

Vascular plant and microbial biomarkers of dissolved organic matter from San Francisco Bay transects

Website: <https://www.bco-dmo.org/dataset/734790>

Data Type: Other Field Results

Version: 2

Version Date: 2019-01-31

Project

» [Collaborative Research: Calibration and application of vascular plant and aqueous microbial biomarkers to examine transformations of dissolved organic matter](#) (DOM biomarkers)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: N:38.478 E:-121.265 S:37.679 W:-122.508

Temporal Extent: 2014-12 - 2016-05

Dataset Description

Vascular plant and microbial biomarkers of dissolved organic matter from San Francisco Bay transects. San Francisco Bay transects were collected in December 2014 (Dec-14), June 2015 (Jun-15), and May 2016 (May-16).

Methods & Sampling

Samples were collected on the USGS R/V Mary Landsteiner and pumped directly from the surface (1 m deep) with a pump and clean tycoon tubing connected to an inline 0.2 um Whatman Polycap filter.

All filters were pumped and field filtered through 0.7 um Whatman glass fiber filters (GF/F, precombusted at 550 degrees C) using a peristaltic pump after purging the line.

Samples for DOC concentration were acidified to pH 2 and stored in a refrigerator (4 degrees C) until analysis by high-temperature combustion on a Shimadzu TOC-L CPH within two weeks following collection. DOC was calculated as the mean of between three and five injections using a six-point standard curve using established protocols (Mann et al., 2012) and the coefficient of variance was always <2%.

Samples for CDOM absorbance were analyzed in a 1 cm cuvette on a Horiba Aqualog-UV-800-C. Absorbance spectra were measured from 230-800 nm, and corrected for a small offset either due to long-term baseline drift or derived from glass fiber particles during filtration (Blough et al., 1993), by subtracting the mean absorbance measured between 750-800 nm. Two spectral slopes were calculated at 275-295 nm and 350-400 nm (S₂₇₅₋₂₉₅ and S₃₅₀₋₄₀₀, respectively), and the spectral slope ratio (SR) was then calculated by dividing the former by the latter (Helms et al., 2008). The CDOM absorption ratio at 250 nm to 365 nm was calculated (a₂₅₀:a₃₆₅) and specific ultraviolet absorbance (SUVA₂₅₄) was calculated by dividing the decadic absorption coefficient at 254 nm by DOC concentration (Weishaar et al., 2003; Fellman et al., 2009).

Fluorescence properties of FDOM were determined using a Horiba Aqualog-UV-800-C. The excitation emission matrices (EEMs) were generated in a 1 cm cuvette at varying integration times (1-10 seconds) to maximize the signal-to-noise ratio based on absorbance values. The EEMs were obtained at excitation (ex) 250-600 nm and at emission (em) 250-600 nm with 5 nm and 2 nm intervals respectively, and the EEMs were corrected for lamp intensity (Cory et al., 2010), inner filter effects (Kothawala et al., 2013), and normalized to Raman units (R.U.) (Stedmon et al., 2003). All corrections were performed using the FDOMcorr toolbox version 1.6 (Murphy, 2011). EEMs were analyzed with parallel factor analysis (PARAFAC) using the procedure described in Murphy et al. (2013). Furthermore, the fluorescence index (FI) (Cory et al., 2010), humification index (HIX) (Ohno, 2002; Zsolnay et al., 1999), and autotrophic productivity index (BIX) (Huguet et al., 2009) were calculated. FI was calculated from the emission wavelengths at 470 nm and 520 nm, obtained at excitation 370 nm (Cory and McKnight, 2005). HIX was calculated using the area under the emission spectra 435-480 nm divided by the peak area 300-345 + 435-480 nm, at excitation 254 nm (Ohno, 2002). BIX was calculated from the emission intensity of 380 nm and 430 nm, obtained at excitation 310 nm (Wang et al., 2014).

