

Ocean Acidification Modeling in OCMIP

Akio Ishida

Dept. Social and Environmental Studies, Tokoha University

- ✓ Ocean Carbon-cycle Model Intercomparison Project (OCMIP)
- ✓ Future projection of Acidification in the Southern Ocean.
- ✓ Climate feedback

Ocean-Carbon Cycle Model Intercomparison Project

The OCMIP is a research program of JGOFS (Joint Global Ocean Flux Study)/GAIM (Global Analysis, Integration and Modelling) under IGBP (International Geosphere-Biosphere Programme).

It was initiated to develop an international collaboration to accelerate development of global-scale, 3-dimensional, ocean carbon-cycle models through model intercomparison.

After a 3-year pilot study (OCMIP-1), a second phase with 13 groups and data specialists took on a more detailed effort during 1998-2002 (OCMIP-2).

OCMIP: Ocean Carbon-cycle Model Intercomparison Project

Projections of anthropogenic CO₂ uptake by models run with IS92a scenario.

(IPCC, TAR, Fig.3.10)

Groups

Europe

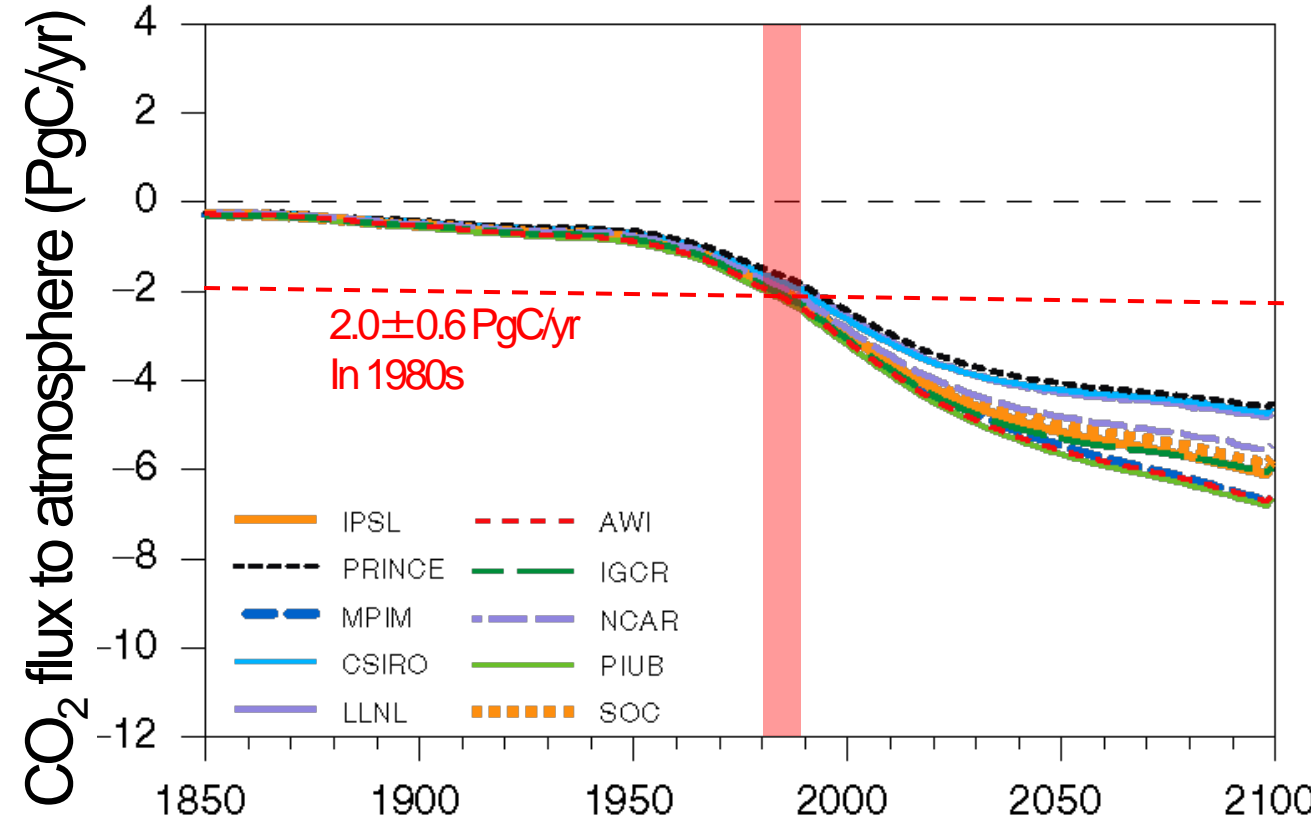
AWI (Germany),
IPSL(France),
MIPM(Germany),
NERSC(Norway),
PIUB(Switzerland),
SOC(UK),UL(Belgium)

U.S.A.

