

**cDrake Current Meter Mooring Documentation
November 2007 to November 2010**

Data submitted by
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ABSTRACT

The goal of cDrake is to quantify the transport and understand the dynamic balances of the Antarctic Circumpolar Current (ACC) in Drake Passage. For this purpose, a transport line spanning all of Drake Passage and a local dynamics array of CPIES were deployed for a period of four years. A CPIES comprises an inverted echo sounder equipped with a bottom pressure gauge and a current meter tethered 50 m above the bottom.

In addition to the CPIESs, three current meter moorings were deployed along the continental margins for the initial two years of the field program. Subsequently, a current meter comparison mooring was deployed in a region of strong bottom currents for a period of one year. Conductivity-temperature-depth and lowered acoustic Doppler current profiler measurements were taken at each CPIES site. A shipboard acoustic Doppler current profiler measured the velocity structure along the cruise track.

cDrake was a collaboration between investigators at University of Rhode Island (URI) and Scripps Institution of Oceanography (SIO). The measurements presented here were made with support provided by National Science Foundation Office of Polar Programs grants ANT-0636493 and ANT-0635437.

This document summarizes the current meter mooring operations. Details are provided about the deployment and data processing of the three short moorings deployed at the continental margins of Drake Passage from November 2007 to December 2009. The comparison mooring is documented in *Kennelly et al.* (2012), provided with this submission, and in a journal publication (*Watts et al.*, 2013). Also included here are descriptions of the data files provided with this submission. For each type of current meter the highest quality data is provided with the least amount of processing.

Fieldwork

The cDrake fieldwork consisted of five cruises: deployment, three telemetry, and recovery. All cruises were conducted aboard the RVIB Nathaniel B. Palmer which departed from and returned to Punta Arenas, Chile. Current meter mooring operations took place on three of these cruises (Table 1). The three short moorings were launched on the first cruise in 2007 and recovered two years later. The comparison mooring was launched in 2009 and recovered one year later.

Table 1: Cruises aboard the RVIB Nathaniel B. Palmer with mooring operations.

Cruise Number	Cruise Dates	Cruise Description
NBP0710	13 November–7 December 2007	Deploy CRIES, deep current meter moorings, LADCP/CTD stations
NBP0908	19 November–19 December 2009	CRIES data telemetry, deep current mooring recoveries, deploy comparison mooring, LADCP/CTD stations
NBP1004	23 October–15 November 2010	CRIES data telemetry, comparison mooring recovery, LADCP/CTD stations

Short moorings

Launch and recovery

Mooring M01 and M02 were located on the northern continental margin of Drake Passage and M03 was located at the southern margin. The mooring locations are listed in Table 2 together with the duration of deployment and nominal depth. Recovery timing information is listed in Table 3. The moorings were instrumented with either two or three current meters positioned within 600 m of the seafloor to examine the vertical current structure for two years. The topmost instrument on each mooring was equipped with a pressure sensor. All instruments were Aanderaa RCM8 current meters, each equipped with a rotor and vane. Serial numbers of the current meters, their position on the moorings, and variables measured are given in Table 4.

Table 2: Short mooring launch information.

Site	Lat deg (S)	Lat min (S)	Lon deg (W)	Lon min (w)	Depth (m)	Date	Anchor Splash Time (Z)	Year Day
M01	55	1.62	64	34.54	1520	11/15/07	1212	319
M02	55	21.96	64	28.76	3355	11/15/07	1655	319
M03	61	47.50	60	30.18	1984	11/21/07	1842	325

Data files provided

The file names include both the mooring site designator and the Aanderaa RCM8 serial number. Header lines are prefaced by a percent symbol. Variables include date and time, velocity components (u and v), temperature, pressure (if available), and a stall warning flag. The bottom current meter on M02 failed near the launch time and no data was recorded; thus there is no file included with this submission.

Table 3: Short mooring recovery information.

Mooring	Date	Release UTC
M01	21 November 2009	1352
M02	21 November 2009	1851
M03	01 December 2009	2346

Table 4: Short mooring layouts.

Mooring	Position	Depth off bottom	SN	variables
M01	top	D - 600 m	9269	u,v,t,p
	middle	D - 300 m	9268	u,v,t
	bottom	D - 100 m	2967	u,v,t
M02	top	D - 600 m	9324	u,v,t,p
	middle	D - 300 m	9325	u,v,t
	bottom	D - 100 m	9591	no data
M03	top	D - 300 m	9687	u,v,t,p
	bottom	D - 100 m	9685	u,v,t

Time base

The current meters were programmed to sample every hour. Time base was established by making note of events such as on-time, rotor spinning, release and recovery. Clock drifts were determined by comparing the timing of these events with the time stamps recorded by each current meter. Clock drifts have been corrected and the data included in this submission are at one hour intervals. The timing provided in each file is UTC.

Current velocity

The counts measured by the instruments were converted to speed using an equation provided by Aanderaa. The coefficients to convert counts into headings were obtained using calibration tests performed at URI in 1999. The headings were corrected for magnetic declination. Subsequently speed and heading were converted to the vector components. Hourly u (positive eastward) and v (positive northward) are provided in units of cm s^{-1} . The rotor on RCM8 current meter will stall when the current speed is below 0.01 m s^{-1} . If a stall occurred, the stall warning flag is set to 1.

Temperature

Counts were converted to temperatures using coefficients obtained with calibration tests conducted at URI in 1999. Hourly values in degrees Celsius are provided.

Pressure

The topmost instrument on each mooring was equipped with a pressure sensor. At sites M01 and M02, these instruments were nominally located 600 m above the seafloor. At site M03 it was located 300 m above the seafloor. Hourly values in decibars (10 kPa) are provided.

Comparison mooring

Launch and recovery

The mooring, designated M04, was deployed on 24 November 2009 at 56.55°S , 62.15°W in the cDrake Local Dynamics Array in about 4000 m water depth. After an 11-month deployment it was recovered on 28 October 2010. Included in *Kennelly et al.* (2012) are descriptions of the current meter models, their locations on the mooring and corrections applied to the data (clock drift, tilt and sound speed). Note, no corrections were made for magnetic declination. All records for the comparison mooring would have identical declination.

Data files provided

The file names include both the mooring site designator and the current meter serial number. Header lines are prefaced by a percent symbol. Variables include date and time, velocity components (u and v), temperature and pressure (if available). Data included in this submission are at one minute intervals for the VMCMs and 30 minute intervals for the acoustic current meters.

References

Kennelly, M. A., D. R. Watts, K. L. Tracey, and K. A. Donohue. *An intercomparison of four models of current meter in high current conditions in Drake Passage*. GSO Technical Report 12-04, University of Rhode Island, 2012.

Watts, D. R., M. A. Kennelly, K. A. Donohue, K. L. Tracey, T. K. Chereskin, R. A. Weller, and I. Victoria. Four current meter models compared in strong currents in Drake Passage. *J. Atmos. and Oceanic Technol.*, 30:2465-2477, 2013. (doi:10.1175/JTECH-D-13-00032.1)