Samples for FT-ICR MS analysis were solid-phase extracted using the procedure described in Dittmar et al., 2008. Filtered samples were acidified to pH 2 before solid phase extraction on 500 mg Agilent Bond Elut PPL cartridges. Each 1 L sample was extracted by eluting 2 mL of methanol and then diluted to a DOC target concentration of 50 µg C mL⁻¹. Extracted samples were stored at -20 degrees C prior to analysis on a 21 T (Bruker Daltonics, Billerica, MA, USA) FT-ICR MS located at the National High Magnetic Field Laboratory (NHMFL) (Tallahassee, Florida). Direct infusion electrospray ionization (ESI) generates negative ions at a flow rate of 700 nL min⁻¹, and 100 time domain acquisitions were coadded for each mass spectrum.

Molecular formulas were assigned to signals >6RMS baseline noise with EnviroOrg ©, TM software (Koch et al., 2007; Stubbins et al., 2010). Elemental combinations of C₁₋₄₅H₁₋₉₂N₀₋₄O₁₋₂₅S₀₋₂ with a mass accuracy of ≤300 ppb were considered for assignment. Classification of formulas were based on their elemental ratios (Corilo, 2015). The modified aromaticity index (Almod) of each formula was calculated and Almod values of 0.5-0.67 and ≥0.67 were classified as aromatic and condensed aromatic structures (Koch and Dittmar, 2006; Koch and Dittmar, 2016). Other compound classes were unsaturated low oxygen=Almod<0.5, H/C<1.5, O/C<0.5; unsaturated high oxygen=Almod<0.5, H/C<1.5, O/C>0.5; aliphatics=H/C 1.5-2.0, O/C<0.9, N=0; peptide-like=H/C 1.5-2.0, O/C<0.9, N>0, and sugar-like= O/C>0.9. Sugar-like compounds provide a very minor contribution to %RA (mean = 0.05, ± 0.06 %RA) and so were combined with peptide-like compounds throughout. Although FT-ICR MS allows for the precise assignment of molecular formulas to signals that may represent multiple isomers, they describe the underlying molecular compounds comprising DOM, thus the term compound may be used when describing the signals detected by FT-ICR MS.

Lignin derived phenols were isolated from the dried solid phase extracts followed by cupric oxide oxidation and liquid-liquid extraction modified from Spencer et al., (2010). Briefly, PPL extracts were redissolved in O₂ free 2 M NaOH in a 6 mL Teflon vial (Saville Corp) containing 500 mg CuO, and amended with 100 mg ferrous ammonium sulfate and 50 mg glucose and reacted in a 155 degree C oven for 3 hours. Following oxidation, the samples were centrifuged and supernatants were decanted into 40 mL vials. Oxidation products were acidified to pH 1 with H₃PO₄ and t-cinnamic acid was added as an internal standard. Liquid-liquid extractions of the oxidation products were undertaken by addition of 4 mL ethyl acetate, vortexing, and centrifugation prior to removal of the ethyl acetate. Extracts were pipetted through drying columns containing sodium sulfate into a 4 mL vial. Samples were dried under ultra-high purity argon between each extraction for a total of three extractions, following the last extraction the sodium sulfate was rinsed with 1 mL of ethyl acetate into the extract vial. Dried ethyl acetate extracts were dissolved in pyridine and derivatized with N/O bis-trimethylsilyltrifluoromethylacetamide (BSTFA) at 60 degrees C for ten minutes. Lignin phenol monomers were measured as trimethylsilane derivatives using an Agilent 6890N GC/5975 MS and were quantified as the relative response factors of each compound compared to the response of t-cinnamic acid and a five-point calibration curve bracketing the concentration range. Eight lignin phenols from three phenol groups were quantified; vanillyl (vanillin, acetovanillone, vanillic acid), syringyl (syringaldehyde, acetosyringone, syringic acid), and coumaryl (coumaric acid, ferulic acid).

