Edited Nitrate, Nitrate+Nitrite, Nitrite, and Phosphate Data from the Arctic Ocean and its Adjacent Seas

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Overview

The nitrate, nitrite, and nitrate +nitrate data and phosphate data in this file were used to estimate Net Community Production (NCP) from seasonal changes in nutrient concentrations (Codispoti et al., submitted). They comprise an edited suite of data from the following databases: An Arctic nutrient data (ARCNUT) base assembled under the direction of G. Cota and L. Pomeroy (http://data.eol.ucar.edu/codiac/dss/id=62.015), the Eurocean database (http://www.eur-oceans.eu/integration/wp2.2), an initial version (2009) of the CARINA database http://cdiac.ornl.gov/oceans/CARINA/Carina_inv.html), and the Hydrochemical Atlas of the Arctic Ocean (Colony and Timokhov, 2001). These data were supplemented with observations from the Western Arctic Shelf-Basins Interaction Program (Codispoti et al., 2005 &2009), data from the Fram III expedition (Packard and Codispoti, 2007), data from the Canadian Archipelago supplied by F. McLaughlin, and data from a recent expedition to the Canadian Archipelago and Baffin Bay supplied by K. Falkner.

Significant portions of the phosphate, nitrate, nitrate+nitrite and nitrite data in the original data bases were dubious and were excluded from this file. The original temperature, salinity, depth, date, time and position data were assumed to be accurate, although, we had to decide which longitudes were correct when different data bases did not agree on east and west longitudes for a cruise near the prime meridian.

Whenever possible nutrient values from depths > 300 m were examined to see if they were in accord with high-quality historical data from the same region. In cases where the historical data suggest little temporal variability (e.g. deep water in the Canada Basin) stations that had deep values more than ~ 10% different from the expected values were rejected. The ARCNUT database did not include deep values, and many stations in all databases were too shallow to apply this test. Other criteria included rejection of data that produced jagged vertical profiles and values well outside of the expected range for a given region or water mass (based on the temperature and salinity data) when compared to data from cruises that were known to have produced high-quality data . Implausible nitrate to phosphate ratios caused rejection of some data, as did wide variations in nutrient concentrations within mixed surface layers.

A large ensemble of data from the eastern Arctic contained extremely low nitrate and phosphate values suggesting an error during unit conversions or data encoding and these values were excluded. An ensemble of data with implausibly high nitrite values that cast into doubt the accompanying nitrate data was also rejected, as were some implausibly high nitrite values that were not accompanied by nitrate data.

Completely quantitative protocols for accepting or rejecting data were not possible, and we had to also draw on long experience in working with Arctic nutrient data. Interested investigators can, however, compare the accepted values in these files with the data in the original sources.

Data Format

The data are in .CSV format.

 Null values are indicated by -999.

Column 1 = Cruise names employed in the data bases from which we extracted the data.

There may be ambiguity in cruise names between data bases. It is best to

match data up by position, depth, date and time when comparing these data with the data in the original data bases.

Column 2 = Individual station designator assigned to each station by our data base programs.

Column 3 = Original stations name (OSN) from the parent data base when available.

Column 4 = Date (MM/DD/YYYY).

Column 5 = Year (YYYY).

Column 6 = Month (MM)

Column 7 = Day of the month (DD).

Column 8 = Time in decimal hours.

Column 9 = Latitude in degrees and decimal degrees with north latitudes positive.

Column 10 = Longitude in degrees and decimal degrees with east longitudes positive and west longitudes negative.

Column 11 = depth in meters (z).

Column 12 = temperature in degrees Centigrade.

Column 13 = salinity. Units for salinity have changed, and definitions have also caused small changes in salinity values that are not significant with respect to the analysis for which these data were employed (Codispoti et al., in press). In the early days of oceanography salinity values were based on chlorinity titrations and reported as ppm (parts per thousand). Then they were based on conductivity ratios, but still reported as ppm. Now they are considered to be a ratio based on conductivities of samples to a standard conductivity solution and are reported as a dimensionless number, although some investigators still report them as ppm in "Practical Salinity Units". These definitional and method changes cause differences of less than 0.1.

Column 14 = phosphate in micromolar (μM).

Column 15 = nitrate in micromolar (μM).

Column 16 = nitrate+nitrite in micromolar (μM).

Column 17 = nitrite in micromolar (μM).

References

Codispoti L.A., Flagg, C., Kelly, V., Swift J.H., 2005. Hydrographic conditions during the 2002 SBI process experiments. *Deep-Sea Research II*, 52 (24-26):3199-3226.

Codispoti L.A., Flagg, C., Swift J.H., 2009. Hydrographic conditions during the 2004 SBI process experiments. *Deep-Sea Research II*, 56 (17):1144-1163.

Codispoti, L.A., Kelly, V., Thessen, A., Matrai, P. Suttles, S., Hill, V., Steele, M., Light, B. (submitted) Synthesis of Primary Production in the Arctic Ocean: III. Nitrate and Phosphate Based Estimates of Net Community Production.

Colony, R., Timokhov, L., 2001. *Hydrochemical Atlas of the Arctic Ocean*. International Arctic Research Center, University of Alaska, USA & State Research Center — the Arctic and Antarctic Research Institute, Russia, CD-ROM.

Packard, T.T., Codispoti, L. A., 2007. Respiration, Mineralization, and Biochemical Properties of the Particulate Matter in the Nansen Basin Water Column in April 1981. *Deep-Sea Research I*, 54:403-414.