

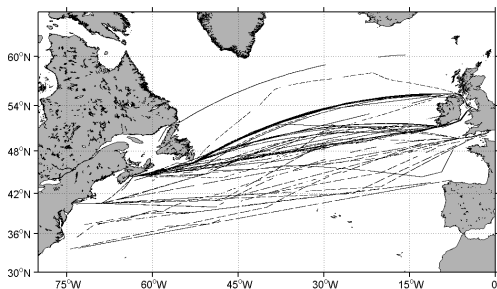
# Eddy-Kovarianz-Messungen an Bord von Handelsschiffen

Tobias Steinhoff, Alex Zavarsky, Melf Paulsen, Arne Körtzinger und Christa Marandino



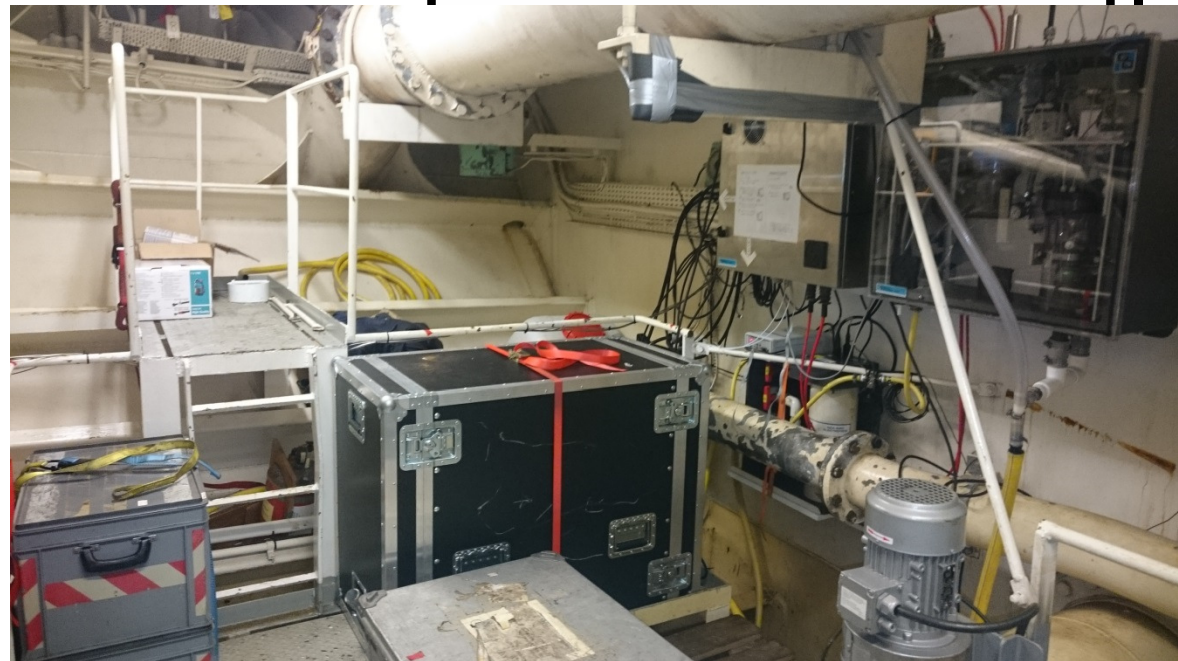
Helmholtz-Zentrum für Ozeanforschung Kiel

# VOS Linie im subpolaren Nordatlantik



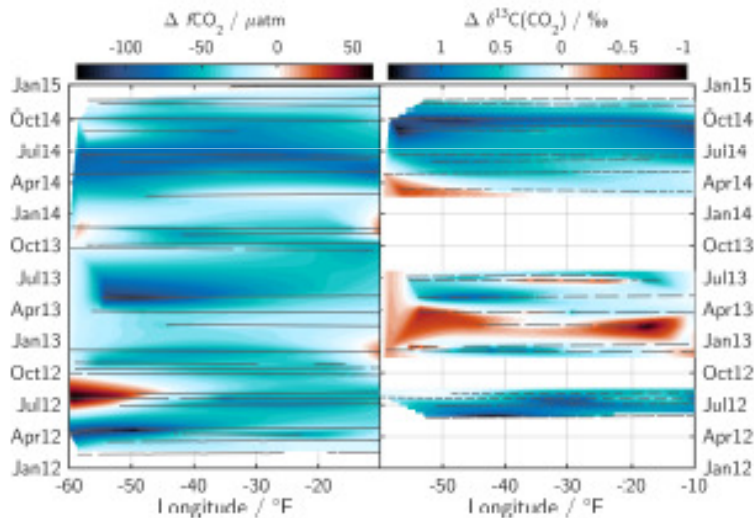
- 2002-2005: M/V Falstaff, Wallenius Lines (CAVASSOO/CARBOOCEAN)
- Seit 2006: MV Atlantic Companion, Atlantic Container Lines (CARBOCHANGE/CARBOOCEAN/ICOS)
- Underway Messungen von  $p\text{CO}_2$  (Ozean und Atmosphäre), SST, SSS, (Sauerstoff); >400,000 Datenpunkte
- Diskrete Probennahme von DIC, Alkalinität, Nährstoffe, organischer Kohlenstoff