Seven neutral sugars (fucose, rhamnose, arabinose, galactose, glucose, mannose, xylose) were analyzed

according to Skoog and Benner (1997) with modifications. Briefly, samples were hydrolyzed in 1.2 mol L⁻¹ sulfuric acid and neutralized with a self-absorbed ion retardation resin (Kaiser and Benner, 2000). After desalting with a mixture of cation and anion exchange resins, neutral sugars were isocratically separated with 25 mM NaOH on a PA 1 column in a Dionex 500 system with a pulsed amperometric detector (PAD).

The following amino acids were analyzed using the method of Kaiser and Benner, 2005: histidine, serine, arginine, glycine, aspartic acid, glutamic acid, threonine, alanine, lysine, tyrosine, methionine, valine, norvaline, isoleucine, leucine, phenylalanine.

Data Processing Description

BCO-DMO Processing:

- modified parameter names to conform with BCO-DMO naming conventions (removed units, replaced spaces with underscores);
- replaced "NaN" with "nd" (no data);
- 31-Jan-2019: updated dataset to version submitted on 20-Dec-2018.

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Data Files

File
SFB_Transects.csv (Comma Separated Values (.csv), 14.82 KB) MD5:0b7a6fa6734779646d004f4587162e68
Primary data file for dataset ID 734790

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Related Publications

Blough, N. V., Zafiriou, O. C., & Bonilla, J. (1993). Optical absorption spectra of waters from the Orinoco River outflow: Terrestrial input of colored organic matter to the Caribbean. *Journal of Geophysical Research: Oceans*, 98(C2), 2271–2278. doi:10.1029/92jc02763 <https://doi.org/10.1029/92JC02763>
Methods

Corilo, Y. (2015) PetroOrg Software; Florida State University: Tallahassee, FL, 2014.
Methods

Cory, R. M., & McKnight, D. M. (2005). Fluorescence Spectroscopy Reveals Ubiquitous Presence of Oxidized and Reduced Quinones in Dissolved Organic Matter. *Environmental Science & Technology*, 39(21), 8142–8149. doi:[10.1021/es0506962](https://doi.org/10.1021/es0506962)
Methods

Cory, R. M., Miller, M. P., McKnight, D. M., Guerard, J. J., & Miller, P. L. (2010). Effect of instrument-specific response on the analysis of fulvic acid fluorescence spectra. *Limnology and Oceanography: Methods*, 8(2), 67–78. doi:[10.4319/lom.2010.8.67](https://doi.org/10.4319/lom.2010.8.67)
Methods

Dittmar, T., Koch, B., Hertkorn, N., & Kattner, G. (2008). A simple and efficient method for the solid-phase extraction of dissolved organic matter (SPE-DOM) from seawater. *Limnology and Oceanography: Methods*, 6(6), 230–235. doi:[10.4319/lom.2008.6.230](https://doi.org/10.4319/lom.2008.6.230)
Methods

Fellman, J. B., Hood, E., D'Amore, D. V., Edwards, R. T., & White, D. (2009). Seasonal changes in the chemical quality and biodegradability of dissolved organic matter exported from soils to streams in coastal temperate rainforest watersheds. *Biogeochemistry*, 95(2-3), 277–293. doi:[10.1007/s10533-009-9336-6](https://doi.org/10.1007/s10533-009-9336-6)
Methods

Helms, J. R., Stubbins, A., Ritchie, J. D., Minor, E. C., Kieber, D. J., & Mopper, K. (2008). Absorption spectral slopes and slope ratios as indicators of molecular weight, source, and photobleaching of chromophoric

dissolved organic matter. *Limnology and Oceanography*, 53(3), 955–969. doi:[10.4319/lo.2008.53.3.0955](https://doi.org/10.4319/lo.2008.53.3.0955)
Methods

Huguet, A., Vacher, L., Relexans, S., Saubusse, S., Froidefond, J. M., & Parlanti, E. (2009). Properties of fluorescent dissolved organic matter in the Gironde Estuary. *Organic Geochemistry*, 40(6), 706–719. doi:[10.1016/j.orggeochem.2009.03.002](https://doi.org/10.1016/j.orggeochem.2009.03.002)
Methods

