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Seasonal pH variations in the North Atlantic near Iceland

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Fronts between temperate and arctic influences, both in the atmosphere and the ocean, lie in the vicinity of Iceland. The Irminger Current branch of the North Atlantic Current carries relatively warm Atlantic Water (AW), S>35, t >4 ^{o}C, northward west of Iceland and into the Iceland Sea. There it meets and mixes with water masses of arctic origin. The Atlantic Water not only brings heat into the Iceland Sea, but also essential nutrients for primary production. Seasonal changes in the 0-200 m layer have been studied, with temporal resolution of one to three months, in regions on each side of the subarctic front. In the Irminger Sea with relatively warm and saline Atlantic Water, and in the Iceland Sea and in the Norwegian Sea east of Iceland, where the conditions are dominated by arctic or polar influences. The Atlantic Water in the Irminger Sea is about 5˚C warmer and with much narrower salinity range than the Iceland and Norwegian Seas, where conditions vary with the strength of Polar Water influences. Calculations indicate that the pH of the Irminger Sea was 0.106 lower in the year 2000 than when the atmospheric CO_2 level was 280 ppm. The seasonal pCO_2 minimum is lower in the Iceland Sea than in the Irminger Sea and the surface undersaturated throughout the year. In the Iceland Sea there are, however, larger interannual variations in hydrographic conditions and also in biogeochemical processes. This is reflected in calculated pH which has an annual amplitude of 0.16 in the Irminger Sea. The long term shift in pH due to rising atmospheric CO_2 can be expected, within few decades, to bring the seasonal variations to pH fields which were not encountered 200 years ago.