# CRDS based CO<sub>2</sub> detection

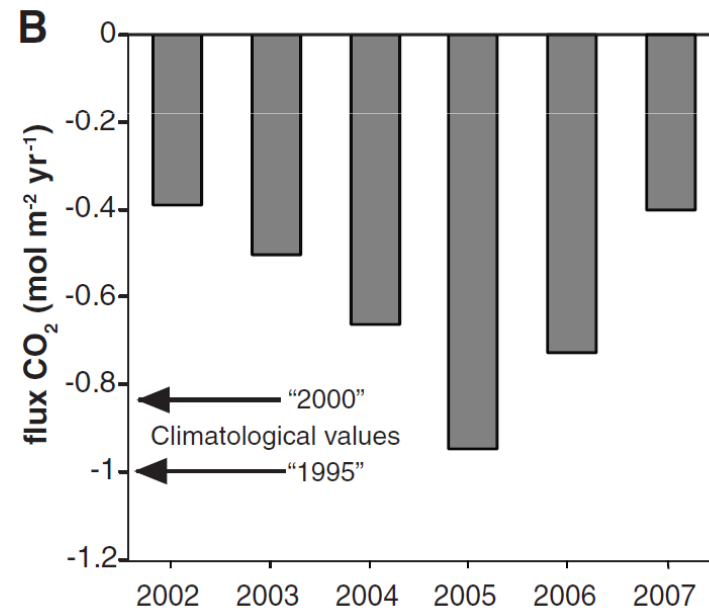
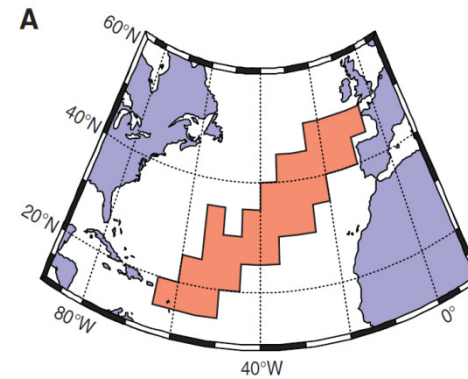


# CO<sub>2</sub> Fluss im Nordatlantik

- CO<sub>2</sub> Fluss =  $f(\Delta p\text{CO}_2, k, \text{wind})$
- High interannual and seasonal variability

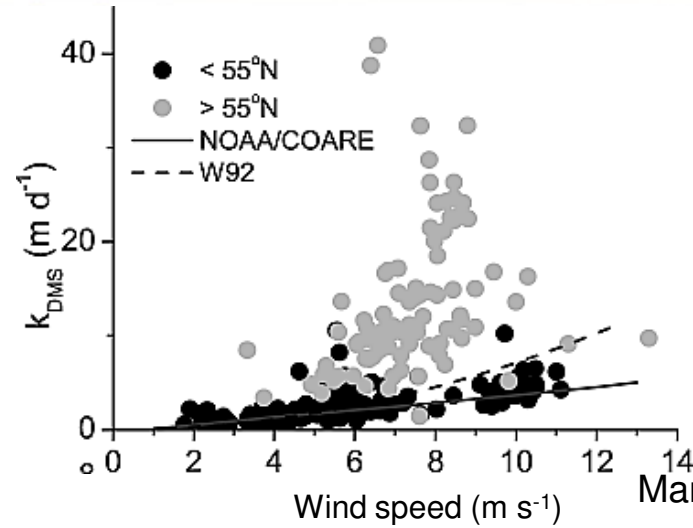
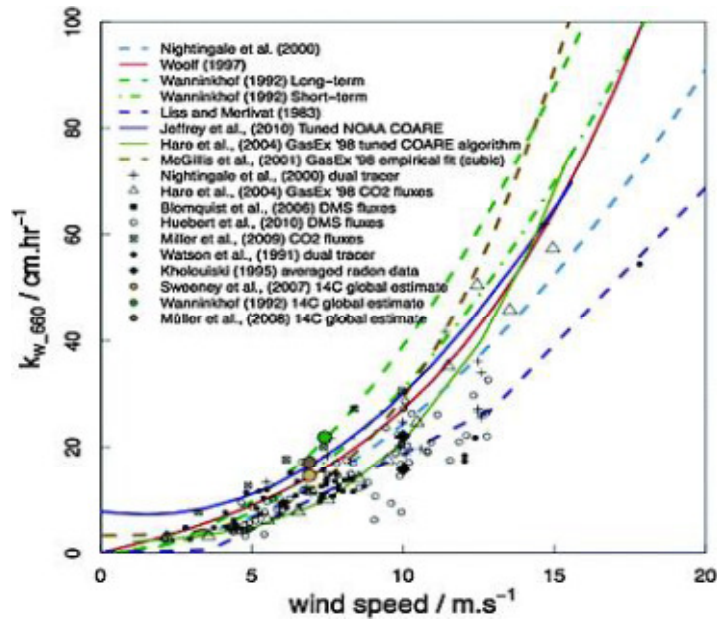


