



Anthropogenic CO₂ in the oceans estimated using transit-time distributions

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We estimate the distribution of anthropogenic carbon in the oceans using the transit time distribution (TTD) method applied to global measurements of CFC12. Unlike most other inference methods, the TTD method does not assume weak mixing and avoids the large uncertainty involved with attempts to correct for the large natural carbon background in dissolved inorganic carbon measurements. The highest concentrations and deepest penetration of anthropogenic carbon in our calculations are found in the North Atlantic and Southern Oceans, with an estimated global inventory in 1994 of 134 Pg-C. This inventory is 31% larger than that obtained by Sabine et al. (2004) using the C* method applied to the same data set. The differences between the two estimates occur in intermediate and deep waters, with the TTD estimates generally smaller in intermediate waters and larger in deep waters. In most cases these differences are consistent with the biases due to the weak mixing assumption made in the C* method. The larger global inventory from the TTD method occurs because the integrated effect of deep-water difference dominates those in intermediate waters, particularly in the southern ocean.