Units are given below the parameter name

Methods:

Nutrients and DFe

Samples for dissolved inorganic macro-nutrients were filtered through an 0.2 μm Acrodisc filter and stored frozen in a high-density polyethylene pony-vial (nitrate, nitrite and phosphate) or at 4ºC (silicate) until analysis. Nutrients were analysed under temperature controlled conditions using a QuAAtro Gas Segmented Continuous Flow Analyser. All measurements were calibrated with standards diluted in low nutrient seawater in the salinity range of the stations to ensure that analysis remained within the same ionic strength. Phosphate (PO_4), nitrate plus nitrite (NO_x), were measured according to Murphy and Riley (1962) and Grasshoff et al. (1983), respectively. Silicate was analysed using the procedure of Strickland and Parsons (1968).

Absolute and relative precision were regularly determined for reasonably high concentrations in an in-house standard. For phosphate, the standard deviation was 0.028 μM (N = 30) for a concentration of 0.9 μM; Hence the relative precision was 3.1%. For nitrate, the values were 0.14 μM (N = 30) for a concentration of 14.0 μM, so that the relative precision was 1.0%. For silicate, the values were 0.09 μM (N = 15) for a concentration of 21.0 μM, so that the relative precision was 0.4%. The detection limits were 0.007, 0.012 and 0.008 μM, for phosphate, nitrate and silicate, respectively.

For dissolved iron samples, the ultraclean "Pristine" sampling system for trace metals was used (Rijkenberg et al., 2015). The original PVDF samplers were replaced by a light-proof version of the Pristine samplers and were made from polypropylene to allow sampling for phytoplankton as well.

All bottles used for storage of reagents and samples were cleaned according to an intensive three step cleaning protocol. Dissolved iron concentrations were measured shipboard using a Flow Injection—Chemiluminescence method with preconcentration on iminodiaceticacid resin as described by Klunder et al. (2011). In order to validate the accuracy of the system, standard reference seawater (SAFe) was measured regularly in triplicate (Johnson et al. 1997).

The average SAFe D1 measured during the cruise was 0.64 ±0.07 nM/L, whereas the reference value is 0.65 ±0.07 nM/L.

Yoyo CTD's

At 19 out of 32 stations a yoyo consisting of 3 to 6 casts, totaling 88 casts, of electronic CTD profiles was done to monitor the temperature-salinity variability and to establish turbulent mixing values from 5 to 500 m below the ocean surface. For the yoyos, a separate CTD was used instead of the ultraclean CTD sampling system. The yoyo casts were made consecutively and took between 1 and 2 hours per station.

Calibrated SeaBird 911plus CTDs were used. The CTD data were sampled at a rate of 24 Hz, whilst lowering the instrumental package at an average speed of 0.9 m s^{-1}. The yoyo CTD data were processed using the standard procedures incorporated in the SBE-software, including corrections for cell thermal mass (Lueck, 1990) using the parameter setting of Mensah et al. (2009), sensor time-alignment and vertical bin-averaging over 0.33 m. All other analyses were performed using Conservative Temperature (Θ), Absolute Salinity S_A and potential density anomalies σ_θ, with 1000 kg m^{-3} subtracted from total density and referenced to the surface for pressure corrections as vertical profiles were only analyzed shallower than 600 m, using the Gibbs SeaWater-software (IOC, SCOR, IAPSO, 2010).

Observations were made with the yoyo CTD upright rather than horizontal in a lead-weighted frame without water samplers to minimize artificial turbulent overturning. Variable speeds of the flow passing the temperature and conductivity sensors will cause artificial temperature and thus apparent turbulent overturning, noticeable in near-homogeneous waters such as found near the surface during nighttime convection. To eliminate variable flow speeds, a custom-made assembly with pump in- and outlet tubes

and tube-ends of exactly the same diameter was mounted to the CTD as described in van Haren and Laan (2016).

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