GLOBAL MEAN SEA SURFACE COMPUTATION BASED UPON A COMBINATION OF SEASAT AND GEOS-3 SATELLITE ALTIMETER DATA

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A mean sea surface map has been computed for the global ocean areas between 70°N latitude and 62°S latitude based upon the 70-day Seasat and 3.5 year Geos-3 altimeter data sets. The mean sea surface is presented in the form of a global contour map and a 0.25° x 0.25° grid. A combination of regional adjustments based upon crossover techniques and the subsequent adjustment of the regional solutions into a global reference system has been employed in order to minimize the effects of radial orbit error. A global map of the crossover residuals after the crossover adjustments have been made is in good agreement with earlier mesoscale variability contour maps based upon the last month of Seasat collinear data. This high level of agreement provides good evidence that relative orbit error has been removed to the decimeter level on a regional basis. This represents a significant improvement over our previous maps which contained patterns, particularly in the central Pacific, which were due to radial orbit error. Long wavelength, basin scale errors are still present with a sub-meter amplitude due to errors in the PGS-S4 gravity model. Such errors can only be removed through the improvement of the earth gravity model and associated geodetic parameters.

Image processing techniques have been applied as a means of enhancing the detailed topographic structure contained in the map. Ocean surface expressions, ranging in amplitude from several meters to a few decimeters, of bathymetric features such as the Mid-Atlantic Ridge, the Mendocino, Murray and other fracture zones in the Eastern Pacific, deep ocean trenches, sea mounts and many other bathymetric features are clearly depicted. Significant improvement in the definition of the small amplitude short wavelength features (e.g., sea mounts, trenches, and fracture zones) has been achieved in this new map as a result of: 1) the increased resolution provided by the combination of the total Geos-3 and Seasat data sets, and 2) the reduction of the regional orbit errors.

Basin scale ocean circulation patterns computed by analyzing the difference between the mean sea surface map and the most accurate satellite derived long wavelength geoid are in good agreement with dynamic topography maps based upon hydrographic data.