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The Fram Strait tomography system for ocean model validation, assimilation, and inversion

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The Fram Strait is the main passage through which the ocean mass and heat exchange between the Atlantic and Arctic Ocean takes place. On the eastern side of the strait the northbound West Spitzbergen Current transports Atlantic water to the Arctic Ocean, whereas on the western side the southbound East Greenland Current transports sea ice and polar water from the Arctic Ocean, to the Nordic Seas and the Atlantic Ocean. The currents in the Fram Strait are characterised by significant recirculation and numerous of propagating mesoscale eddies. Our aim is to improve the accuracy of the heat, mass and freshwater transport through the Fram Strait.

Our approach is to establish an integrated data and model system combining acoustic tomography, gliders, and ice-ocean modelling with data assimilation techniques. As a first step, an acoustic observing system to monitor ocean temperature change in the Fram Strait has been implemented under the EU DAMOCLES project [1]. This system will be extended as part of the follow-up project ACOBAR (2008-2012), including both 3D acoustic tomography (temperature and current) and acoustic navigation of gliders and floats in ice-covered regions [2]. The acoustic system is co-located with the fixed array of oceanographic moorings array across the strait at 78° 50' N [3].

The first result from the first tomography experiment is a year-long time series of acoustic travel times over a 130 km long section in the West Spitzbergen Current. These observations are available for advanced model ocean model validation, inversion into ocean temperature through data oriented inversion [4] and for assimilation of travel times into the ice ocean modeling systems [1]. Our ultimate comparison is between heat flux estimates from the integrated model system and fluxes calculated from the oceanographic mooring array. Results from this work will be reported.

References

- [1] H. Sagen, S. Sandven, P. Worcester, M. Dzieciuch and E. Skarsoulis. "The Fram Strait acoustic tomography system" In the proceeding for "Acoustics'08, Paris" (2008).
- [2] H. Sagen, Sandven, S., Beszczynska-Moeller, A., Boebel, O., Duda T. F., Freitag, L., Gascard, J. C., Gavrillov, A., Lee, C. M., Mellinger, D.K., Mikhalevsky, P., Moore, S., Morozov, A., Rixen, M., Skarsoulis, E., Stafford, K., Tveit, E., Worcester P.F. (2009). Acoustic technologies for observing the interior of the Arctic Ocean. In Proceedings of the "Ocean Obs'09: Sustained Ocean Observations and Information for Society" Conference (Annex), Venice, Italy, 21-25 September 2009, Hall.D.E. and Stammer, D., Eds., ESA Publication WPP-306, 2010.
- [3] U. Schauer, A. Beszczynska-Möller, W. Walczowski, F. Fahrbach, J. Piechura, E. Hansen (2008). Variation of Measured Heat Flow Through the Fram Strait Between 1997 and 2006., Arctic-Subarctic Ocean Fluxes: Defining the Role of the Northern Seas in Climate, edited by R.R. Dickson et al., © Springer Science + Business Media B.V., 65-85.
- [4] E. Skarsoulis, G. Piperakis, M. Kalogerakis, and H. Sagen. Ocean acoustic tomography: Travel-time inversion in the eastern Fram Strait. In the proceeding for "Acoustics'08, Paris" (2008)

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