

Report on the Equatorial Pacific Synthesis and Modelling Workshop (EPSMW) and the EPSMG meeting (prepared by Robert Le Borgne, Chair of the EPSMG)

Darling Marine Center, University of Maine, Walpole, Maine, USA, 17-19 September 2002.

Background

During the past three years, the JGOFS Equatorial Pacific Synthesis and Modelling Group (EPSMG) coordinated efforts to organize a special issue of Deep-Sea Research dedicated to the synthesis and modelling for the Equatorial Pacific. After the completion of this work, it was felt that the modellers could benefit from the new ideas and concepts brought about by the synthesis. Subsequently, a small workshop, gathering leaders of the synthesis topics and modellers, was organized by Fei Chai (University of Maine, member of EPSMG) and Robert Le Borgne (IRD-ex ORSTOM, chairman of EPSMG), following the decision taken by the EPSMG during its Bergen meeting in April 2000. The JGOFS SSC approved the workshop in July 2001 and supported part of the cost, together with US-JGOFS and PROOF (French component of JGOFS).

Objectives of the workshop

- To bring observationalists and modellers together in order to present the updated synthesis and modelling results.
- To identify the gaps in the current models and the way they can be filled.
- To discuss potential international collaborative research on the equatorial Pacific.

Participants

From the start, the workshop aimed at being international with a balanced number of observationalists and modellers. However, for reasons independent of financial ones, there was only one representative from Australian JGOFS, Canadian JGOFS, and Japanese JGOFS. The rest of the participants were French (4), Chinese (2) and US (16). A list of the 25 participants is given in the addendum. The meeting benefited from participation of top scientists working in various field dealing with the equatorial Pacific or the global ocean.

Location

The Darling Marine Center of the University of Maine hosted the meeting in a very quiet and peaceful environment. The very helpful staff of the Center and the weather contributed to the success of the meeting.

Agenda

The workshop was organized in half-day sessions devoted to the main topics (see addendum for details). The session on «large-scale description of the equatorial area from remote sensing, moorings and oceanographic cruises» had presentations on the PDO, the variations of sea surface chlorophyll during the 1997-1998 El Niño and the following La Niña, effect of Tropical Instability Waves (TIW) on the carbon cycle from models, zonal and latitudinal variabilities and the latitudinal asymmetry with respect to the equator. The session on «the biological pump and its short-term variability» considered both the warm pool and the HNLC system and provided a fair knowledge on some subjects and unresolved questions, particularly where iron distribution and inputs are concerned. The following session considered «ecosystem modelling» of the HNLC system, which is still being developed and should benefit from the workshop. The session on «long-term variations of the CO₂ flux and the biological pump» considered different time-scales and stressed the need for a continuation of monitoring activities in order to test and improve model predictions. «Modelling of various

time scale variabilities (seasonal, ENSO and PDO)» followed and showed interesting modelling directions.

The workshop finished with general remarks considering the following topics: Is the equatorial Pacific different from other equatorial systems and the other regions studied in the frame of JGOFS? How strong is the organic carbon pump in the ocean and how does the equatorial Pacific fit in? Finally what is the impact of diatoms in climate variability? The conclusions were drawn by the organizers and stressed the following needs in future research on the region: (1) the Tropical Instability Waves have been observed during two oceanographic cruises, but we rely presently on models to assess their net impact on the carbon budget because processes take place in three dimensions (longitude, latitude and depth). Special operations, combining remote sensing, oceanographic cruises and moorings are the only way to validate the models and they require an international cooperation. (2) In a similar way, interactions of iron and silicate effects on primary production are currently considered in models but we lack in situ observations on the iron distribution and inputs and experimental works considering the combined effects of both nutrients. (3) There is also a need to validate remote sensing measurements and models outputs on long-term variations by field observations. This requires long-term monitoring by sensors set on moorings (e.g., NOAA TAO project), ships of opportunities and oceanographic cruises.

Conclusions

During the EPSMG meeting, following the workshop, its members and a few workshop participants noted several general conclusions from the workshop. Given its small size and the high level of the participants, the amount of information that came out was amazingly high. Part of the explanation comes from the fact that the Equatorial Pacific JGOFS fieldwork took place at the right time. Thus, it benefited from a good physical description after the implementation of the TAO project, new technologies that had just been developed (e.g. flow cytometry, bio-optical sensors, etc.), and the succession of various climatic events, which took place in a rather short time. However, the unprecedented knowledge acquired on the entire region, which covers almost half of the earth circumference), would not have been possible without the efficient international collaboration that was organized from the start. As expected, the workshop was found useful to the modellers and the new models results set forth new questions, which will deserve, benefit from novel experiments or new observations in the future. The workshop also confirmed an unexpected output from the JGOFS project, which is the use of modelling ecosystem studies by a component of GLOBEC involved in tuna fisheries occurring in the warm pool. Finally, the participants agreed with the need to continue an international program, as within the JGOFS project. The future resides in monitoring activities, oceanographic cruises and utilisation of sea colour from remote sensing. In that respect, the information given by C. McClain regarding the termination of the SeaWiFS contract at the end of 2002, which is a great loss for oceanography. A solution needs the support of JGOFS SSC. Overall, the workshop showed an impressive progress with respect to the SMP meeting, which took place three years ago in Norfolk, thanks to the efforts put on synthesis, and modelling works. A possible output would be the organisation of a training course on the equatorial Pacific for graduate, Ph.D. and post-doc students. This would constitute a good start for future studies in the region.