Becker, Dissertation, 2016



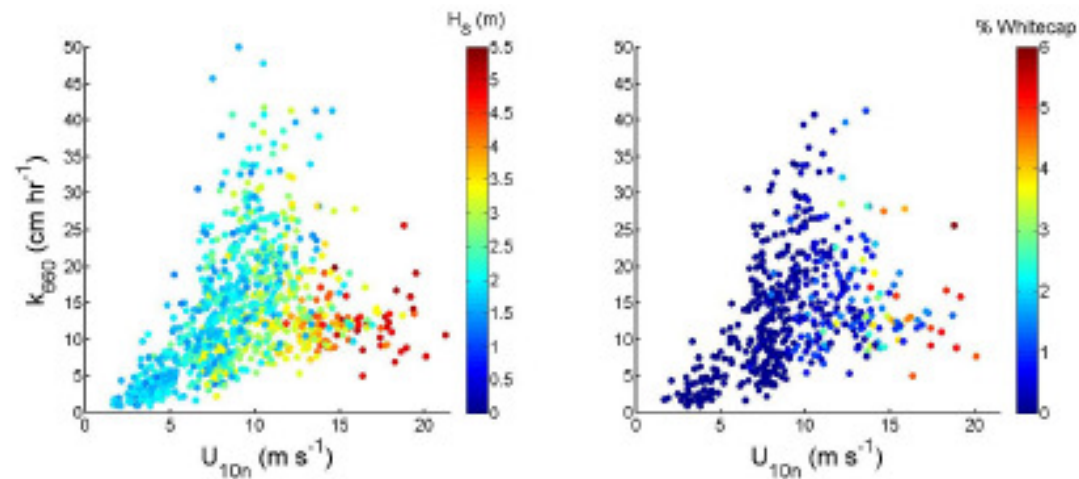
Watson et al., Science, 2009

# Was treibt den Austausch von Gasen?



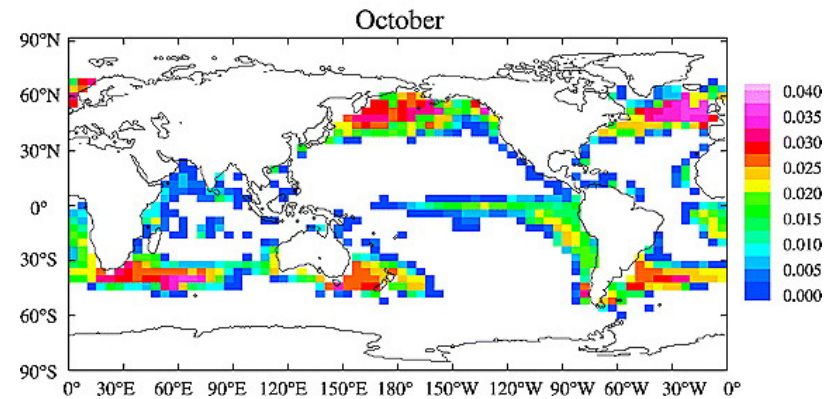
