

**Sea Surface fCO₂ measurements in the Indian and Southern Oceans
obtained during MINERVE-29 associated to JGOFS/ANTARES-2 cruise
onboard the R.V. Marion-Dufresne (IPEV), 28/1-22/3/94
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Method

The sea surface fugacity of CO₂ (fCO₂) was measured onboard the research vessel Marion-Dufresne (IPEV) during the French JGOFS/ANTARES-2 by C. Brunet and C. Bossonet (LBCM, Paris) in the frame of the project MINERVE-29. The fCO₂ measurements technique has been described for other MINERVE cruises conducted during years 1990-1995 in the Indian and Southern Ocean (Poisson *et al.*, 1993; Metzl *et al.* 1995, 1999). This instrumentation was also used by our group during the international at-sea intercomparison of fCO₂ systems conducted in 1996 in the North-Atlantic (Kortzinger *et al.*, 2000).

In short, sea surface water is continuously equilibrated using a "thin film" type equilibrator thermostated with surface seawater. The CO₂ in the dried gas is measured with a non-dispersive infrared analyser (NDIR, Siemens Ultramat 5F). Standard gases for calibration (269.9, 349.7, 489.6 ppm) and atmospheric CO₂ are measured every 7 hours. To correct measurements to in situ data, we used polynomials given by Weiss and Price (1980) for vapour pressure and by Copin-Montégut (1988, 1989) for temperature. Depending the location (warm and cold waters) the temperature in the equilibrium cell was 0.50°C to 5°C warmer than the SST during MINERVE-29 cruise. The differences between temperature in the equilibrium cell and SST is much larger than during previous cruises (e.g. Poisson *et al.*, 1993). This is explained by the sea surface water pumping system which was not operating in an homogeneous way during this cruise. As long as the difference of temperature is taken into account in the fCO₂ corrections, the sea surface fCO₂ measurements are accurate. However, for short periods, the problems encountered with the seawater pumps may have

change the equilibration time and thus any measurements of seawater properties (salinity, fCO₂,...). At present, the possible off-sets have not been unidentified.

Based on different cruises analysis, the oceanic fCO₂ data should be accurate to about $\pm 0.7 \mu\text{atm}$. All parameters presented in this data-set correspond to the average of about 60 records made during 10 minutes.

The fCO₂ data obtained during MINERVE cruise have been included in synthesis studies of air-sea CO₂ fluxes at regional scale in the SubAntarctic zone (Metzl et al., 1999), for constructing global scale pCO₂ climatologies (Takahashi et al., 2002) and for comparing and/or validating ocean models (e.g. Louanchi et al., 1996; Metzl et al., 1998).

File description

The file **MIN29CO2W.xls** contains all the results of sea surface fCO₂ measurements (and associated properties) made onboard during the cruise MINERVE-29. The columns of the file include: Date-hour (dd/mm/yy hh:mn), Latitude (degree.degree), Longitude (degree.degree), atmospheric pressure (mb), sea surface water fCO₂ fugacity (μatm) normalized at 1atm, FCO₂ (1013) and at local pressure, FCO₂(patm), fluorescence (in relative units), temperature in the equilibrium cell (°C), sea surface temperature (°C), and sea surface salinity (PSU). The first date, first line of the data set, is 28/01/94 at 01:16.

For more information or if you have questions concerning these data, please contact N.Metzl (metzl@ccr.jussieu.fr) or C.Brunet (brunet@ccr.jussieu.fr)

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