# Ocean carbon modelling:World perspective

R.S. Sundarvel

School of Ecology, Pondicherry University, Pondicherry 605 014, India, ragasakthi@yahoo.co.in

The world's oceans contain about 60 times more carbon than either the atmosphere or the world's terrestrial vegetation. Thus, at equilibrium, the oceans might be expected to absorb about 60 times more of the released carbon than the atmosphere, or 98 percent of total emissions. Sea water is strongly buffered with respect to carbon-dioxide, however, the percentage change in the concentration of total dissolved carbon-dioxide is about ten times less than the percentage change in the partial pressure of carbon dioxide alone. Because the practical pressure of carbon-dioxide in the oceans is what determines the equilibrium with atmospheric carbon-dioxide, the oceans are expected to hold about 86 percent of the total emissions when the equilibrium is reached.

As of 1980, the oceans are thought to have absorbed only about 20 to 47 of the total emissions. There are clearly two mechanisms which slows down the oceanic absorption of carbon-dioxide:

1.The transfer of carbon-dioxide across the air-sea interface, and

2. The mixing of water masses within the sea.

The rate of transfer of carbon-dioxide across the air-sea interface is believed to have reduced the oceanic absorption of carbon-dioxide by about 10 percent.

From the knowledge of the concentrations of carbon-dioxide, oxygen, and alkalinity throughout the oceans, it is theoretically possible to calculate the increased abundance of carbon in the oceans as a result of the increased concentration in the atmosphere.

The approach is based on the assumption that the surface waters were in equilibrium with the atmosphere when they sank, or at least, that the extent of des-equilibrium is known. For convenience, the ocean models have assumed the carbon cycle to be in steady state prior to the start of Industrial revolution. Evidence from the concentrations of carbon-dioxide in ice cores, however, shows that no such steady state existed.

Oceans are currently absorbing less carbon than estimated by models. If the analysis is correct, terrestrial ecosystems and not the oceans must have accumulated much of carbon released over the decades. Some other studies show that the alkalinity of tropical waters may have increased in recent years. Then the uptake of carbon-dioxide by the oceans has been larger than estimated by models.