

Methane and Nitrous Oxide in the Guadalquivir estuary (SW Spain) over 2016-2017

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“Guadalquivir estuary”; river; “methane”; “nitrous oxide”; pCO₂; temperature; salinity; “nitrate”; “freshwater discharge”; chlorophyll; “total dissolved nitrogen”; “dissolved organic carbon”; “dissolved oxygen”; “tidal intrusion”

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Abstract:

This data set includes recently published data used to assess the spatio-temporal variability of dissolved methane and nitrous oxide in the Guadalquivir river estuary, SW Spain (Long: -6° 20' 31.56'', Lat: 36° 47' 54'', Datum: WSG84) between March 2016 and March 2017 and calculate air-water fluxes of both gases.

Description:

This data set includes measurements of water samples collected from 5 sites during 8 surveys carried out between March 2016 and March 2017 in the Guadalquivir river estuary. Geographic coordinates of sampling positions and a Google Earth .kml file are provided. During samplings, *in situ* water conductivity (converted to salinity), temperature and pH were measured using a multi-probe (YSI-6920V2, YSI Incorporated, Yellow Springs, Ohio, USA) and water samples were collected for laboratory analysis of dissolved methane and nitrous oxide by static-head space equilibration gas chromatography (GC) using an Agilent 7890 GC equipped with an Electron Capture Detector (ECD) for N₂O and Flame Ionization Detector (FID) for CH₄, according to de la Paz et al. (2015). Samples were also taken for analysis of phosphate, nitrate, nitrite and ammonia (with a Skalar San⁺⁺215 Continuous Flow Analyzer and using the standard colorimetric techniques described in Hansen and Koroleff 1999), dissolved oxygen and total alkalinity (using a Metrohm 794 Titroprocessor following the methods described by Mintrop et al. (2000) and Winkler) and dissolved organic carbon and total dissolved nitrogen that through catalytic oxidation at high temperature (720 °C) and chemiluminescence (using a Shimadzu Total Organic Carbon analyzer Model TOC-VCPH/CPN, according to Álvarez-Salgado and Miller 1998). Dissolved carbon dioxide partial pressure was calculated from pH and total alkalinity using co2sys.xls (Pierrot et al., 2000) with the dissociation constants for carbon and sulphate of Cai and Wang (1998) and Dickson (1990), respectively.

Calculations of the equilibrium concentrations of methane and nitrous oxide in the water phase was done using the annual averaged atmospheric mixing ratios CH₄ (xCH₄atm) and N₂O (xN₂Oatm) provided by the World Data Center for Greenhouse Gases

(<http://ds.data.jma.go.jp/gmd/wdcgg/>). Such mean values during the sampling period were calculated as 1866 ppb and 328 ppb for $x\text{CH}_4\text{atm}$ and $x\text{N}_2\text{Oatm}$ respectively.

Daily measurements of rainfall (mm), air temperature ($^{\circ}\text{C}$), relative humidity and wind speed (m s^{-1}) were provided by a meteorological station located in Lebrija ($36^{\circ} 58' 35''\text{N}$, $06^{\circ} 07' 34''\text{W}$) managed by the Junta de Andalucía (www.juntadeandalucia.es/agriculturaypesca/ifapa/ria/servlet/FrontController).

The data are provided as [space] delimited plain text files and Google Earth .kml and .kmz files within a compressed folder that also includes a single README file (in PDF format) containing a detailed description of the data structure.

For more details, see the publication:

- I. Emma Huertas, Susana Flecha, Gabriel Navarro, Fiz F. Perez, Mercedes de la Paz. 2018. Spatio-temporal variability and controls on methane and nitrous oxide in the Guadalquivir estuary, Southwestern Europe. *Aquatic Sciences*. DOI: 10.1007/s00027-018-0580-5

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General Notes

The data are provided under an Attribution-ShareAlike 4.0 International license. However, if you use the data, so as to support the authors, please consider citing the article:

- I. Emma Huertas, Susana Flecha, Gabriel Navarro, Fiz F. Perez, Mercedes de la Paz. 2018. Spatio-temporal variability and controls on methane and nitrous oxide in the Guadalquivir estuary, Southwestern Europe. *Aquatic Sciences*. DOI: 10.1007/s00027-018-0580-5

Data collection and analytical techniques are given in detail with the associated publication, here we only give a brief details and a guide to the contents of the data files.

