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An ECCO-GODAE adjusted GRACE geoid estimate with uncertainty

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The geoid, in combination with time-average satellite altimetry, implies major elements of the ocean circulation. Thus knowledge of the circulation can be used to infer a geoid estimate. By combining the equations of motion and thermodynamics with measurements one can produce a formal best-estimated geoid that by construction is dynamically acceptable. In practice, both direct measurements such as those made by GRACE, with those inferred from independent estimates of the oceanic flow field would be used. Here, the machinery developed by the ECCO-GODAE Consortium at MIT/AER is used to combine a variety of data with a general circulation model to produce a new ECCO-GODAE geoid estimate. Specifically, ECCO-GODAE incorporates the absolute sea surface height, the GRACE mean dynamic topography estimate, and a large quantity of in situ oceanographic data as well as estimates of the driving meteorology. Because the equations of motion are nonlinear, the essential error estimate is made by producing ensemble solutions where the ensembles are generated from the statistics of the errors in initial and boundary conditions.