

## Pacific anthropogenic carbon between 1991 and 2017

\*Akihiko Murata<sup>1</sup>, Carter B.R.<sup>2,3</sup>, Feely, R.A. Feely, R.A.<sup>3</sup>, Wanninkhof, R. Wanninkhof, R.<sup>3</sup>, Shinya Kouketsu<sup>1</sup>, Sonnerup R.E.<sup>2</sup>, Pardo P.C.<sup>4</sup>, Sabine C.L.<sup>5</sup>, Johnson G. C.<sup>3</sup>, Sloyan B.M.<sup>6</sup>, Mecking S.<sup>2</sup>, Tilbrook B.<sup>6</sup>, Speer K.<sup>7</sup>, Talley L.D.<sup>8</sup>, Millero F.J.<sup>9</sup>, Wijffels S.E.<sup>6,10</sup>, Macdonald A.M.<sup>10</sup>, Gruber N.<sup>11</sup>, Bullister J. L.<sup>3</sup>

1. Japan Agency for Marine-Earth Science and Technology, 2. University of Washington, 3. NOAA, 4. University of Tasmania, 5. University of Hawaii Manoa, 6. CSIRO, 7. The Florida State University, 8. University of California, 9. University of Miami, 10. Woods Hole Oceanographic Institution, 11. IBP

The ocean is storing between a fourth and a third of anthropogenic CO<sub>2</sub> (C<sub>anth</sub>) emissions. Monitoring the oceanic CO<sub>2</sub> sink is critical to assessing the global carbon budget. We estimate total C<sub>anth</sub> storage and accumulation rates from 14 Pacific hydrographic sections that have been occupied two to four times over the past decades, with most sections having been recently measured as part of the Global Ocean Hydrographic Investigations Program (GO-SHIP). The C<sub>anth</sub> sink over the top 1500 m of the Pacific increased from 8.6 (±1.1, 1  $\sigma$ ) Pg of carbon decade<sup>-1</sup> from 1995 to 2005 to 10.8 (±1.1) PgC decade<sup>-1</sup> from 2005 to 2015. We estimate 1.2 of this observed 2.2 PgC decade<sup>-1</sup> increase in the rate of accumulation between decades is attributable to atmospheric anthropogenic CO<sub>2</sub> increases alone, while the remaining increase is consistent with recent literature suggesting there was an increase in the ocean carbon sink during the mid-2000s. Methods that allow for analysis of multiple occupations of sections and comparisons between different sections spaced irregularly in time are introduced. The accuracy of the resulting C<sub>anth</sub> accumulation reconstructions is limited by the accuracy of the data, suggesting that a continuation of repeat hydrographic surveys with a high emphasis on obtaining multiple independent realizations of the most accurate possible measurements is a critical piece of future carbon cycle monitoring.