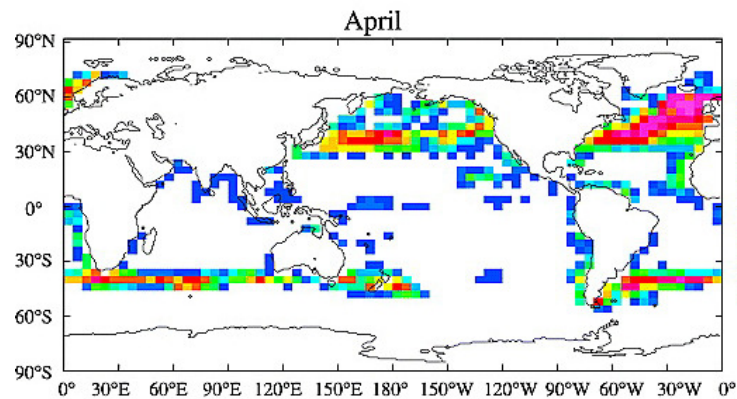
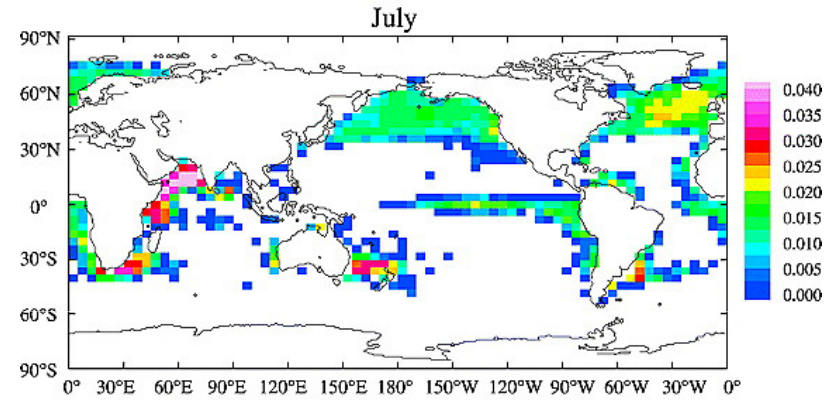
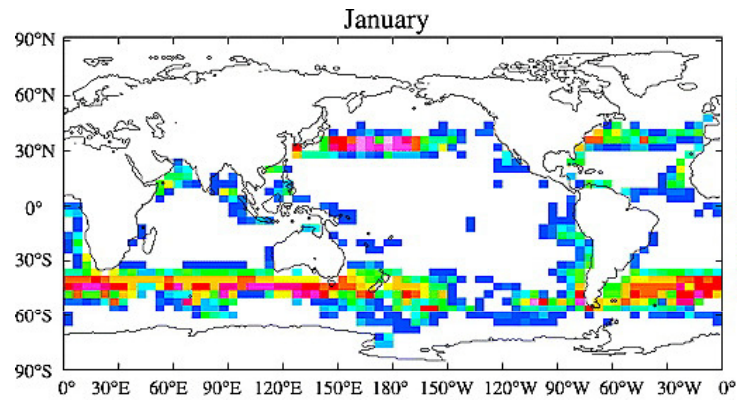
Marandino et al., 2008

