COASTAL DEM DEVELOPMENT
BEST PRACTICES

NOAA's National Geophysical Data Center (NGDC) builds and distributes high-resolution, coastal digital elevation models (DEMs) that integrate ocean bathymetry and land topography to support NOAA's mission to understand and predict changes in Earth's environment, and conserve and manage coastal and marine resources to meet our Nation's economic, social, and environmental needs. DEMs should be as accurate as possible to minimize error in the modeling of coastal processes. Good practices throughout DEM development help to ensure this.

http://www.ngdc.noaa.gov/mgg/coastal/coastal.html

STRATEGY: Plan Ahead

1. Determine the purpose of the DEM. DEMs have many uses (e.g., modeling of tsunamis, storm surges, or coastal currents), each of which may have specific requirements.
2. Select DEM parameters (extent, cell size, vertical datum, file format, etc.) that will best support the intended use.
3. Choose a gridding technique that will minimize errors when interpolating across large areas without data (see Fig. 1).
4. Collect data in an area larger than the DEM (see Fig. 1) to avoid anomalies along DEM edges.

check

Search the Internet for DEMs of your study area to see if an existing one is suitable.

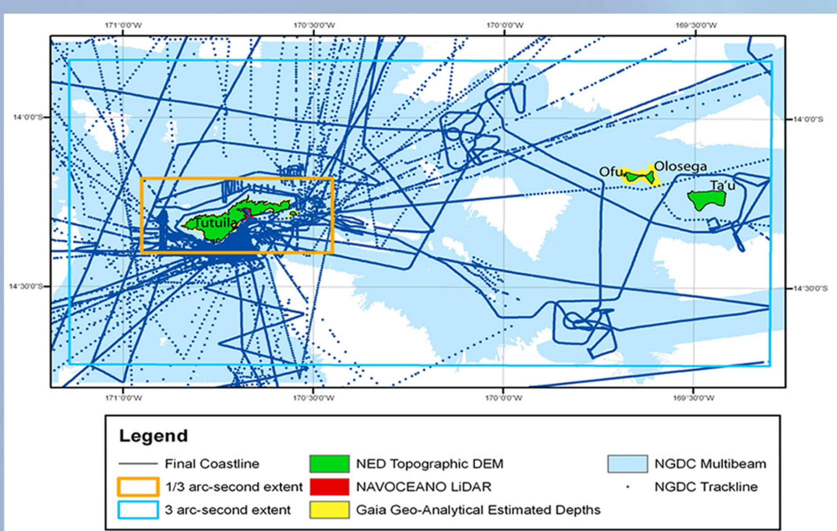

Fig 1. Pago Pago, American Samoa DEM data sources. Data were collected in an area 5% larger than DEM extents to prevent gridding edge effects. The DEM was also extended to encompass the smaller U.S. islands to the east. A second, higher-resolution DEM (orange box) was built where data are denser. White areas lack depth measurements.

STRATEGY: Know Your Data

1. Determine what data are available and carefully assess that data, so that you know their inherent problems and limitations.
2. Verify that metadata are correct.
3. Determine if data overlapped by newer surveys need to be eliminated. This may or may not be necessary depending upon if there has been significant morphologic change between the two survey years (see Fig. 2).

hint

Review journal articles, company survey reports, and local government documents to find data sets in the region that are not accessible on the Internet.

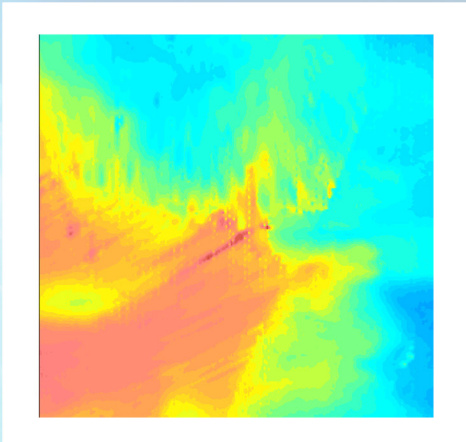

Fig 2. An example of anomalies created from overlapping and inconsistent data sets. More recent or higher-resolution data sets are usually more accurate, and the other data may need to be eliminated.

STRATEGY: Pay Attention to Detail

1. Organize your file structure to help keep track of file types, data edits, and datum conversions. This helps others review your work.
2. Double-check all data conversions and transformations for possible software or processing errors.
3. Determine how detailed your coastline needs to be, and what features should be included or excluded, such as piers (see Fig. 3).

to do

Document all data sources and processing steps when building the DEM, so that users can reconstruct your work.

