# Current flow, pressure, and oxygen concentrations recorded by the 3OEC-instrument in the Florida Keys from 11-17 July 2017

**Website**: https://www.bco-dmo.org/dataset/849934
**Data Type**: Other Field Results
**Version**: 1
**Version Date**: 2021-04-21

**Project**
» Collaborative Research: Robust optode-based eddy correlation systems for oxygen flux measurements in aquatic environments (Robust optode-based eddy correlation systems)



| Contributors | Affiliation | Role |
|---|---|---|
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**Abstract**
This dataset presents the velocity and external sensor data recorded by the Nortek Vector ADV logger. The eddy covariance instrument was deployed July 11-17, 2017 in a subtropical inner shelf environment (Salinity: 35-36, temperature: 28-31°C) approximately 9 km south of Long Key in the Florida Keys (24° 43.52'N, 80° 49.85'W). The site was located at 9 ± 1 m water depth near the center of a large flat carbonate platform covered with coral sand. The measuring volume of the ADV was adjusted to be ~35 cm above the sediment-water interface.

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## Coverage

**Spatial Extent**: **Lat**:24.7253 **Lon**:-80.83083
**Temporal Extent**: 2017-07-11 - 2017-07-17

### Methods & Sampling

The Nortek Vector ADV logger was deployed July 11-17, 2017 in a subtropical inner shelf environment (Salinity: 35-36, temperature: 28-31°C) approximately 9 km south of Long Key in the Florida Keys (24° 43.52'N, 80° 49.85'W). The site was located at 9 ± 1 m water depth near the center of a large flat carbonate platform covered with coral sand. The measuring volume of the ADV was adjusted to be ~35 cm above the sediment-water interface.

The velocity data are unprocessed raw data as recorded by the Nortek Vector ADV using the following settings.
Sampling rate: 64 Hz, down-averaged to 8Hz
Nominal velocity range: 0.30 m/s

Burst interval: CONTINUOUS
Samples per burst: N/A
Sampling volume: 14.9 mm
Measurement load: 59 %
Transmit length: 4.0 mm
Receive length: 0.01 m
Number of beams: 3
Software version: 1.37.02

Measurements and data analysis are reported in Huettel et al. (2020).

**Known Problems**:
Deployment 11-12 July: Measurements could not start before 14:00 due to bad weather preventing earlier deployment.

**Data Processing Description**

**Data Processing:**
Vector 1.39.06 (Nortek) software (for downloading the data from the Nortek Vector ADV)
ORIGIN 2017, Origin labs (for converting Vector data files into .csv files)

**BCO-DMO Processing:**
- renamed fields to comply with BCO-DMO naming conventions;
- concatenated separate files from each deployment into one dataset; added the 'deployment' column.

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## Data Files

| File |
|---|
| **3OEC_current_flow.csv** (Comma Separated Values (.csv), 202.88 MB)<br>MD5:3a6c75ebec89337c60d80a6ab85f4115<br>Primary data file for dataset ID 849934 |

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## Related Publications

Huettel, M., Berg, P., & Merikhi, A. (2020). Technical note: Measurements and data analysis of sediment–water oxygen flux using a new dual-optode eddy covariance instrument. Biogeosciences, 17(17), 4459–4476. doi:10.5194/bg-17-4459-2020
*Methods*

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| deployment | Name of original data file; date range of the deployment (YYYY MM Day_Start Day_End) | unitless |
| t | Time | hours |
| t_increase | Time increase | seconds |
| Vx | Velocity x | centimeters per second (cm s-1) |
| Vy | Velocity y | centimeters per second (cm s-1) |
| Vz | Velocity z | centimeters per second (cm s-1) |
| P | Pressure | kilopascals (kPa) |
| O2_S1 | Oxygen concentration | micromoles per liter (umol l-1) |
| O2_S2 | Oxygen concentration | micromoles per liter (umol l-1) |
| O2_S3 | Oxygen concentration | micromoles per liter (umol l-1) |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | Nortek Vector ADV |
| **Generic Instrument Name** | Acoustic Doppler Velocimeter |
| **Dataset-specific Description** | Flow measurements used an Acoustic Doppler Velocimeter (Vector, Nortek); Serial number VEC 1436; Calibrations: The Nortek Vector ADV was factory-calibrated prior to the deployments. Accuracy: ± 0.5% of measured value ±1 mm/s Velocity precision: typ. 1% of velocity range (at 16 Hz) |
| **Generic Instrument Description** | ADV is the acronym for acoustic doppler velocimeter. The ADV is a remote-sensing, three-dimensional velocity sensor. Its operation is based on the Doppler shift effect. The sensor can be deployed either as a moored instrument or attached to a still structure near the seabed. Reference: G. Voulgaris and J. H. Trowbridge, 1998. Evaluation of the Acoustic Doppler Velocimeter (ADV) for Turbulence Measurements. J. Atmos. Oceanic Technol., 15, 272–289. doi: http://dx.doi.org/10.1175/1520-0426(1998)0152.0.CO;2 |