Kaiser, K., & Benner, R. (2005). Hydrolysis-induced racemization of amino acids. *Limnology and Oceanography: Methods*, 3(8), 318–325. doi:[10.4319/lom.2005.3.318](https://doi.org/10.4319/lom.2005.3.318)
Methods

Koch, B. P., & Dittmar, T. (2006). From mass to structure: an aromaticity index for high-resolution mass data of natural organic matter. *Rapid Communications in Mass Spectrometry*, 20(5), 926–932. doi:[10.1002/rcm.2386](https://doi.org/10.1002/rcm.2386)
Methods

Koch, B. P., & Dittmar, T. (2015). From mass to structure: an aromaticity index for high-resolution mass data of natural organic matter. *Rapid Communications in Mass Spectrometry*, 30(1), 250–250. doi:[10.1002/rcm.7433](https://doi.org/10.1002/rcm.7433)
Methods

Koch, B. P., Dittmar, T., Witt, M., & Kattner, G. (2007). Fundamentals of Molecular Formula Assignment to Ultrahigh Resolution Mass Data of Natural Organic Matter. *Analytical Chemistry*, 79(4), 1758–1763. doi:[10.1021/ac061949s](https://doi.org/10.1021/ac061949s)
Methods

Kothawala, D. N., Murphy, K. R., Stedmon, C. A., Weyhenmeyer, G. A., & Tranvik, L. J. (2013). Inner filter correction of dissolved organic matter fluorescence. *Limnology and Oceanography: Methods*, 11(12), 616–630. doi:[10.4319/lom.2013.11.616](https://doi.org/10.4319/lom.2013.11.616)
Methods

Mann, P. J., Davydova, A., Zimov, N., Spencer, R. G. M., Davydov, S., Bulygina, E., ... Holmes, R. M. (2012). Controls on the composition and lability of dissolved organic matter in Siberia's Kolyma River basin. *Journal of Geophysical Research: Biogeosciences*, 117(G1). doi:10.1029/2011jg001798
<https://doi.org/10.1029/2011jg001798>
Methods

Murphy, K. R. (2011). A Note on Determining the Extent of the Water Raman Peak in Fluorescence Spectroscopy. *Applied Spectroscopy*, 65(2), 233–236. doi:[10.1366/10-06136](https://doi.org/10.1366/10-06136)
Methods

Ohno, T. (2002). Fluorescence Inner-Filtering Correction for Determining the Humification Index of Dissolved Organic Matter. *Environmental Science & Technology*, 36(4), 742–746. doi:[10.1021/es0155276](https://doi.org/10.1021/es0155276)
Methods

Skoog, A., & Benner, R. (1997). Aldoses in various size fractions of marine organic matter: Implications for carbon cycling. *Limnology and Oceanography*, 42(8), 1803–1813. doi:[10.4319/lo.1997.42.8.1803](https://doi.org/10.4319/lo.1997.42.8.1803)
Methods

Spencer, R. G. M., Aiken, G. R., Dyda, R. Y., Butler, K. D., Bergamaschi, B. A., & Hernes, P. J. (2010). Comparison of XAD with other dissolved lignin isolation techniques and a compilation of analytical improvements for the analysis of lignin in aquatic settings. *Organic Geochemistry*, 41(5), 445–453. doi:[10.1016/j.orggeochem.2010.02.004](https://doi.org/10.1016/j.orggeochem.2010.02.004)
Methods

Stedmon, C. A., Markager, S., & Bro, R. (2003). Tracing dissolved organic matter in aquatic environments using a new approach to fluorescence spectroscopy. *Marine Chemistry*, 82(3-4), 239–254. doi:10.1016/S0304-4203(03)00072-0 [https://doi.org/10.1016/S0304-4203\(03\)00072-0](https://doi.org/10.1016/S0304-4203(03)00072-0)
Methods