LLNL, MIT, NCAR,
PRINCE

Japan: FRCGC

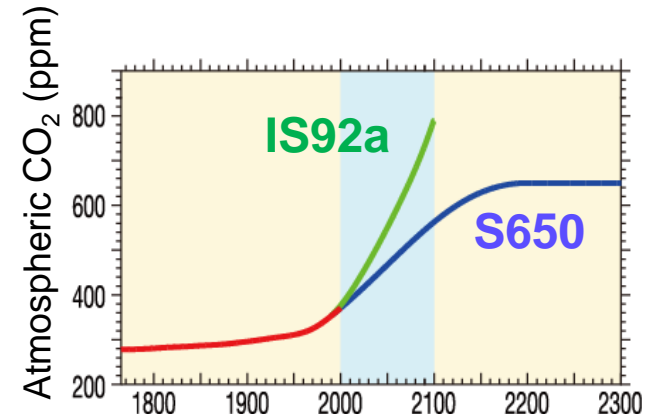
Australia: CSIRO



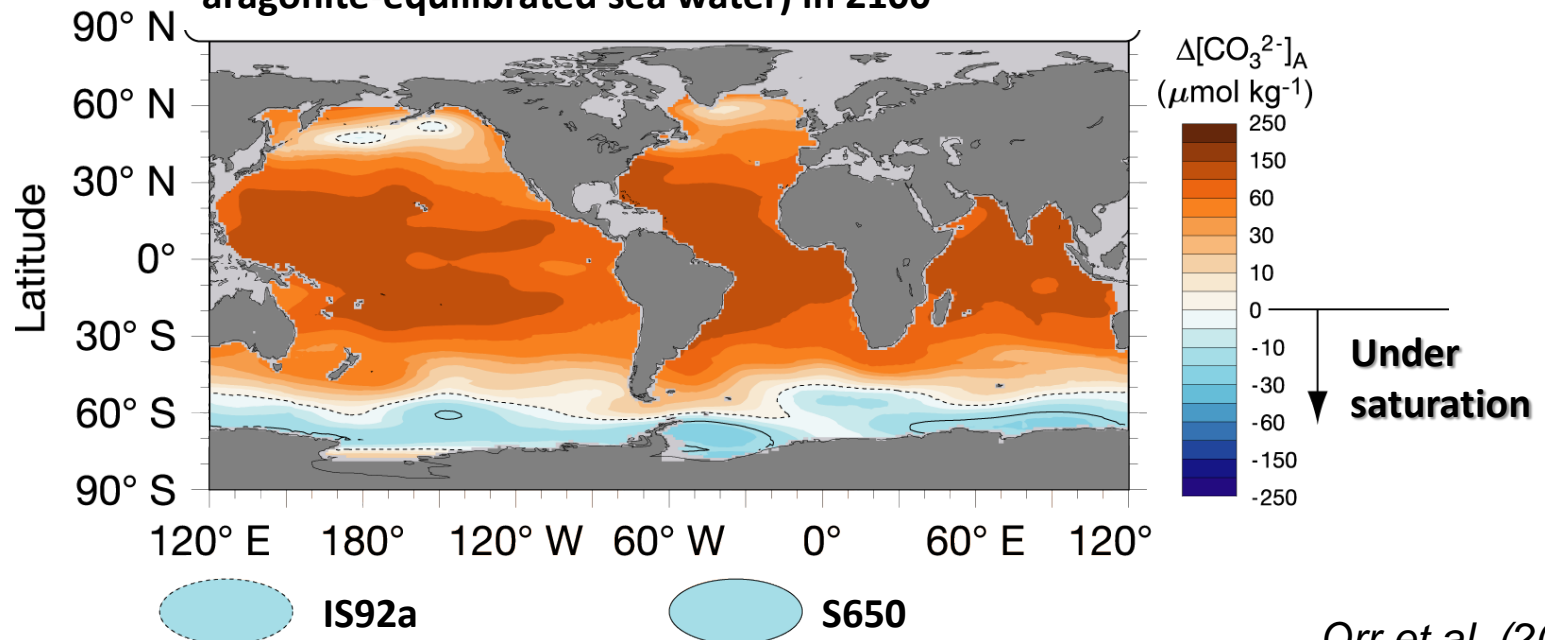
Future projection of ocean acidification

