Vertical Datum Transformations: Exploring a GIS Approach

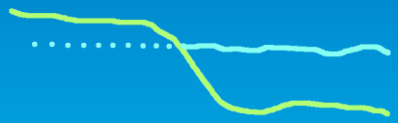
Bertrand Baud - Esri

What is a vertical datum?

- Reference surface of zero elevation to which heights of various points are referred
- **Ellipsoid**

- **Geoid**

- **Tidal**



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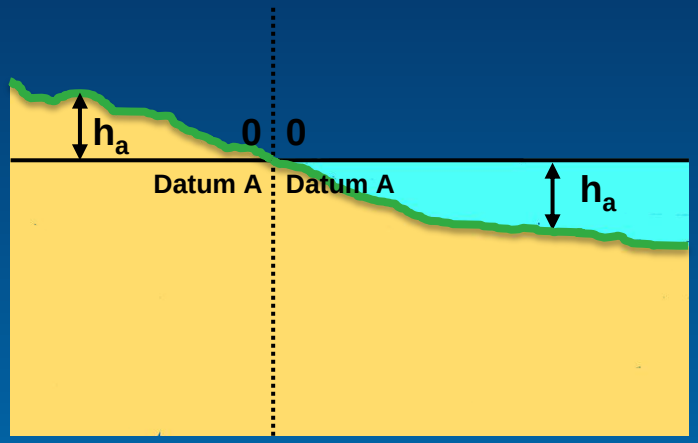
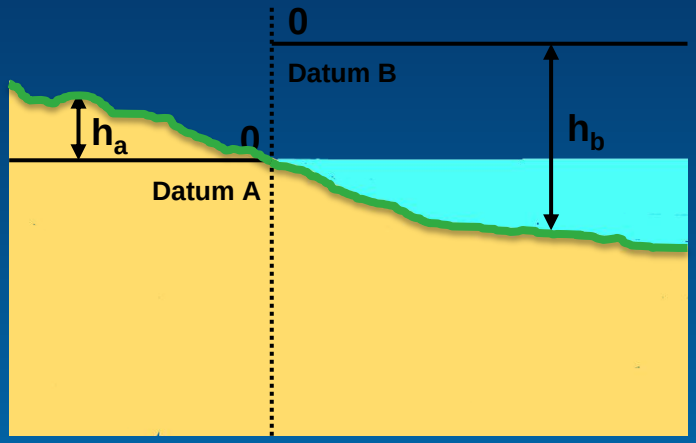
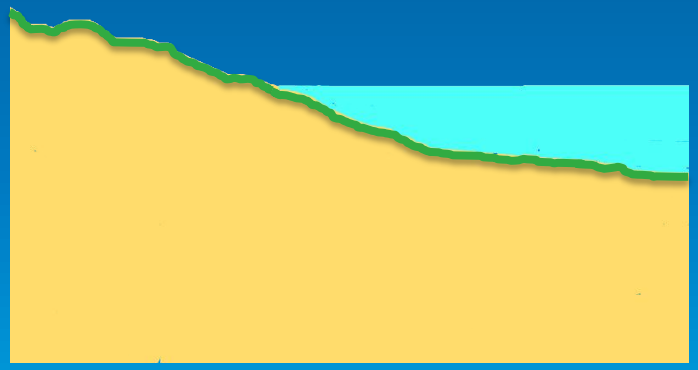
Why do we need several datum?

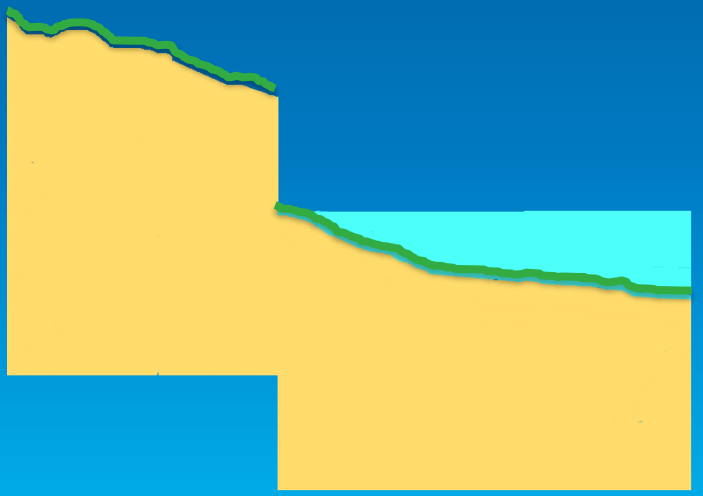
- Better local approximation of the real world
- Improved accuracy of remote sensing
- Changing world
- Special purposes

