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Inventory and uptake of anthropogenic carbon by Labrador Sea Water

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We apply to Classical Labrador Sea Water (CLSW) the transit-time distribution (TTD) method to estimate the inventory and uptake anthropogenic carbon (C'). A parametric model of TTDs representing bulk-advective and diffusive mixing is constrained with WOCE CFC data. The constrained TTDs are then used to propagate C' into the interior of the CLSW in a manner that allows the air-sea CO_2 disequilibrium to evolve consistently. We find the outcrop C' to be highly undersaturated with respect to the atmospheric CO_2. We estimate for the year 2001 an inventory of 1.12 to 1.24 Gt C and an uptake of 0.021 to 0.023 Gt C^{-1}. We also estimate the preindustrial flux to be: -0.0044 to + 0.0030 Gt C^{-1}, implying the Labrador Sea to be a weak source for the atmosphere in the preindustrial era.