AIR-WATER CO_2 EXCHANGE IN THE MOUNTAIN STREAMS AND ESTUARY OF KAILUA, OAHU, HAWAII

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ABSTRACT

Models and observational data show that the worldwide estuarine zone is likely a source of CO_2 to the atmosphere but few estuarine zones around the world have been studied in detail. The mountain streams, marsh, and estuarine zone of Kailua, Oahu, Hawaii are known to be a source of CO_2 to the atmosphere during dry periods, but the air-water CO_2 exchange during storm events is unknown. To determine the air-water exchange during storm events, *in-situ* measurements of salinity, temperature, and pH were taken from 16 sites in the Kailua watershed/estuary system during 2006-2007. Only one storm event occurred during the period of the study. Water samples were also taken from each site for determination of total alkalinity and nutrient concentrations. Using salinity, temperature, pH, and total alkalinity data, the partial pressure of CO_2 was calculated for 54 water samples. The average background ρCO_2 and standard deviation for the mountain streams was 1727 ± 1399 μatm and the average ρCO_2 dropped to 702 ± 62 μatm during the storm event. The background average ρCO_2 for the marsh was 6160 ± 8245 μatm and the ρCO_2 dropped to 4809 μatm during the storm event. The background average ρCO_2 for the estuarine zone was 1790 ± 2188 μatm and the average ρCO_2 increased to 2831 ± 1561 μatm during the storm event. The mouth of the concrete canal draining Kawai Nui Marsh was normally a sink for atmospheric CO_2 with an average background ρCO_2 of 265 ± 110 μatm. However during the one storm event, the ρCO_2 increased to 1728 μatm at the mouth of the canal, switching to a source of CO_2 to the atmosphere. During storm events, the Kailua system becomes a weaker source of atmospheric CO_2.