

R/V Poseidon cruise: P320-2/3

This cruise were part of the German SOPRAN project.

Initial submission: 2011
Most recent update: 21. September 2012

Date of cruise (dd/mm/yyyy): 31.05. 2010 - 23.06.2010
Geographic coverage: 16°N - 39°N, 9°W - 25°W
Ports of call: Las Palmas, Gran Canaria - Vigo, Spain

Vessel name: R/V Poseidon
Vessel ID: DBKV
Country: Germany
Owner: Federal Republic of Germany

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Citation: Steinhoff, T. and Kortzinger, A. (2010).
Underway fCO₂ measurements off NW Africa on
R/V Poseidon in June 2010.

Reported variables:

(1-3) Year Month Day	date
(4-6) Hour Minute Second	time (UTC)
(7) Day of year	decimal year day
(8) Longitude [deg E]	Longitude in decimal degrees E
(9) Latitude [deg N]	Latitude in decimal degrees N
(10) SST [deg C]	Sea surface temperature in deg C
(11) SSS	Sea surface salinity
(12) Atm. Pressure [mbar]	Atmospheric pressure in mbar
(13) Equi Temp [deg C]	Water temperature inside the equilibrator in deg C
(14) Equi Press [mbar]	Pressure inside the equilibrator in mbar
(15) xCO ₂ (equi temp, dry) [ppm]	mole fraction of CO ₂ in the equilibrator headspace (dry) at equilibrator temperature in ppm
(16) pCO ₂ (SST, 100hum) [uatm]	partial pressure of CO ₂ in seawater at SST and 100% humidity in atm
(17) fCO ₂ (SST, 100hum) [uatm]	fugacity of CO ₂ in seawater at SST and 100% humidity in atm
(18) Atm. xCO ₂ (dry) [ppm]	mole fraction of CO ₂ of atmospheric air in ppm
(19) Atm xCO ₂ (dry, running mean) [ppm]	same as 18 but with a running mean (700 minutes) to interpolate between measurements.

Instrument information:

- SST (+- 0.05 deg C):
SST was taken from the ship's thermosalinograph (Seabird SBE21 with an external SBE38). Both instruments were calibrated approximately every 6 months. SST data weren't recorded 09.06. 08:30:09 - 10.06. 23:27:07, 13.06. 08:58:35 - 13.06. 13:27:25, 15.06. 07:47:34 - 16.06. 08:57:53. Data were also not recorded from 17. June. Missing SST data were estimated from an linear relation between equilibrator temp and SST ($SST(calc) = 1.0269 \times equT - 0.983$). This relationship was established using the remaining SST-EquT data.

-SSS (+- 0.1 PSU, partly +-0.4 PSU):
SSS was measured with a thermosalinograph from Seabird (SBE21) which was calibrated approximately every 6 months. SSS data weren't recorded 09.06.

08:30:09 - 10.06. 23:27:07, 13.06. 08:58:35 - 13.06. 13:27:25, 15.06. 07:47:34 - 16.06. 08:57:53. Data were also not recorded from 17. June. Missing SSS data were taken from World Ocean Atlas (2005).

-Atmospheric press. (± 0.1 mbar):

The atm. Pressure was taken from the ship's weather station.

-Equilibrator temp (0.05 °C):

The temperature probe inside the equilibrator was compared to a calibrated high precision thermometer and the SST temperature sensor.

-Equilibrator press (± 0.1 mbar):

Differential measurement. For the pressure outside the equilibrator atmospheric pressure was used and 3 mbar were added to account for the height difference and possible overpressure inside the engine room: $P_{\text{equ}} = P_{\text{atm}} + 3\text{mbar} + P_{\text{equ}}(\text{differential})$

-pCO₂/fCO₂ (± 3 atm):

IR sensor: Licor 7000, calibrated with 2 standard gases.

Standard gases: Deuste Steininger (347.6, 670.84 ppm), calibrated against

NOAA/CMDL standard gases. Resulting uncertainty: ± 0.5 ppm.

Water flow rate: 2-3 L min⁻¹

Gas flow rate: 100 mL min⁻¹

A so-called Neill system was used for pCO₂ measurements. The system is described in detail in Pierrot (2009) and the whole setup is described in Steinhoff (2010). Surface water is pumped continuously (by a torque flow pump) from the intake to the equilibrator. The equilibrator contains a water spray head, and as the water flows through it the dissolved CO₂ equilibrates with the headspace. The headspace is dried and xCO₂ is determined by an infrared sensor. Calculations were performed following Pierrot (2009) and are described in detail in Steinhoff (2010).

References:

Pierrot, D., Neill, C., Sullivan, K., Castle, R., Wanninkhof, R., Langer, H., Johannessen, T.,

Olsen, A., Feely, R. A., and Cosca, C. E. (2009). Recommendations for autonomous underway pCO₂ measuring systems and data reduction routines. Deep-Sea Res. II , 56, 512_522.

Steinhoff, T. (2010). Carbon and nutrient fluxes in the North Atlantic Ocean. Dissertation. http://eldiss.uni-kiel.de/macau/receive/dissertation_diss_00005704