$$\text{Flux} = k * \Delta C$$



Bell et al., 2013

Reduzierung des CO<sub>2</sub>-Flusses: sog. Dampening factor

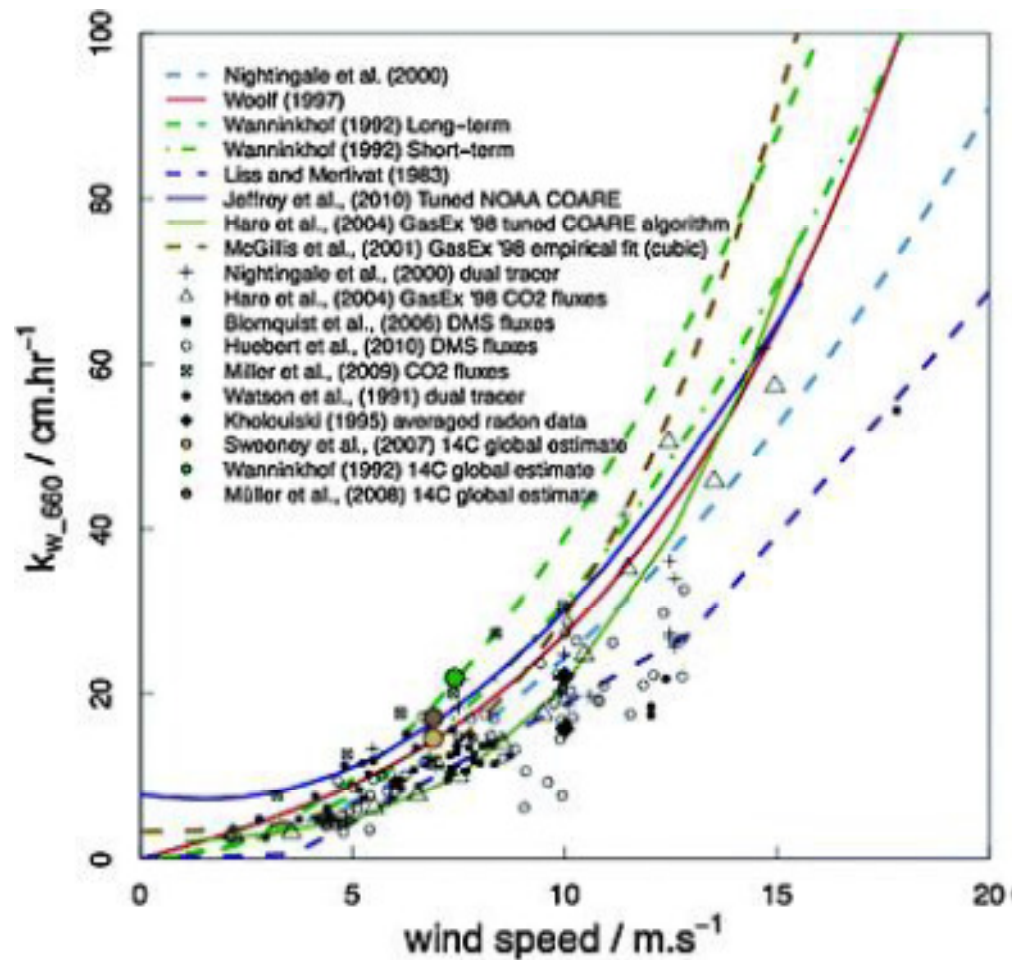


