

Elemental Stoichiometry of The Taylor Valley Lakes, Antarctica



R. VanTreese¹,
J. Dore¹, and J.C. Priscu¹

¹ Department of Land Resources and Environmental Sciences, Montana State University, Bozeman, MT
Contact email: vantjerr@montana.edu



TDN and TDP are now included as core LTER measurements, which are collected each season. These data represent fractions that were either not previously quantified (FRX), or had not been regularly collected (ELB, HOR), and are important reservoirs of N and P in the Taylor Valley Lakes.

BACKGROUND:

We implemented UV-Persulfate based methods to determine Total Dissolved Nitrogen (TDN) and Phosphorus (TDP) in water samples. These assays allow for calculation of organic N & P fractions, which were not routinely monitored by the MCM LTER until 2007. We hypothesize that unique biogeochemical legacies of the Taylor Valley Lakes are expressed in the stoichiometric ratios of these elements.



METHODS:

Heated inline manifolds were added to the Lachat 8000 Flow-Injection Analyzer (FIA) located in the Cray Laboratory at McMurdo Station, Antarctica.

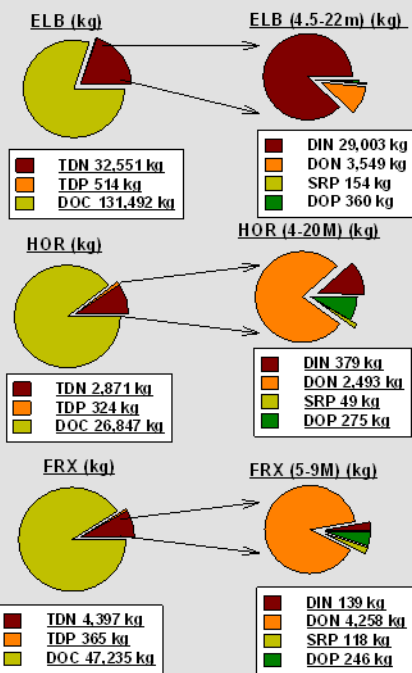
These methods were first adapted during the McMurdo Extended Season (2007-08), and are now included as part of the core limno assays performed each season. These methods combine an inline digestion (UV-Persulfate) with subsequent determination of the oxidation products (NO_3^- and PO_4^{3-} , respectively) from a single sample.

We calculated stoichiometric ratios by combining these new TDN,P data with existing LTER datasets. Dissolved inorganic nitrogen (DIN), organic carbon (DOC), and inorganic phosphate (SRP) depth profile data were retrieved from the MCM-LTER online database. In addition, published data from J. Dore and J.C. Priscu (2001) (1) were included to compliment the dataset. Mass-balances were calculated by trapezoidal integration using lake bathymetry and depth profiles of each analyte. Mole fraction Redfield ratios were calculated as a classic index of nutrient status in the lakes.

SIGNIFICANCE:

The addition of FIA based TDN and TDP methods complement core measurements of the MCM LTER. The MCM Dry Valleys have been described as sensitive indicators likely to respond to changes in climate. Incorporating TDN,P measurements will aid in developing more complete mass-based landscape models to monitor, and potentially to detect changes, in nutrient cycling within these end-member ecosystems.

PHOTIC Dissolved Stoichiometry



APHOTIC Dissolved Stoichiometry

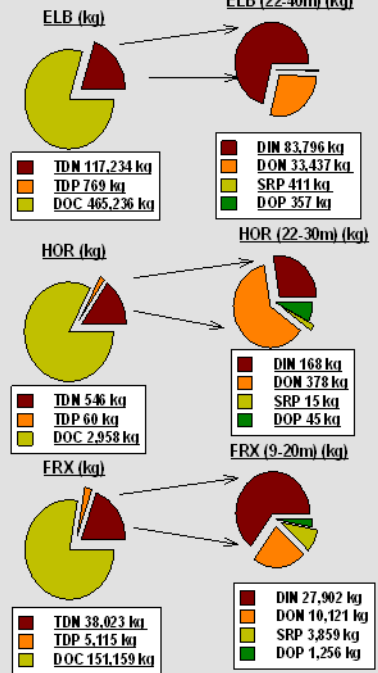


FIGURE 1. Relative Mass and Dissolved fractions of C,N,P in the Taylor Valley Lakes.

TABLE 1. Comparison of DOC, TDN, TDP Mole ratios. (Theoretical Redfield CNP ratio 106:16:1).

	PHOTIC			APHOTIC		
	C	N	P	C	N	P
ELB (mol)	943	22	1	3359	207	1
HOR (mol)	252	20	1	169	19	1
FRX (mol)	495	38	1	311	18	1

1) Dore and Priscu (2001) Limnol. Oceanogr 46(6) 2001 1331-1346