Stubbins, A., Spencer, R. G. M., Chen, H., Hatcher, P. G., Mopper, K., Hernes, P. J., ... Six, J. (2010). Illuminated darkness: Molecular signatures of Congo River dissolved organic matter and its photochemical alteration as revealed by ultrahigh precision mass spectrometry. *Limnology and Oceanography*, 55(4), 1467–1477. doi:[10.4319/lo.2010.55.4.1467](https://doi.org/10.4319/lo.2010.55.4.1467)
Methods

Wang, Y., Zhang, D., Shen, Z., Chen, J., & Feng, C. (2014). Characterization and spacial distribution variability of chromophoric dissolved organic matter (CDOM) in the Yangtze Estuary. *Chemosphere*, 95, 353–362.

doi:[10.1016/j.chemosphere.2013.09.044](https://doi.org/10.1016/j.chemosphere.2013.09.044)

Methods

Weishaar, J. L., Aiken, G. R., Bergamaschi, B. A., Fram, M. S., Fujii, R., & Mopper, K. (2003). Evaluation of Specific Ultraviolet Absorbance as an Indicator of the Chemical Composition and Reactivity of Dissolved Organic Carbon. *Environmental Science & Technology*, 37(20), 4702–4708. doi:[10.1021/es030360x](https://doi.org/10.1021/es030360x)
Methods

Zsolnay, A., Baigar, E., Jimenez, M., Steinweg, B., & Saccomandi, F. (1999). Differentiating with fluorescence spectroscopy the sources of dissolved organic matter in soils subjected to drying. *Chemosphere*, 38(1), 45–50. doi:10.1016/s0045-6535(98)00166-0 [https://doi.org/10.1016/S0045-6535\(98\)00166-0](https://doi.org/10.1016/S0045-6535(98)00166-0)
Methods

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Parameters

Parameter	Description	Units
Date	Date of sample collection. Format: month-year. (e.g. Dec-14 = December 2014, Jun-15 = June 2015, May-16 = May 2016)	unitless
Salinity	Salinity	PSU
Lat	Latitude of sample collection	decimal degrees
Long	Longitude of sample collection	decimal degrees
Temp	Temperature	degrees Celsius
pH	pH	unitless
DO	Dissolved oxygen	milligrams per liter (mg/L)
Turbidity	Turbidity	FNU
TSS	Total suspended solids	milligrams per liter (mg/L)
DOC_uM	Dissolved organic carbon in uM	micromolar (uM)
DOC_mgL	Dissolved organic carbon in mg/L	milligrams per liter (mg/L)
FI	Fluorescence Index (DOM composition metric)	unitless
HIX	Humification Index (DOM composition metric)	unitless
HIX_Norm	Humification Index Norm (DOM composition metric)	unitless
BIX	Autotrophic productivity index (DOM composition metric)	unitless
abs_250	CDOM absorbance at 250 nm	reciprocal meters (m ⁻¹)
abs_254	CDOM absorbance at 254 nm	m ⁻¹
abs_350	CDOM absorbance at 350 nm	m ⁻¹
abs_365	CDOM absorbance at 365 nm	m ⁻¹

