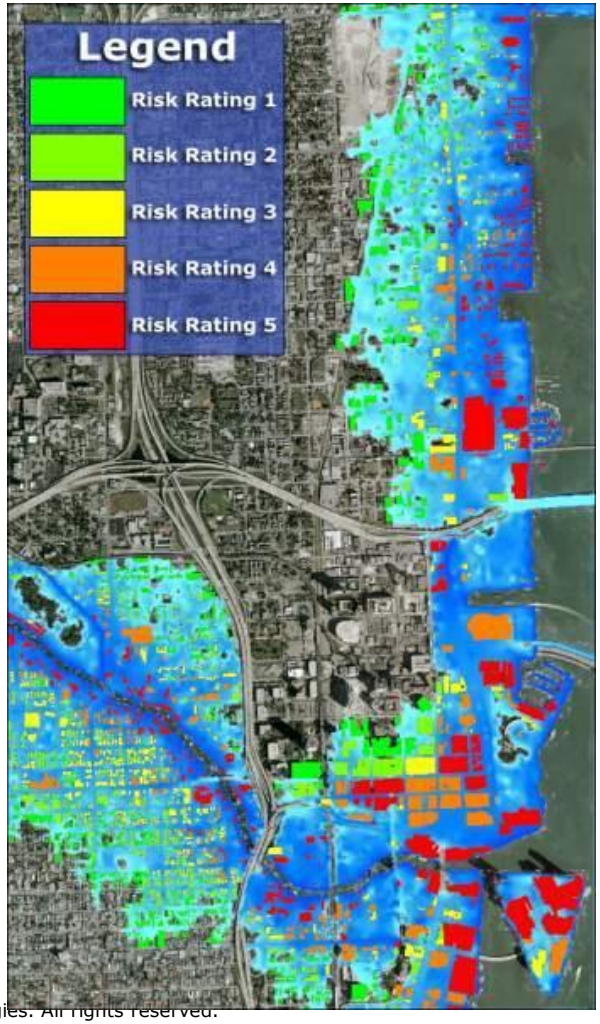


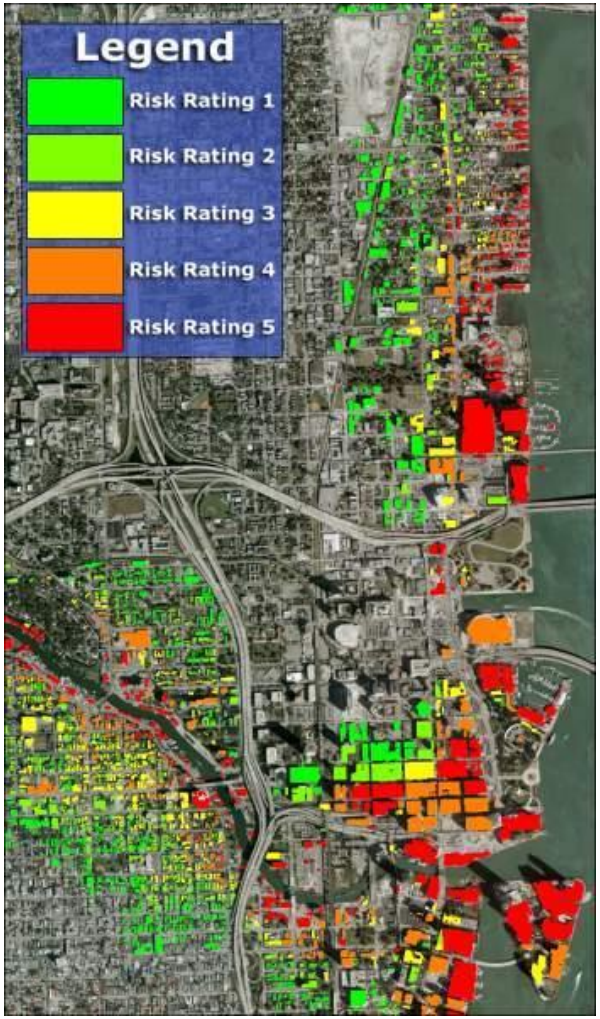
5m DSM Elevation Data
30m DSM Elevation Data

Flood Planning Applications

- Flood planning over political boundaries or over large areas require consistent elevation data for flood and hazard models to work.

10 m DTM





5 m DTM

Conclusions

- We reviewed how a variety of elevation data sets from different sources could be fused to create a seamless, consistent elevation foundation for use in a host of applications.

- Data fusion process is critical in a world where we work with multiple data sets, comprised of different technologies, resolutions, accuracies, over areas of interest.

- **Thanks for you time!**

- **QUESTIONS?**