Fig 3. Example of varying coastline needs. Two coastlines were developed for the region surrounding the Los Angeles and Long Beach harbors. The red coastline does not include the large wharves resting on pilings and was used to build an intermediate model of seafloor relief. The white coastline, which includes the wharves, was used to clip the seafloor relief model and ensure that the wharves had positive elevation values in the final DEM.

Strategy: Convert to Common Datum

1. Convert all data to a common horizontal datum and file format, so that overlapping data sets can be directly compared to each other.
2. When necessary (i.e. when the cell size is small, 30 meters or less), convert data to a common vertical datum to minimize anomalies along the coastline.
3. Where available, use VDatum (http://vdatum.noaa.gov/) to convert between vertical datums. Otherwise, use datum offsets measured at local tide stations (http://tidesandcurrents.noaa.gov/).

Look for inconsistencies between overlapping data sets, especially along the boundaries of data sets.

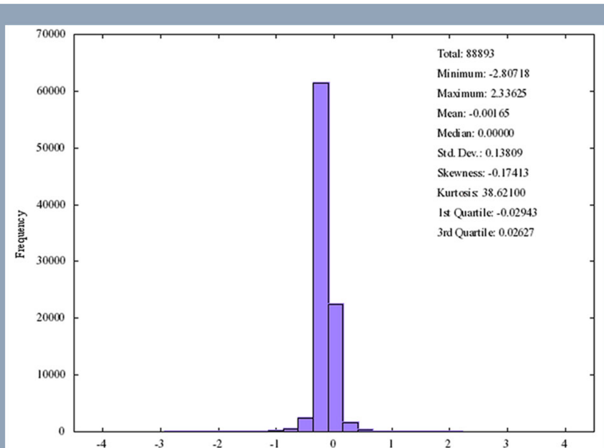

Fig 4. A histogram comparing a source data set's elevations with the DEM. Large discrepancies need to be evaluated to determine their origin.

Strategy: Thoroughly Evaluate DEM

1. Statistically compare DEM cell elevations with source data sets to ensure that the DEM accurately represents source elevation values (see Fig. 4).
2. Visually compare the DEM with satellite images, topographic maps, nautical charts, and aerial and personal photographs to ensure that the DEM represents current morphology (see Fig. 5).
3. Compare DEM cell elevation values with independent measurements of eleva tion that were not used in DEM development, such as geodetic monuments (http://www.ngs.noaa.gov).

Search the Internet for personal photographs of your study area. They may show coastal morphology and be useful for visually evaluating your DEM.

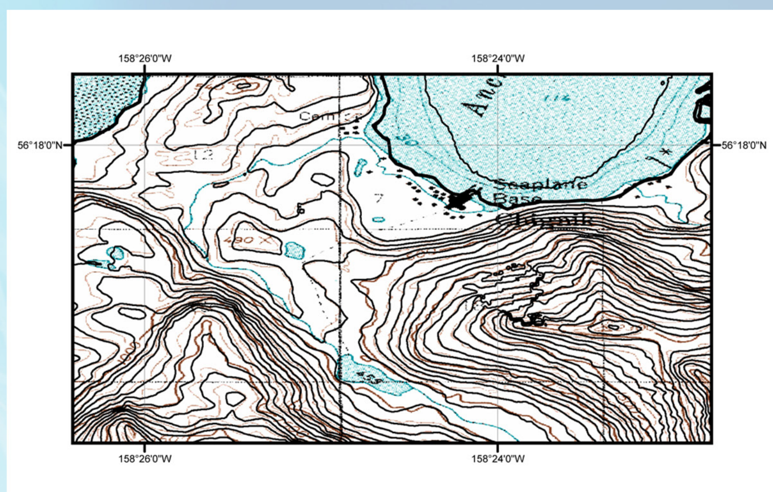

Fig 5. Comparison of DEM contours with a georeferenced USGS topographic contour map. Areas where the two contour sets diverge may indicate changes in morphology or errors in the DEM.

FOR MORE INFORMATION CONTACT:

NOAA National Geophysical Data Center
325 Broadway E/GC3
Boulder, CO 80305-3328 USA

Phone: 303-497-6826
Fax: 303-497-6513
TDD: 303-497-6958
Email: dem.info@noaa.gov
Web: http://www.ngdc.noaa.gov/mgg/coastal/coastal.html