abs_412	CDOM absorbance at 412 nm	m-1
abs_440	CDOM absorbance at 440 nm	m-1
abs_ratio_250_365	Absorbance ratio; absorbance at 250/365	unitless
SUVA254	Specific UV absorbance at 254 nm	L mgC-1 m-1
S275_295	Spectral slope range 275-295	unitless
S350_400	Spectral slope range 350-400	unitless
Sr	Spectral slope ratio (275-295/350-400)	unitless
C1	Fluorescence intensity of component 1	Raman units
C2	Fluorescence intensity of component 2	Raman units
C3	Fluorescence intensity of component 3	Raman units
C4	Fluorescence intensity of component 4	Raman units
C5	Fluorescence intensity of component 5	Raman units
C6	Fluorescence intensity of component 6	Raman units
C7	Fluorescence intensity of component 7	Raman units
C8	Fluorescence intensity of component 8	Raman units
C9	Fluorescence intensity of component 9	Raman units
C10	Fluorescence intensity of component 10	Raman units
Ctotal	Fluorescence intensity total	Raman units
Num_formula	FT-ICR MS: Number of formula assigned	unitless
Aliphatic_HighOC	Aliphatic High OC (FT-ICR MS compound class)	% relative abundance
Aliphatic_LowOC	Aliphatic Low OC (FT-ICR MS compound class)	% relative abundance
Condensed_aromatics	Condensed Aromatics (FT-ICR MS compound class)	% relative abundance
Highly_Unsaturated_and_Phenolic_HighOC	Highly unsaturated and phenolic high OC (FT-ICR MS compound class)	% relative abundance
Highly_Unsaturated_and_Phenolic_LowOC	Highly unsaturated and phenolic low OC (FT-ICR MS compound class)	% relative abundance
Peptide_like	Peptide-like (FT-ICR MS compound class)	% relative abundance
Polyphenolic_HighOC	Polyphenolic high OC (FT-ICR MS compound class)	% relative abundance
Polyphenolic_LowOC	Polyphenolic low OC (FT-ICR MS compound class)	% relative abundance

conc_Sum8	Lignin Phenols Concentration Sum of 8	micrograms per liter (ug/L)
conc_Sum6	Lignin Phenols Concentration Sum of 6	micrograms per liter (ug/L)
Cnorm_Sum8	Lignin Phenols C-normalized Sum of 8	mg/100 mg OC
Cnorm_Sum6	Lignin Phenols C-normalized Sum of 6	mg/100 mg OC
S_to_V	S:V (syringyl to vanillyl ratio)	unitless
C_to_V	C:V (cinnamyl to vanillyl ratio)	unitless
Ad_to_Al_v	(Ad:Al)v (Vanillic acid to aldehyde ratio)	unitless
Ad_to_Al_s	(Ad:Al)s (Syringic acid to aldehyde ratio)	unitless
THAA	Total hydrolyzable amino acids	micromoles per liter (umol/L)
Asp	Aspartic acid	mol%
Glu	Glutamic acid	mol%
Ser	Serine	mol%
His	Histidine	mol%
Thr	Threonine	mol%
Gly	Glycine	mol%
Arg	Arginine	mol%
Ala	Alanine	mol%
Tyr	Tyrosine	mol%
Val	Valine	mol%
Ile	Isoleucine	mol%
Phe	Phenylalanine	mol%
Leu	Leucine	mol%
Lys	Lysine	mol%
THNS	Total hydrolyzable neutral sugars	micromoles per liter (umol/L)
Fuc	Fucose	mol%
Rha	Rhamnose	mol%
Ara	Arabinose	mol%
Gal	Galactose	mol%
Glc	Glucose	mol%
Man	Mannose	mol%
Xyl	Xylose	mol%

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Instruments

Dataset-specific Instrument Name	Horiba Aqualog-UV-800-C
Generic Instrument Name	Fluorometer
Dataset-specific Description	Samples for CDOM absorbance were analyzed in a 1 cm cuvette on a Horiba Aqualog-UV-800-C (benchtop fluorometer). Fluorescence properties of FDOM were also determined using a Horiba Aqualog-UV-800-C.
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

Dataset-specific Instrument Name	FT-ICR MS
Generic Instrument Name	Fourier Transform Ion Cyclotron Resonance Mass Spectrometer
Dataset-specific Description	Samples were analyzed on a 21 T (Bruker Daltonics, Billerica, MA, USA) FT-ICR MS located at the National High Magnetic Field Laboratory (NHMFL) (Tallahassee, Florida).
Generic Instrument Description	In Fourier Transform Ion Cyclotron Resonance Mass Spectrometry, the mass-to-charge ratio (m/z) of an ion is experimentally determined by measuring the frequency at which the ion processes in a magnetic field. These frequencies, which are typically in the 100 KHz to MHz regime, can be measured with modern electronics making it possible to determine the mass of an ion to within +/- 0.000005 amu or 5 ppm.

