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COMBINATION OF TOPOGRAPHY AND BATHYMETRY THROUGH APPLICATION OF CALIBRATED VERTICAL DATUM TRANSFORMATIONS IN THE TAMPA BAY REGION

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The impact and utility of Geographic Information Systems (GIS) to support mapping in coastal regions has created the need to relate the diverse data sets of topography, bathymetry, and shoreline. This requirement has lead to the Bathymetric-Topographic Demonstration Project, a joint NOAA-USGS project to develop a Digital Elevation Model (DEM) for Tampa Bay. The creation of a seamless DEM requires resolution of the numerous vertical datum references upon which the source data are based.

In the case of Tampa Bay, NOS charted soundings are referenced to both the Mean Lower Low Water (MLLW) and Mean Low Water (MLW) tidal datums. USGS topography data are referenced to the North American Vertical Datum 1988 (NAVD 88), an orthometric height datum. And, the newest data sets are geo-referenced with GPS in the North American Datum 1983 (NAD 83) datum.

A Java application, VDatum, developed at the National Ocean Service, NOAA, incorporates transformation equations and models for 26 vertical datums. This includes a geoid model, to relate GPS to an orthometric datum, and a numerical circulation model of Tampa Bay, to establish a variety of tidal datum relationships. The geoid model was calibrated against GPS ellipsoid heights on leveled benchmarks throughout the conterminous United States. The circulation model was calibrated against tide gauge measurements prior to extraction of the tidal datum model fields.

Comparison with over 100 leveled tidal benchmarks indicates a 16.3 cm offset between NAVD 88 and local mean sea level at Tampa Bay. The RMS fit of the various tide datums range from 1.9 to 3.3 cm, consistent with the assigned error of the numerical circulation model. A new method of circulation model testing developed during this project, based on comparing MLW and MLLW model values to tide gauge differences, shows that further circulation modeling improvements are warranted. In sum, the calibrated transformation and circulation models have been highly successful in incorporating the diverse data in Tampa Bay into a unified, seamless DEM.

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