

SOLAS Denmark

compiled by Lise-Lotte Soerensen

Notes:

Reporting Period is January 2009 – December 2009

Information will be used for: reporting, fundraising, networking, strategic development & outreach

1. Scientific highlights

Atmosphere-surface fluxes of CO₂ using spectral techniques

A method using spectral techniques to estimate air-sea fluxes of scalars has been validated based on air-sea flux data of CO₂ and H₂O.

To improve the reliability of global climate models it is important to accurately parameterize the CO₂ air-sea exchange. This requires good air-sea exchange or flux measurements for validation of the parameterization of the exchange coefficient. Different flux estimation techniques have been compared in order to evaluate air-sea exchange measurement methods used on moving platforms. Techniques using power spectra and cospectra to estimate fluxes have been applied to measurements of wind speed and sensible heat, latent heat and CO₂ fluxes. Momentum and scalar fluxes have been calculated from the dissipation technique utilizing the inertial sub-range of the power spectra and from estimation of the cospectra amplitude. The flux estimates have been compared to covariance derived fluxes and it has been shown how even data having poor signal-to-noise ratio can be used for flux estimations.

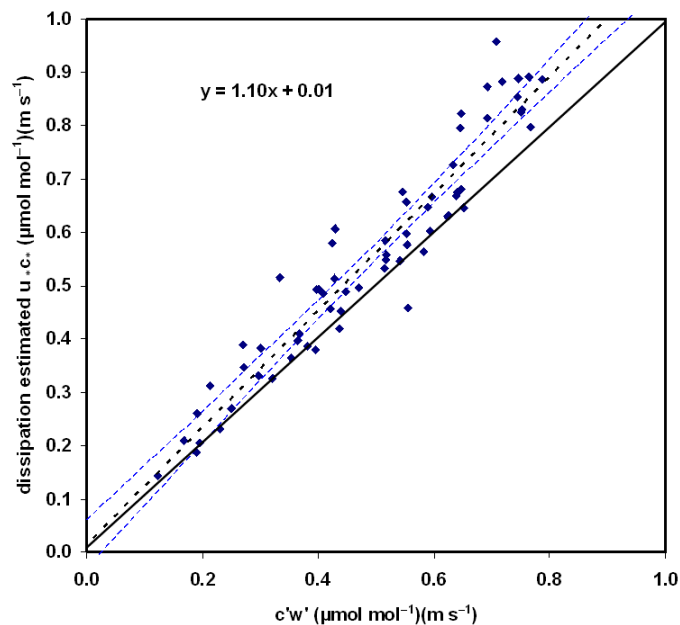


Fig. 1 CO₂ Fluxes derived from covariance calculations compared to CO₂ flux estimated from the dissipation technique

The work is described in a paper, which has been accepted for publication in Boundary Layer Meteorology.

2. Main accomplishments (research projects, cruises, special events, workshops, outreach, capacity building, remote sensing used etc)

Analysis of the data from the Galathea 3 cruise (www.galathea3.dk) has been carried out and several papers are in preparation and one has been accepted for publication. The work is focused on sea spray fluxes and air-sea exchange of CO₂. One Masters thesis by Thomas Bjerring Kristensen, Department of Geophysics at Copenhagen University, was based on the sea spray measurements and the CO₂ flux data are used by Ph.D. Student Maria Norman from Uppsala University in Sweden.

A research cruise on air-sea CO₂ exchange in the coastal area of Greenland has been carried out in 2008 and the data are processed and papers are now in preparation.

A new project on air-sea CO₂ flux in the coastal area of Greenland has been granted by the Nordic Council of ministers and the measurements will start spring 2010.

3. Top 10 publications in 2009 (Reports, articles, models, datasets, products, website etc)

Hilligesoe K M, Richardson K, Bendtsen J, Lyngsgaard M M, Soerensen L L, Nissen J, 2009, The biological pump: How large and how vulnerable a component of the oceans carbon uptake, oral presentation at the Climate Change Congress, Copenhagen, March 10-12.

4. International interactions and collaborations

Professor Sara Pryor, Indiana University has been affiliated as a professor at the National Environmental Research Institute, Aarhus University in summer 2009. During her stay she has been analysing data from the Galathea 3 cruise on sea spray fluxes.

Ph. D. student Maria Norman from Uppsala University has visited the National Environmental Research Institute, Aarhus University in spring 2009 as a part of COST action 735. During her stay she has been analysing CO₂ flux data from the Galathea 3 cruise.

5. Goals and plans for future activities

Activities on air-sea CO₂ exchange in the coastal area of Greenland are planned for 2010. A measurement station will be established in the Godthaabs Fjord in spring 2010 as a collaboration between the National Environmental Research Institute, Aarhus University (contact person: Lise Lotte Soerensen; email: lls@dmu.dk), the Nature Institute in Greenland (Soeren Ryesgaard), Uppsala University (Anna Rutgersson) and University of Lund (Torben Kristensen)

A second measurement station will be established in 2011 at Daneborg on the east coast of Greenland.

Professor Sara Pryor will be visiting Aarhus University in summer 2010 in order to finish the data analysis and paper on sea spray fluxes.

6. Other comments