Pb: Mixing datasets datum









Real world impact: Vertical datum issues during Hurricane Katrina (2005)

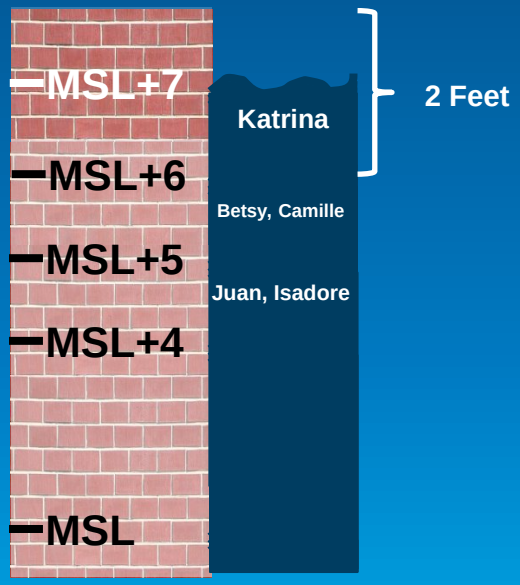
- Levee system failure in New Orleans
  - 1833 deaths
  - US$81 billion

- Report:

  "Investigation of the Performance of the New Orleans Flood Protection Systems"

  - "Vertical Datum" mentioned 75 times*

  - Levee System: *Wrong datums were selected for the contract drawings. Some walls were constructed almost 2 feet lower than intended**



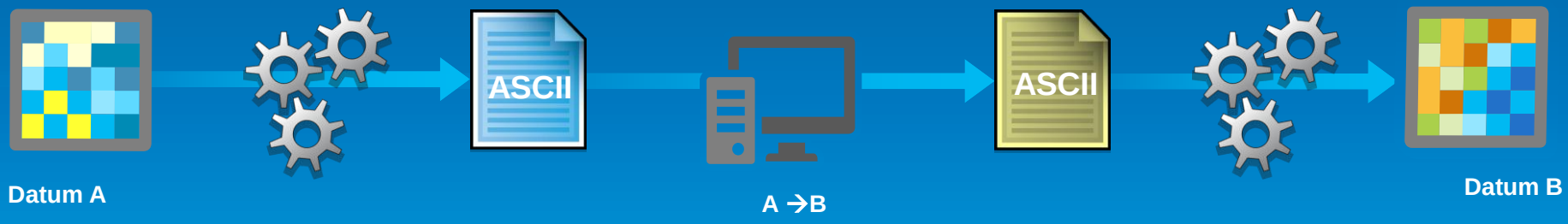
NOAA - National Geodetic Survey:

"Training Required for Proper Use of Vertical Datums"

Current tools:

- Handful of commercial tools
- Limited, ad-hoc solutions
- In North America: NOAA's VDATUM
  - Great tool, free, but has some limitations

- Typical workflow:



- Limitations: Data manipulations, data duplication, manual process, slow, limited extent

How to improve on it?
Wish list:

- Convenient
- Fast
- No data duplication
- No need to reformat data
- Cloud-based
- …

- Proof of concept using Mosaic Datasets

Possible paths forward

- Easily extendable (local knowledge)
- Automated (metadata-driven)
- Crowed-sourced separation model data store
  - Cloud-based
  - Authoritative
  - Multiresolution
  - Free

Closing thought

Always document vertical datum information in metadata

Understanding our world.