Dataset-specific Instrument Name	Agilent 6890N GC/5975 MS
Generic Instrument Name	Gas Chromatograph
Dataset-specific Description	Lignin phenol monomers were measured as trimethylsilane derivatives using an Agilent 6890N GC/5975 MS.
Generic Instrument Description	Instrument separating gases, volatile substances, or substances dissolved in a volatile solvent by transporting an inert gas through a column packed with a sorbent to a detector for assay. (from SeaDataNet, BODC)

Dataset-specific Instrument Name	Dionex 500 system
Generic Instrument Name	Ion Chromatograph
Dataset-specific Description	Neutral sugars were isocratically separated in a Dionex 500 system with a pulsed amperometric detector (PAD).
Generic Instrument Description	Ion chromatography is a form of liquid chromatography that measures concentrations of ionic species by separating them based on their interaction with a resin. Ionic species separate differently depending on species type and size. Ion chromatographs are able to measure concentrations of major anions, such as fluoride, chloride, nitrate, nitrite, and sulfate, as well as major cations such as lithium, sodium, ammonium, potassium, calcium, and magnesium in the parts-per-billion (ppb) range. (from http://serc.carleton.edu/microbelife/research_methods/biogeochemical/ic....)

Dataset-specific Instrument Name	Agilent 6890N GC/5975 MS
Generic Instrument Name	Mass Spectrometer
Dataset-specific Description	Lignin phenol monomers were measured as trimethylsilane derivatives using an Agilent 6890N GC/5975 MS.
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

Dataset-specific Instrument Name	Shimadzu TOC-L CPH
Generic Instrument Name	Shimadzu TOC-L Analyzer
Dataset-specific Description	DOC concentration was determined on a Shimadzu TOC-L CPH.
Generic Instrument Description	A Shimadzu TOC-L Analyzer measures DOC by high temperature combustion method. Developed by Shimadzu, the 680 degree C combustion catalytic oxidation method is now used worldwide. One of its most important features is the capacity to efficiently oxidize hard-to-decompose organic compounds, including insoluble and macromolecular organic compounds. The 680 degree C combustion catalytic oxidation method has been adopted for the TOC-L series. http://www.shimadzu.com/an/toc/lab/toc-l2.html

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Project Information

Collaborative Research: Calibration and application of vascular plant and aqueous microbial biomarkers to examine transformations of dissolved organic matter (DOM biomarkers)

Coverage: San Francisco Bay Delta

NSF abstract:

Organic matter (OM) fluxes between and within terrestrial and oceanic reservoirs play an important role in the global carbon cycle. A clearer understanding of OM dynamics is critical for understanding fundamental processes and effects on greenhouse gases and climate. At present, researchers have an abundance of analytical methods and tools for investigating dissolved organic matter (DOM) cycling, but the field struggles to move past a qualitative understanding of sources, processing, and fates toward a quantitative understanding. Researchers from University of California-Davis, Woods Hole Oceanographic Institute, and Texas A&M University will develop biomarker tools to advance quantitative understanding of DOM cycling in riverine and estuarine environments in California, specifically targeting vascular plant and microbial markers. Results from this study will allow for future biomarker studies to quantitatively address DOM source and processing in aquatic environments and improve the limited understanding of the fate of terrestrial DOM in the ocean.

Broader Impacts: This study will provide interdisciplinary scientific training and development for undergraduate and graduate students, including individuals from underrepresented groups. Results from the study will be disseminated to the public, California stakeholders, and college students to educate them about the carbon cycle.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1464396
NSF Division of Ocean Sciences (NSF OCE)	OCE-1335622
NSF Division of Ocean Sciences (NSF OCE)	OCE-1333633

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