OCMIP: Ocean Carbon-cycle Model
Intercomparison Project

Models with common formulation and dataset
(atmospheric pCO₂, wind, gas transfer coefficient,
carbonate chemistry)

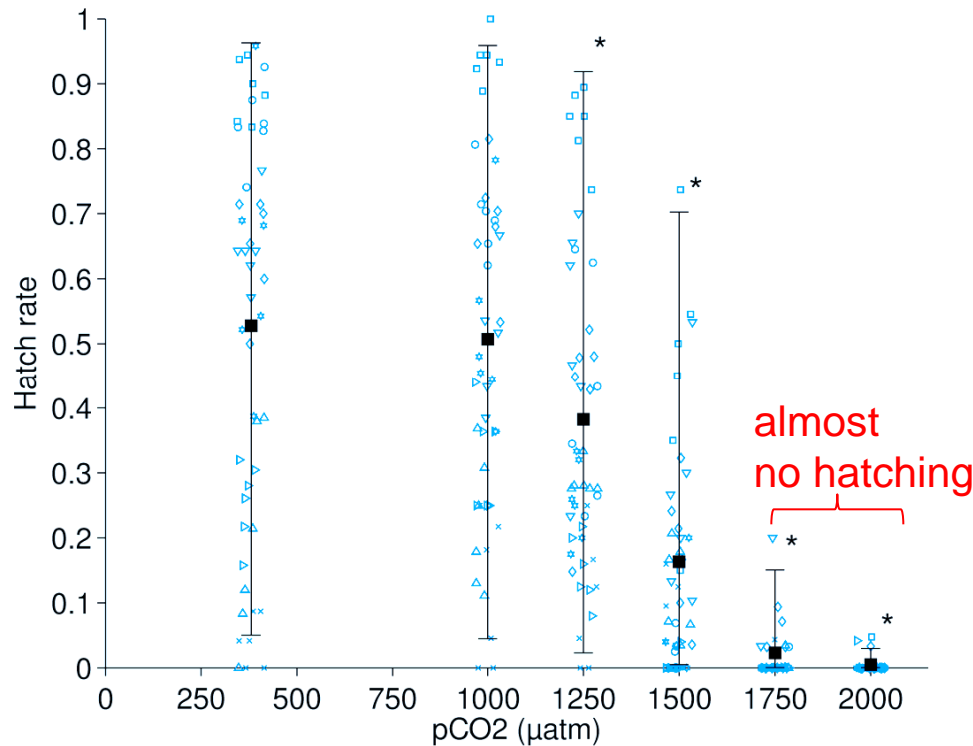


**Aragonite saturation difference (in situ minus that for
aragonite-equilibrated sea water) in 2100**

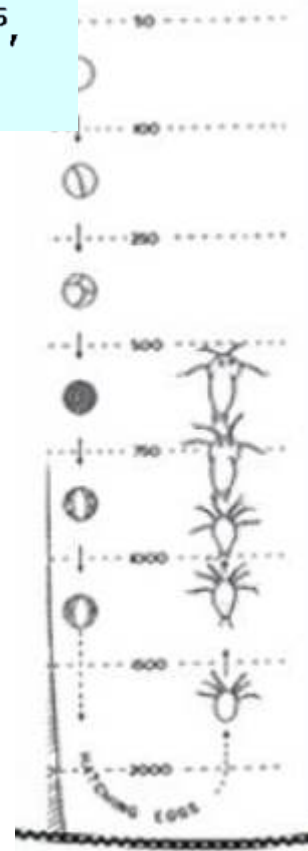


Risk maps for Antarctic krill under projected Southern Ocean acidification

S. Kawaguchi^{1,2*}, A. Ishida^{3,4}, R. King¹, B. Raymond^{1,2}, N. Waller¹, A. Constable^{1,2}, S. Nicol⁵, M. Wakita^{4,6} and A. Ishimatsu⁷



