## Improvement in Global Marine Gravity from CryoSat

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## Abstract

Marine gravity anomalies derived from radar altimeter measurements of ocean surface slope are the primary data for investigating global tectonics and seafloor bathymetry. The accuracy of the global marine gravity field is limited by the availability of non-repeat altimeter data. Current models, having accuracies of 3-5 milligals (e.g., S&S V18 and DNSC08), are based on the non-repeat data collected by Geosat (18 mo.) and ERS-1 (12 mo.) which use altimeter technology from the 70's and 80's, respectively. Over the next 3 to 5 years, a wealth of new marine gravity data will be provided by three currently operating satellite altimeters CryoSat, Jason-1, and Envisat. With careful processing of the data, in combination with data from past Geosat and ERS-1/GM altimeter missions, we expect to improve the accuracy of the global marine gravity field by at least a factor of two and in some areas a factor of four. In addition to track coverage, the accuracy of the recovered gravity field depends on the accuracy of the arrival time parameter. We have developed an optimized retracking algorithm for CryoSat in the LRM mode and show that the arrival time estimated from CryoSat is at least 2 times better than Geosat and ERS-1. We are currently developing a retracking algorithm for CryoSat in the SAR mode and expect a factor of 2 or more improvement in the accuracy of the arrival time. CryoSat has been collecting ocean data for 1.5 years and the ground track density is now adequate to make significant improvements in the marine gravity field. We will construct an improved global gravity model based on these data and provide an evaluation at the meeting.

CryoSat is a mission of the European Space Agency. We thank ESA ESTEC for construction and operation of the satellite. The data were provided by ESA ESRIN.



Ground tracks for 13 months of CryoSat. This is the first altimeter in 15 years that has dense track spacing comparable to Geosat and ERS-1.









- CryoSat range precision is at least 2 times better than Geosat and ERS-1.

One year of CryoSat provides a significant improvement in gravity resolution and accuracy.
The accuracy of the gravity field will increase by a factor of 2-4 over the next 4 years.

(Funding provided by ConocoPhillips Co. Proposal for open distribution of new gravity grids under review at NSF.)



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Vertical Gravity Gradient from CryoSat, Geosat, and ERS-1

