ON THE GEOGRAPHICAL CORRELATION OF ORBIT ERROR

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The orbit accuracies needed to support the global crustal dynamics project and recent satellite altimeter missions have placed unique demands on the data analysis and orbit analysis systems. These demands include accurate and well-distributed observations, improved computational techniques and substantial enhancements in the force models which represent the satellite's motion. For example, the satellite altimeter mission (TOPEX), whose objectives will be 1) to measure the time variable ocean surface topography, and 2) to demonstrate the ability to map the general ocean circulation, requires that the radial component of the satellite's orbit be known with an rms accuracy of 13 cm for the three-year mission lifetime. The primary force model uncertainty which limits the contemporary orbit computation accuracy is the inaccuracy in the values assigned to the spherical harmonic coefficients used to model the earth's gravity field.

This presentation describes the effects of gravity model errors on previous satellite altimeter missions, looks at the projected effects of errors in the current geopotential model on the TOPEX Mission and describes the pre-mission studies which must be conducted to achieve the objectives of the TOPEX Mission. The investigations demonstrate that the radial orbit error, represented in a geographic sense, will contain a regionally dependent mean and variability and that it is not possible to use conventional ground-based tracking to remove these effects. The magnitude of the effects can be reduced by improvement in the knowledge of the gravity field. The conclusion reached in this investigation is that an order of magnitude improvement in the accuracy of the earth's gravity field models is required to realize the full potential of the TOPEX altimeter mreasurements.