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Increased CO_2 outgassing in February-May 2010 in the tropical Atlantic

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The tropical Atlantic is a source of CO_2 for the atmosphere but the magnitude of this source and its evolution with time are still poorly known. A CO_2 network has been set up in the Atlantic to monitor the fugacity (partial pressure) of CO_2 in the ocean. Two merchant ships sailing from France to French Guyana and from France to Brazil have been equipped with an automated CO_2 system. On the France-Brazil line, the fCO_2 distribution shows very high values in 2010 compared to 2009 and 2011. This anomaly occurred mainly in boreal spring (from February to May) between 10oS and 10oN with values as high as 10 to 15% than during the other years. At the basin scale, this anomaly was associated with higher than usual sea surface temperature and salinity. Moreover, reduced northeasterly winds were observed in the north-western Atlantic basin. In addition, the inter-tropical convergence zone was shifted northwards in boreal spring, an exceptional position never reached during the last 50 years. The anomalous physical conditions observed in 2010 led to an increased fCO_2 outgassing in the tropical Atlantic compared to the years 2009 and 2011. This situation can be put in correlation with the high Pacific Nino index in 2009, an elevated AMO index and a strongly negative NAO index in 2010.