There is a growing demand in the geophysical community for better regional representations of the world ocean's bathymetry. However, given the vastness of the oceans and the relative limited coverage of even the most modern mapping systems, it is likely that many of the older data sets will remain part of our cumulative database for several more decades. Therefore, regional bathymetrical compilations that are based on a mixture of historic and contemporary data sets will have to remain the standard. This raises the problem of assembling bathymetric compilations and utilizing data sets not only with a heterogeneous cover but also with a wide range of accuracies. In combining these data to regularly spaced grids of bathymetric values, which the majority of numerical procedures in earth sciences require, we are often forced to use a complex interpolation scheme due to the sparseness and irregularity of the input data points. Consequently, we are faced with the difficult task of assessing the confidence that we can assign to the final grid product, a task that is not usually addressed in most bathymetric compilations. We approach the problem of assessing the confidence via a direct-simulation Monte Carlo method. We start with a small subset of data from the International Bathymetric Chart of the Arctic Ocean (IBCAO) grid model [Jakobsson et al., 2000]. This grid is compiled from a mixture of data sources ranging from single beam soundings with available metadata to spot soundings with no available metadata, to digitized contours; the test dataset shows examples of all of these types. From this database, we assign a priori error variances based on available meta-data, and when this is not available, based on a worst-case scenario in an essentially heuristic manner. We then generate a number of synthetic datasets by randomly perturbing the base data using normally distributed random variates, scaled according to the predicted error model. These datasets are then re-gridded using the same methodology as the original product, generating a set of plausible grid models of the regional bathymetry that we can use for standard error estimates. Finally, we repeat the entire random estimation process and analyze each run's standard error grids in order to examine sampling bias and variance in
the predictions. The final products of the estimation are a collection of standard error grids, which we combine with the source data density in order to create a grid that contains information about the bathymetry model's reliability. Jakobsson, M., Cherkis, N., Woodward, J., Coakley, B., and Macnab, R., 2000, A new grid of Arctic bathymetry: A significant resource for scientists and mapmakers, EOS Transactions, American Geophysical Union, v. 81, no. 9, p. 89, 93, 96.
DE: 0910 Data processing
DE: 1299 General or miscellaneous
DE: 3045 Seafloor morphology and bottom photography
SC: OS
MN: 2001 Spring Meeting