



Airborne observations of the surface energy budget in the sea ice zone

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Airborne observations of turbulent and radiation fluxes and surface parameters were taken in the Weddell and Bellingshausen Sea, Antarctica, over sea ice, leads and coastal polynyas in order to investigate the surface energy budget. The observations show that the sea ice cover, its surface albedo and surface temperature play a crucial part in the alteration of the surface energy balance. In the austral summer, the largest components of the surface energy budget in the sea ice area are the radiative components, whereas in comparison the non-radiative components, i.e. the sensible and latent turbulent heat fluxes, are both relatively small. Under warm air advection and Föhn events, an Oasis effect can occur over leads and polynyas with negative Bowen ratio. Negative Bowen ratios are indicating melting of snow and ice. Under cold air advection over leads, polynyas and sea ice, we observed positive Bowen ratios and sea ice production. Over sea surfaces with relatively low albedo values, the energy reaches its maximum into the ocean/ice system, whereas over sea ice with high albedo values the energy into the ice ocean system reaches its minimum. Based on the observations we investigated the parameterization of the energy budget components, i.e. of the boundary layer heat and radiation fluxes and determined the effective roughness lengths of the ice-covered sea, which are needed as input parameter for describing the heat fluxes with bulk parameterizations in numerical models. Moreover, we determined the effective radiative fluxes over various sea ice conditions and investigate the parameterization of sea surface albedo with surface temperature data.