



Interannual variability of pH in the ESTOC site

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Time-series approach is the best procedure to detect long term trends and changes against the background of the interannual variability of biogeochemical processes and hydrodynamics. Since 1996, hydrography properties, $p\text{CO}_2$, $f\text{CO}_2$, pH_T and A_T have been measured in surface waters on monthly cruises at the European Station for Time Series in the Ocean at the Canary Islands, ESTOC, located in the Northeast Atlantic subtropical gyre. With over ten years of oceanographic data, seasonal and interannual trends of $p\text{CO}_2$ and pH have been evaluated. This area is acting as a minor sink of CO_2 , with an average ingassing value of $51 \pm 36 \text{ mmol CO}_2 \text{ m}^{-2} \text{ yr}^{-1}$ controlled by the dominant Trade Winds blowing from May to August.

Surface pH_T has a characteristic seasonal variability of 0.03-0.04 pH units closely coupled to temperature variability. The seasonal pH_T oscillation has been described considering the SST variability over the period studied

$$\text{pH}_T = 11.413 - 0.0017 \text{ date} + 0.0023 \text{ SST} - 0.0089 \sin(2\pi(\text{date}-1995)), r^2 = 0.831$$

After removing seasonality variability, $f\text{CO}_{2sw}$ increases at a rate of $1.57 \pm 0.3 \text{ uatm yr}^{-1}$ and consequently total inorganic carbon (NC_T) increases at a rate of $0.9 \pm 0.2 \text{ umol kg}^{-1} \text{ yr}^{-1}$, while pH_{T25} decreases at a rate of 0.0017 ± 0.0003 and total alkalinity decreases at a rate of $0.79 \pm 0.14 \text{ umol kg}^{-1} \text{ yr}^{-1}$ following the same trend presented by the salinity.