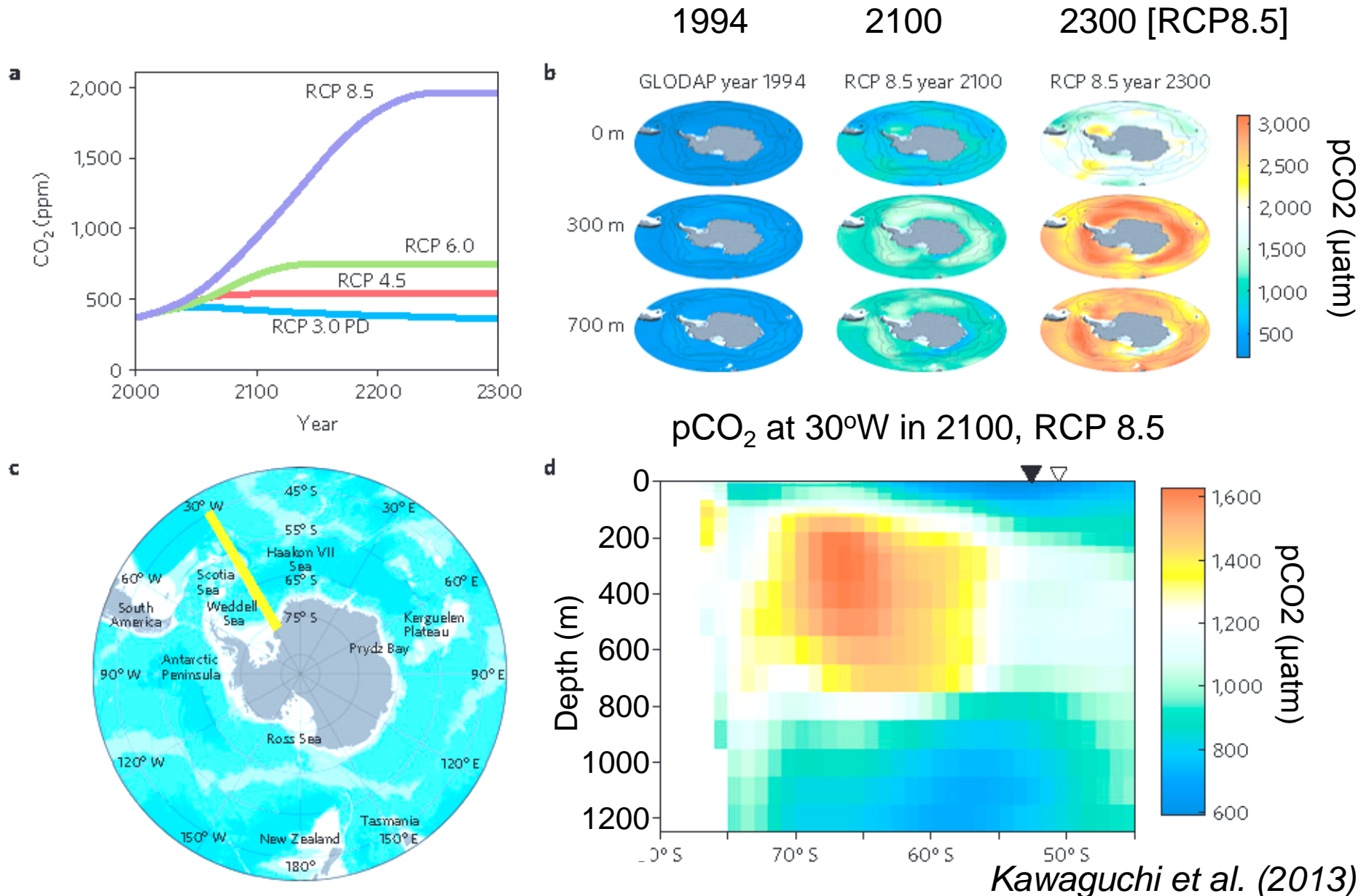
Key species in the Southern Ocean



**Hatch rates :
negatively affected
beyond 1250 µatm CO₂.**

Kawaguchi et al. (2013)

Future projection of $p\text{CO}_2$ in the Southern Ocean



Summary



Ocean Acidification in global or basin scale can be projected with some reliability.

Toward more precise projection,

- Detailed geometrical information and spatial resolution
 - Process oriented vs comprehensive model
 - Extreme climate events to Long-term trend
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