A stable vertical reference for bathymetric surveying and tidal analysis in the high Arctic

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The measurements, as routinely collected and currently presented, are strictly with respect to the local water surface. Though precise navigation and soundings are subject to both horizontal and vertical inaccuracies, the results are not used to build up an accurate picture, at least in the longer term. Vertical data are subject to additional changes in height, due to the construction of buildings, seasonal (heave) and vertical currents. The traditional method used for this has been through the use of a network of tide gauges combined with draft and spatial interpolation. Such an approach is not produced here. In the high Arctic, in the existing network of meter level measuring stations, to first order and the existing hydrodynamic models have not been appropriate utilitie at these higher latitudes.

An alternate approach to a stable vertical datum is to adopt the ellipsoid as the reference. Recent advantages in wide-area differential GPS (WADGPS) now allow vertical referencing to within a few decimeters vertically without the need for coastal base stations. With appropriate filtering and use of inertial navigation the same data can be relied upon for work at the decimeter level. In doing so the geoid and ellipsoid separation offshore and even possibly the establishment of viable chart datums is possible. In this study, we examined the variations in the phase and amplitude of the tide at locations remote from the existing tides network. This is accomplished by applying the Arctic8 and N.W. Atlantic models, supplemental confidence in the augmentation of the tidal predictions. Some examples of the field trials included are shown below, perhaps the characteristic of chart datum ambiguity for these remote areas.

A comparison of geoid height observations against WebTide tidal predictions.

WebTide

WebTide Predictions (3D) - (3D barotropic F.E. hydrodynamic model)