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CHANGES OF HEAT BALANCE IN HORNSUND (SW SPITSBERGEN) IN THE PERIOD FROM MAY TO OCTOBER 2014

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Measurements of heat balance in Hornsund (SW Spitsbergen) using the eddy covariance method were conducted from May to October 2014. Measurement sites were located on the Wilczek Peninsula (Wilczekodden) in such a way as to allow for study of the heat balance above the sea water of the Hornsundfjord. Fast-response sensors were mounted at the top of thin masts, planted at 11 m AMSL, in the rocks right on the seafront. For the prevailing wind directions from the sea, the area of turbulent flux source mainly included the sea water of the Hornsundfjord. The eddy covariance measurement system included a sonic anemometer (an RM Young 81000), and a krypton hygrometer (KH20) connected to the datalogger. The fast-response sensors' data were collected at 10Hz and averaged (simple box-averaging) for 1 hour periods. Slow-response data were also collected for the radiation balance and its components (with a CNR 4 Net Radiometer), air temperature and humidity, wind speed and direction. Data processing was standardised for the eddy covariance system: consistency limits and spike detection were used in pre-processing; covariance from the time shift +/-2s was maximised; fluxes were calculated in a natural wind coordinate system with double rotation; the sonic temperature was corrected for humidity, with WPL correction for mass imbalance applied, and correction for spectral losses. Stationarity was checked using three independent tests. In the data quality procedure, 23% of the data were rejected due to rain, snow and deposition on the sensors, and an additional 17% were rejected due to failed stationary tests.

For this study, heat balance and its component data, at both daily and sub-daily resolutions, has also been used. The values measured of sensible heat flux, Q_H, generally ranged from -50 to +50 Wm^{-2}, with an average of 7.8 Wm^{-2} and median 5.6 Wm^{-2}. The extreme values slightly exceeded 200 Wm^{-2}, and fell below -150 Wm^{-2}. Latent heat fluxes Q_E, were mostly positive (more than 90%). The values of Q_E were, in general, higher than Q_H with mean and median of 71.2 Wm^{-2} and 45.2 Wm^{-2} respectively. The typical daily course of Q_H was observed with the maximum in the noon hours and the minimum at night. Q_H is especially well pronounced in June and July, when it reached an average of about 50 Wm^{-2} at midday and stayed close to zero at night. In the case of latent heat flux, the diurnal cycle is less pronounced and Q_E remained at 50-100 Wm^{-2} over entire 24-hour periods. The mean daily values of Q_E , which were around 2 MJm^{-2} in May-August, increased to about 2.5 MJm^{-2} in September and 3.5 MJm^{-2} in October. At the same time, Q_H turned out to be negative, which might be attributed to more intensive evaporation from the relatively warm sea water.