Data files are in plain text format with [space] used as the delimiter and text enclosed in "". All data files have column titles as the first line. NA is used to represent no data.

Geographical coordinates of water sampling sites

Guadalquivir_estuary_sampling_stations_geo_coordinates.txt provides the geographical coordinates of the sites. ST.ID represents the code (used to link to other data tables) for each site. long and lat are longitude and latitude, respectively. Geographic projection and WSG84 datum is used (EPSG:4326).

For convenience Guadalquivir_estuary_sampling_stations.kml is also included to allow visualization of the site positions in Google Earth (or other GIS software; note kml files have the Pseudo-Mercator projection [EPSG:3857]).

Water physiochemical properties

Guadalquivir_estuary_water_monitoring_2016-2017.txt provides data from water sampling data during eight surveys conducted between March 2016 and March 2017. Temperature, salinity and pH were measured with a multi-probe (YSI-6920V2, YSI Incorporated, Yellow Springs, Ohio, USA). Total alkalinity, concentrations of dissolved compounds (oxygen, organic carbon, total nitrogen, inorganic nitrogen and phosphate), pigments and suspended solids were measured in the laboratory. $p\text{CO}_2$ was calculated using pH and total alkalinity with co2sys.xls.

SAMP.EVENT is a convenience code used to denominate each individual survey. SAMP.DATE is the day in which the survey took place (in the Gregorian calendar). time.stamp.gmt is the time (GMT or UTC) at which the sample was collected, in extended ISO8601 format.

ST.ID represents the code (used to link to other data tables) for each site. T.degC is the water temperature in degrees Celsius. Salinity is the water salinity (practical salinity units, i.e., no units), calculated from conductivity.

CH4.nmolL is methane concentration with units nano mol per liter. N2O.nmolL is nitrous oxide concentration with units nano mol per liter.

Chla.umolL is chlorophyll-a concentration with units micro mol per liter. TSM.mgL is total suspended solids concentration with units milli gram per liter. DOC.mgL is total dissolved organic carbon concentration with units milli gram per liter. TDN.mgL is total dissolved nitrogen concentration with units milli gram per liter. NH4.umolL is dissolved ammonium concentration with units micro mol per liter. NO2.umolL is dissolved nitrite concentration with units micro mol per liter. NO3.umolL is dissolved nitrate concentration with units micro mol per liter. PO4.umolL is dissolved inorganic phosphate concentration (i.e., not organic or total) with units micro mol per liter. O2.umolKg is dissolved oxygen concentration with units micro mol per kilogram. $p\text{CO}_2$.uatm is partial pressure of CO_2 in water with units micro atmosphere.

Meteorological data

Daily measurements of air temperature ($^{\circ}\text{C}$), wind speed (m s^{-1}) and humidity were provided by a meteorological station located in Lebrija ($36^{\circ} 58' 35''\text{N}$, $06^{\circ} 07' 34'' \text{W}$) maintained by the Junta de Andalucía (www.juntadeandalucia.es/agriculturaypesca/ifapa/ria/servlet/FrontController).

Guadalquivir_estuary_meteorological_data.txt contains daily-ensemble-averaged wind velocities at 1 m (uz) above the land surface. SAMP.MONTH is the month in which the survey and samples collection took place. uz.ms is the monthly mean wind velocity at 1m above the land surface with units meters per second. T.degC is monthly mean air temperature at 1m above the land surface with units degrees Celcius. hum.% is the relative humidity at 1m above the land surface expressed as a percent.