Geophysical Research Abstracts
Vol. 15, EGU2013-2376, 2013
EGU General Assembly 2013

An Ensemble Solution for the Earth's time-varying gravitational field from the GRACE mission

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Several groups produce estimates of the Earth's time-varying gravitational field with data provided by the GRACE mission. While the solutions are similar, differences in processing strategies and tuning parameters result in solutions with regionally specific variations and error patterns. Thus it is unclear which solution is most suitable for different types of hydrological or oceanographic research. This project used four of the data center solutions to create an ensemble gravity model, attempting to harness the best characteristics of each solution to create an optimal model. Multiple methods were used to combine and analyze the individual and ensemble solutions. First a simple mean model was created; then the different solutions were weighted based on the formal error estimates published with the solutions as well as the monthly deviation from the simple mean. These ensemble models as well as the four individual data center solutions were evaluated with both statistical and external validation methods. The noise in the time series, scatter of solution over areas where little variation is expected, and comparison with hydrological models was examined. Initial results show that the ensemble models are effective at reducing noise in the models and better model hydrological processes. The ensemble models show slight differences, however all show improvement over any individual solution.