Tsai und Liu, 2003

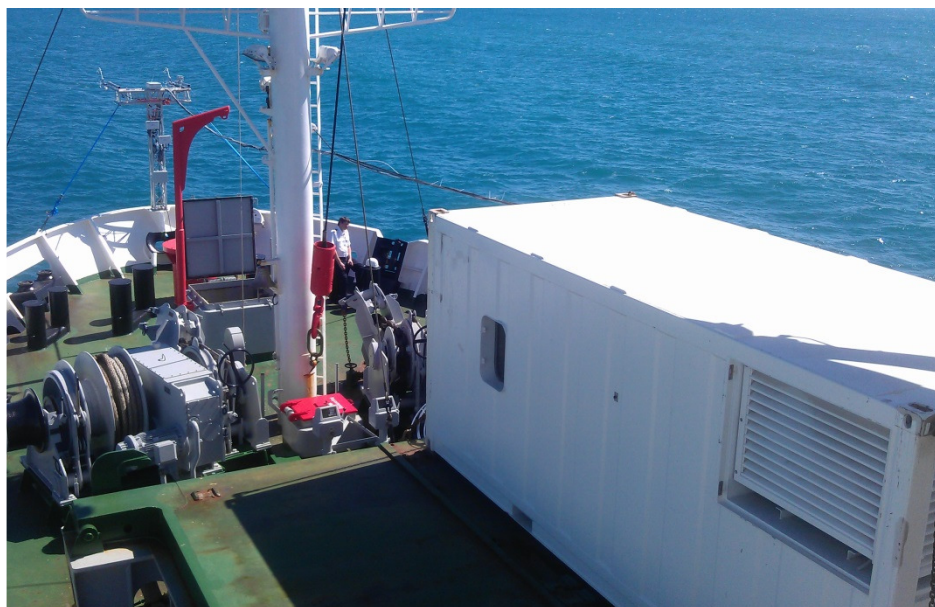
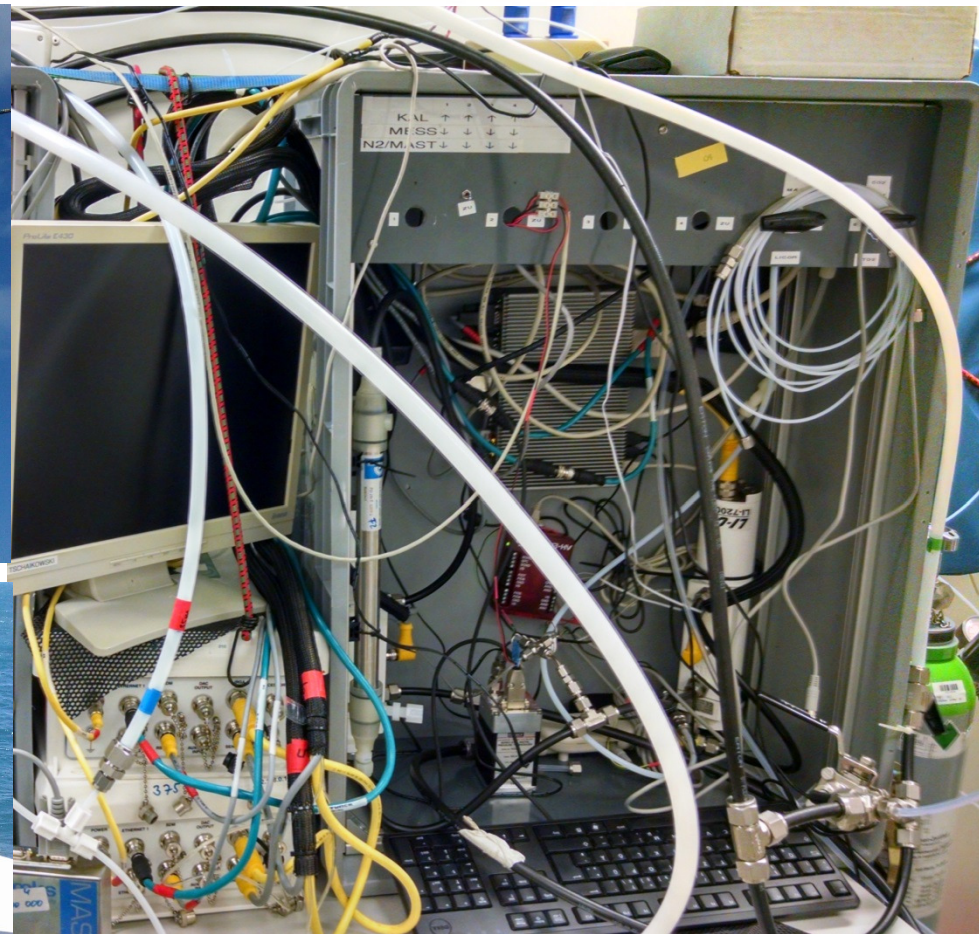
# Austauschfluss: Bulk vs. Direkt