| | |
|---|---|
| **Dataset-specific Instrument Name** | Pyrosience oxygen sensors |
| **Generic Instrument Name** | Oxygen Sensor |
| **Dataset-specific Description** | The Pyrosience oxygen sensors were pre- and post calibrated using air saturated seawater (100% air saturation) and seawater with addition of sodium sulfite (0% air saturation). Oxygen sensor (Pyroscience) Accuracy: at 5% a.s./0.44 mg/L ±0.1% a.s. ±0.01 mg/L at 95% a.s./8.8 mg/L ±1% a.s. ±0.1 mg/L Resolution: at 5% a.s./0.44 mg/L 0.05% a.s. 0.005 mg/L at 95% a.s./8.8 mg/L 0.25% a.s. 0.025 mg/L Detection Limit: 0.1% a.s. 0.01 mg/L |
| **Generic Instrument Description** | An electronic device that measures the proportion of oxygen (O2) in the gas or liquid being analyzed |

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## Deployments

**Diodon_2017-07-11-12**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/849997 |
| **Platform** | R/V Diodon |
| **Start Date** | 2017-07-11 |
| **End Date** | 2017-07-12 |

**Diodon_2017-07-13-14**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/850002 |
| **Platform** | R/V Diodon |
| **Start Date** | 2017-07-13 |
| **End Date** | 2017-07-14 |

**Diodon_2017-07-15-16**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/850003 |
| **Platform** | R/V Diodon |
| **Start Date** | 2017-07-15 |
| **End Date** | 2017-07-16 |

**Diodon_2017-07-16-17**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/850006 |
| **Platform** | R/V Diodon |
| **Start Date** | 2017-07-16 |
| **End Date** | 2017-07-17 |

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## Project Information

**Collaborative Research: Robust optode-based eddy correlation systems for oxygen flux measurements in aquatic environments (Robust optode-based eddy correlation systems)**

**Website**: http://myweb.fsu.edu/mhuettel/Projects/NSF_Instr.html

**Coverage**: Sand flat at ~10 m water depth in Florida Keys, 9 km south of Long Key (24° 43.52'N, 80° 49.85'W)

NSF Award Abstract:

The PIs request funding to build and test robust eddy correlation instruments for unidirectional and oscillating flow environments based on sturdy fiber- and planar-optical sensors and novel signal-processing electronics. The new hardware will be supported by software development to correct potential flux underestimations caused by inadequate oxygen sensor response time and spatial offsets between oxygen and flow sensors. The fragility of the thin glass microelectrode used in aquatic eddy correlation instruments severely limits the use of this powerful technique for flux measurements in benthic environments. This problem represents the major bottleneck preventing the widespread use of this approach.

Broader Impacts:

The PIs have very strong records both in spreading the use of EC technology through the community and in graduate and undergraduate education. They outline clearly the ways in which they will continue their ongoing endeavors in both areas. In addition, the application of this technology to the geochemistry and ecology of shallow-water regions has broad implications for carbon cycling and ocean acidification studies, both of which have important societal ramifications. Better quantify oxygen fluxes in the aquatic environment is important for society. It can e.g. help predict when and if the health of an aquatic system is being weakened, and when e.g. hypoxia or anoxia is approaching. Anoxia leads to death of all higher life

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## Funding

| Funding Source | Award |
|---|---|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1334117 |
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1334848 |

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