

# Chapter 5

## Radiocarbon in the Oceans

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### 5.1 Introduction

Oceanic systems are a relatively heterogeneous component of the Earth System because of the low rate of mixing compared to that of the atmosphere. Most of the mixing in the ocean occurs horizontally, though some occurs vertically. Mixing in the surface ocean (0–100 m depth) is controlled by the winds that produce currents (speed 5–50 cm s<sup>-1</sup>) that are faster than those in the deep ocean (>1000 m depth, speed <5 cm s<sup>-1</sup>), which are controlled by small gradients in density. Surface ocean water in the mid-ocean basins of the Atlantic, Pacific, and Indian oceans circulates laterally in anti-cyclonic, mid-ocean *gyres* that are fueled by the trade and westerly winds, the Coriolis effect, and the placement of the continents. For example, lateral currents that make up the North Pacific gyre centered at about 20°N are the North Equatorial Current (south), the Kuroshio Current (west), the North Pacific Drift (north), and the California Current (east). The movement of water in these gyres is generally lateral allowing the water to stay near the surface for a considerable time (weeks to months). Surface ocean water in the equatorial regions and on the eastern coasts of continents also moves laterally in currents, but they

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