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The surface energy balance of early summer land-fast sea ice in Atka Bay, Antarctica

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In-situ measurements of the land-fast sea ice energy balance are scarce. We present a data set that comprises eddy-covariance measurements of sensible and latent heat as well as measurements of the sea-ice temperature gradient, long-wave and short-wave radiation measurements over land-fast sea ice in Atka Bay, Antarctica. With this setup we are able to monitor all components of the sea-ice energy budget. Additionally, we also measured the turbulent flux of CO_2 over sea ice. This 37 day-long data set is evaluated for the transition period from austral winter to summer (November to December 2012) with regard to atmospheric stability and the general weather conditions. Results for the eddy-covariance measurements show an average sensible heat flux of 6.45 $\pm$10.72 W/m^2 and a latent heat flux of 12.71 $\pm$9.48 W/m^2 (with one standard deviation respectively) for low pressure/high wind-speed conditions. The average net radiation is 44.37 $\pm$41.54 W/m^2 and for the CO_2 flux an average of -3.35 $\pm$3.37 μmol/m^2 was measured. During high pressure/low wind-speed conditions an average of -3.03 $\pm$10.48 W/m^2 and 10.76 $\pm$10.52 W/m^2 was recorded for the sensible and latent heat flux, while the average net radiation and the CO_2 flux are 35.63 $\pm$56.70 W/m^2 and -1.95 $\pm$1.72 μmol/m^2 respectively. The fast ice is therefore found as a sink of CO_2 for both situations.