$$\text{Flux}_{\text{bulk}} = k * \Delta C$$

$$\text{Flux}_{\text{EC}} = \overline{w'c'}$$

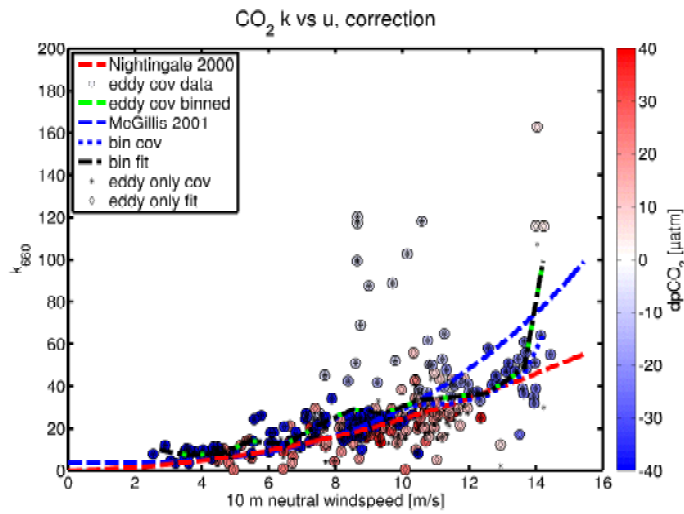
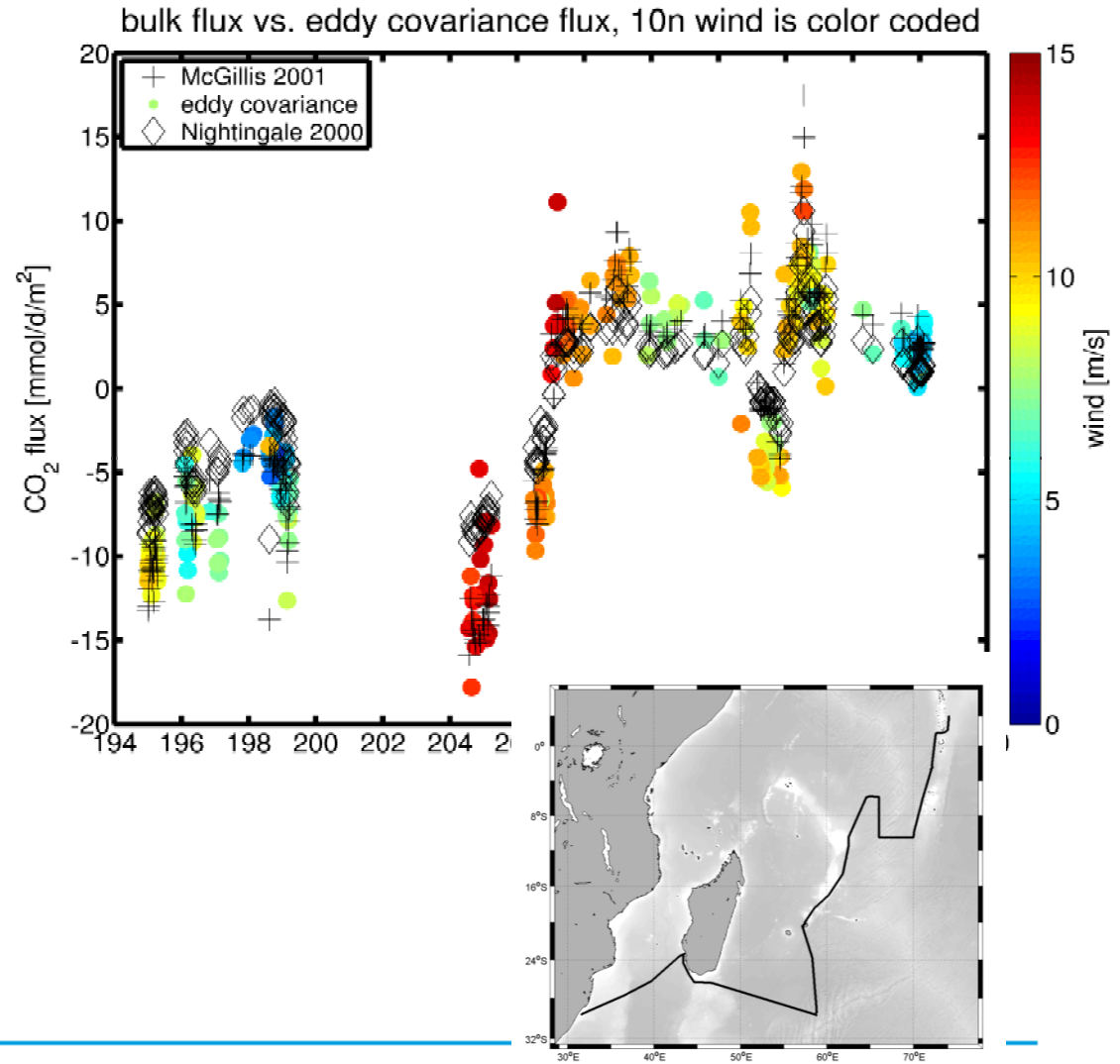
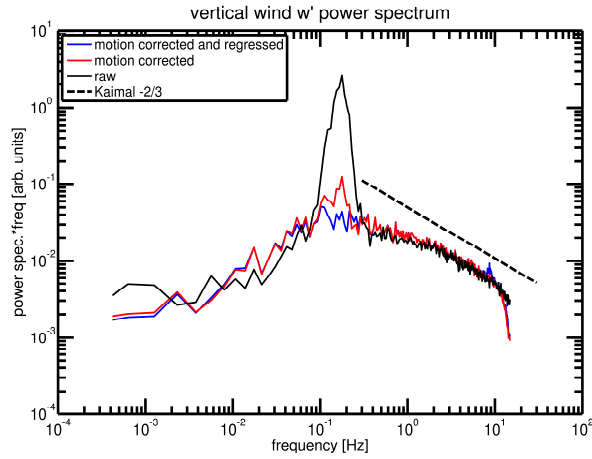


