2012 Project Summary

Satellite Monitoring of the Present-Day Evolution of the Atlantic Meridional Overturning Circulation

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The objectives of this project include the use of contemporary satellite measurements (radar altimetry sea-level and current velocities, GRACE ocean bottom pressure and Greenland melt-water freshening fluxes, sea surface temperature), and tide gauge sea-level and hydrographic data (sea-level and subsurface current velocities) to establish an observational system potentially capable of monitoring the present-day evolution of the Atlantic Meridional Ocean Circulation (AMOC). Our project intends to address the following scientific questions: (1) what is the current state of the AMOC? (2) How has the AMOC varied in the past on the interannual to decadal or longer time scales? (3) Is the AMOC correlated with basin-scale sea level change?

Recent Results
(1) Accuracy of the GRACE ocean bottom pressure data is primarily limited by land signal leakage and the knowledge of the glacial isostatic adjustment forward models. We developed a method to improve the mitigation of the Greenland ice melt signal contamination of the ocean, including the Labrador and Greenland seas (Duan et al., 2009; Guo & Shum, 2009; Guo et al., 2010).

(2) Sea-level rise budget and its contributions from Greenland ice-sheet fresh water freshening and steric sea level have been assessed (Shum & Kuo, 2011, Willis et al., 2010).

(3) We participated in community white papers, which contributed to the next decade’s ocean and sea-level observations, Ocean09, and focused on the use of contemporary and future satellite data (Cazenave et al., 2010, Rintoul et al., 2010, Shum et al., 2010).

(4) Surface and subsurface current velocities computed using satellite altimetry and hydrographic data and EGM08 geoid model show good qualitative agreements with in situ data.

Bibliography


