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An assessment of the Atlantic and Arctic sea-air CO_2 fluxes, 1990-2009

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The Atlantic and Arctic oceans are critical components of the global carbon cycle. Quantification of the net air-sea CO_2 flux across several methodologies is needed for consistent time and space scales in order to assess the state of our understanding. Here, we quantify the long-term mean, seasonal cycle, interannual variability and trends in air-sea CO_2 flux for the period 1990 to 2009 using regional cuts from global observations and modelling products, specifically a pCO_2-based CO_2 flux climatology, ocean inversion, atmospheric inversions, and ocean models, and basin-wide flux estimates from surface ocean pCO_2 observations. We will present our best estimate of the net uptake by the Atlantic (40 oS to 79 oN), and by the Arctic for the two decades. There is broad agreement between methodologies with respect to the seasonal cycle in the subtropics, but not elsewhere. Agreement with respect to detailed signals of interannual variability is poor; and correlations to the North Atlantic Oscillation Index are weaker in the North Atlantic and Arctic than in the equatorial region and south Subtropics. Linear trends for 1995 to 2009 indicate increased uptake and generally correspond between methodologies in the North Atlantic, but there is disagreement between approaches in the equatorial region and south Subtropics. This study is a contribution to the global effort for REgional Carbon Cycle Assessment and Processes (RECCAP).