# EC auf dem Schiff





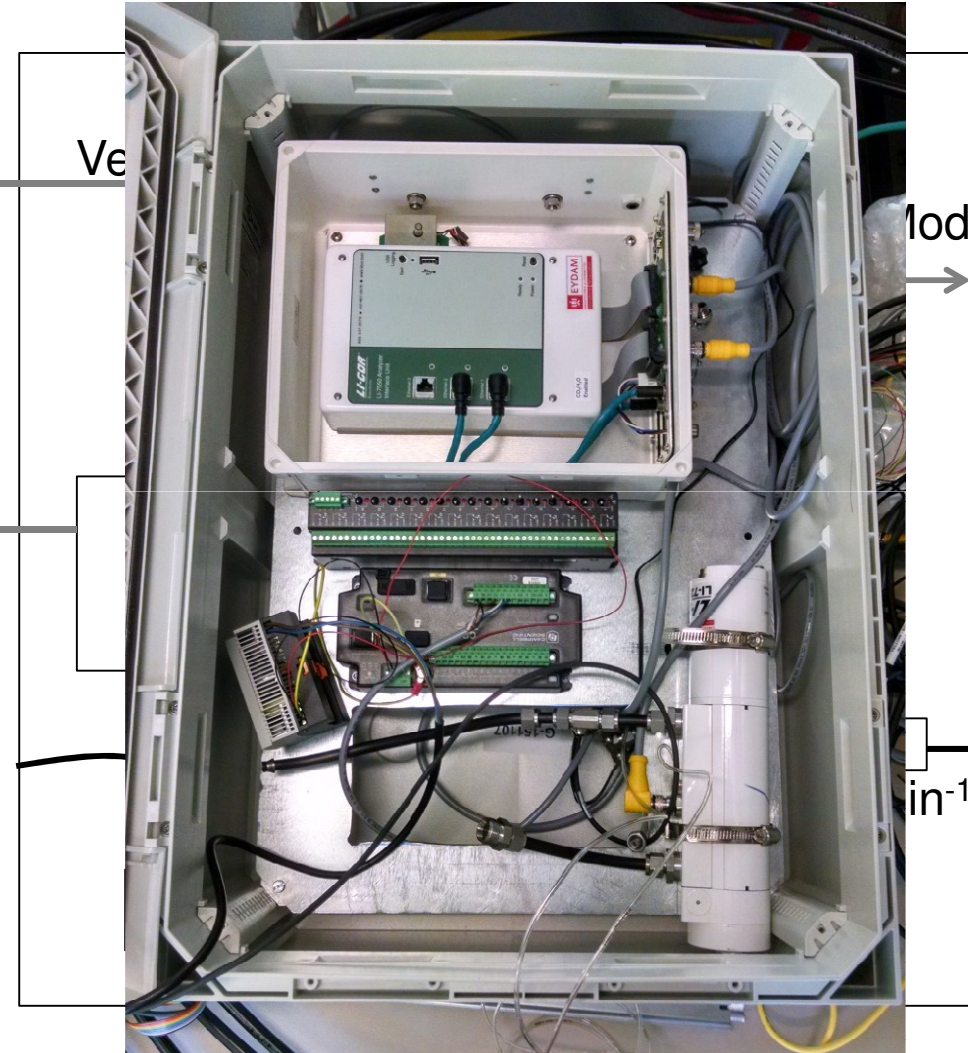
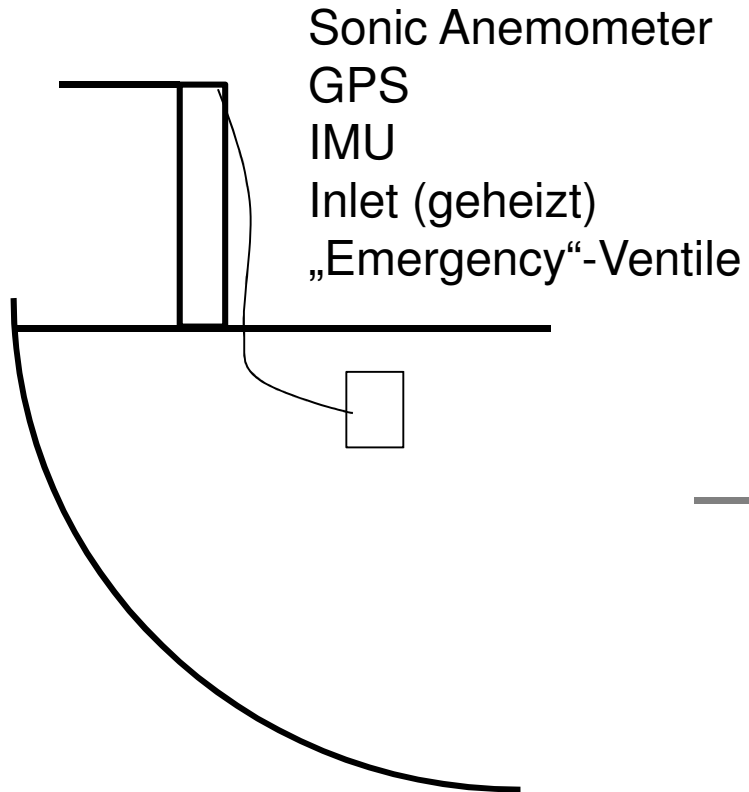
# EC auf dem Schiff



# EC auf dem VOS



# EC auf dem VOS



# EC auf dem VOS

