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Interactive comment on "Air-sea CO_2 flux in the Pacific Ocean for the period 1990–2009" *by* M. Ishii et al.

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General Comment

The manuscript represents a good synthesis of the estimations of the air-sea CO2 flux in the Pacific Ocean. The study divided the Pacific Ocean in three main physically and chemically coherent regions. The Tropic Pacific from 18°S to 18°N shows a positive flux of CO2 whereas the other two extra-tropic North and South Pacific regions are net sinks of CO2. The results are based in observations of CO2, inversions of ocean interior CO2 concentrations, ocean biogeochemical General Circulation Models (OBGCM) and inversions of atmospheric CO2. Seasonal cycle, interannual variability and long-term trends are also described in each region. No significant trends are found. However, the results confirm previous observations of the impact of El Niño Southern Oscillation

in the air-sea CO2 flux. In my opinion, the manuscript is suitable for publication.

Minor Comments Page 12166 Line 17-25. The description of the Ocean Interior CO2 inversion method is rather simplistic. The manuscript linked the use of the Green Function (GF). However, the cited articles (Gloor et al. 2003; Gruber et al. 2009) did not mention GF although they described the use of 'dyes' to calibrate the age of the water mass parcel. The GF was introduced earlier (Haine and Hall 2002; Primeau 2005). Khatiwala et al. (2009) used this method to evaluate the anthropogenic CO2 assuming a steady-state circulation. Other important fact about this method is that it uses the anthropogenic CO2 estimations given in GLODAP (Key et al. 2004) as an additional constrain. This should be addressed. Pag 12167 Line 20. In addition to the restoring SSS, some OBGCMs are also constrained by using the Carbon data, both the one observed and the one computed as anthropogenic, given in GLODAP. If it is the case, this fact should be addressed. Page 12127-12173. In terms of inter-annual variability in the Tropical Pacific, the wind-products can introduce an additional source of variability. Several papers are cited between lines 5 to 15 in page 12173 but they could use different wind-products making the discussion a bit of a mess. Page 12174 and line 2. 0.20 PgCyr-1 should be 0.17 PgCyr-1 Page 12186 lines 1-13. Wind-speed products are pointed to be one of the elements responsible of the discrepancies between OBGCMs and the diagnostic model. However, these discrepancies are quite low in NP and the Tropical regions in comparison with the South Pacific. Any possible cause for this behaviour should be addressed.

References Haine, T. W., and T. M. Hall, 2002. A generalized transport theory: Water-mass composition and age. J. Phys. Oceanogr., 32, 1932–1946. Primeau, F. W., 2005: Characterizing transport between the surface mixed layer and the ocean interior with a forward and adjoint global ocean transport model. J. Phys. Oceanogr., 35, 545–564. Khatiwala, S., Primeau, F., and Hall, T. 2009: Reconstruction of the history of anthropogenic CO2 concentrations in the ocean, Nature, 462, 346–349, doi:10.1038/nature08526.