Addenda:

- List of participants
- Agenda

List of participants

[Richard Barber](#), Duke University, Beaufort, North Carolina, USA

[Fei Chai](#), University of Maine, Orono, Maine, USA

[Richard Dugdale](#), San Francisco State University, Tiburon, California, USA

[John Dunne](#), Princeton University, Princeton, New Jersey, USA

[Andrew Edwards](#), Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada

[Scott Elliott](#), Los Alamos National Laboratory, Los Alamos, New Mexico, USA

[Richard Feely](#), PMEL/NOAA, Seattle, Washington, USA

[Marjorie Friedrichs](#), Old Dominion University, Norfolk, Virginia, USA

[Michael Landry](#), University of Hawaii at Manoa, Honolulu, Hawaii, USA

[Edward Laws](#), University of Hawaii at Manoa, Honolulu, Hawaii, USA

[Robert Le Borgne](#), IRD (ex-ORSTOM), Nouméa, New Caledonia, France

[Patrick Lehodey](#), South Pacific Commission, Nouméa, New Caledonia, France

[Aude Leynaert](#), Institut Européen de la Mer, Brest, France

[Denis Mackey](#), CSIRO Marine Research, Hobart, Tasmania, Australia

[Chuck McClain](#), NASA/GSFC, Greenbelt, Maryland, USA

[Michael McPhaden](#), PMEL/NOAA, Seattle, Washington, USA

[Nicolas Metz](#), CNRS, LBCM, Université P. et M. Curie, Paris, France

[David Nelson](#), Oregon State University, Corvallis, Oregon, USA

[Michael Roman](#), University of Maryland, Cambridge, Maryland, USA

[Shaoling Shang](#), University of Maine, Orono, Maine, USA

[Lei Shi](#), University of Maine, Orono, Maine, USA

[Lan Smith](#), Frontier Research System, Yokohama, Japan

[Pete Strutton](#), SUNY, State University of New York, Stony Brook, New York, USA

[Robbie Toggweiler](#), GFDL/NOAA, Princeton, New Jersey, USA

[Mark Wells](#), University of Maine, Orono, Maine, USA

EPSMW 2002 Agenda (part 1)

Day 1 – Tuesday, September 17th

9:00-9:15 Welcome/goals – Fei Chai and Robert Le Borgne

Large scale description of the equatorial area from remote sensing, moorings and oceanographic cruises (chair: Richard Feely)

9:15-9:40 [Slowdown of the meridional overturning circulation in the upper Pacific ocean](#) – Michael McPhaden

9:40-10:05 Ocean Color (SeaWiFS) spatial and temporal distributions – Chuck McClain

10:05-10:30 [Sea level, SST and tropical instability waves](#) – Pete Strutton

10:30-11:00 **Break**

11:00-11:25 [Zonal variability from oceanographic cruise observations](#) – Robert Le Borgne

11:25-11:50 [Latitudinal variability from oceanographic cruises](#) – Michael Roman

11:50-12:15 [The meridional asymmetry of source nutrients and its impacts on production and CO₂ export](#) – Richard Dugdale

12:15-1:30 **Lunch**

The biological functioning and its short-term variability (chair: Richard Dugdale)

1:30-1:55 [Microbial community variability in the tropical Pacific](#) – Michael Landry

1:55-2:20 [The HNLC system: Primary production](#) – Richard Barber

2:20-2:45 The HNLC system: New production in the equatorial Pacific - Edward Laws

2:45-3:10 [The HNLC system: silicon uptake and limitation](#) – Aude Leynaert

3:10-3:40 **Break**

3:40-4:05 The HNLC system: Export production – John Dunne

4:05-4:30 [Community grazing balances in the HNLC region](#) – Michael Landry

4:30-4:55 [The warm pool case](#) – Denis Mackey

4:55-5:20 [The role of iron \(zonal and meridional aspects\)](#) – Mark Wells

6:00 **Reception**

EPSMW 2002 Agenda (part 2)

Day 2 – Wednesday, September 18th

Ecosystem modelling (chair: Denis Mackey)

9:00-9:25 [A simple HNLC model that includes effects of iron fertilisation](#) – Andrew Edwards

9:25-9:50 [Test-bed project focusing on data assimilation](#) – Marjorie Friedrichs

9:50-10:15 [Flexible phytoplankton composition modeling](#) – David Nelson

10:15-10:40 **Break**

CO₂ flux and biological pump

10:40-11:10 [Interannual variability of CO₂ flux](#) – Richard Feely

11:10-11:35 [Long term variability of the CO₂ export](#) – Nicolas Metzl

11:35-12:00 [Long term variations of the biological pump](#) – Francisco Chavez/Pete Strutton

12:00-1:30 **Lunch**

Temporal variability on seasonal, ENSO and decadal time scales (chair: Michael Landry)

1:30-1:55 Eddy resolving biogeochemical simulations in the Global Parallel Ocean Program: emphasis on the low latitude Pacific – Scott Elliott

1:55-2:20 [Pacific ecosystem modeling](#) – Lan Smith

2:20-2:45 [Physical-biogeochemical modeling in the equatorial Pacific: ENSO and decadal time scaled simulations](#) – Fei Chai

2:45-3:10 [Impact of ENSO variability on fisheries in the western Pacific](#) – Patrick Lehodey

3:10-3:40 **Break**

Conclusive remarks

3:40-4:10 Primary production in the different JGOFS field studies – Richard Barber

[Equatorial Pacific vs. Equatorial Atlantic](#) – Robert Le Borgne

4:10-4:50 [How strong is the organic carbon pump in the ocean? How does the equatorial Pacific fit in?](#) – Robbie Toggweiler

[Impact of diatoms on climate variability](#) – Richard Dugdale

4:50-5:00 Conclusive remarks – Robert Le Borgne

5:00 **Adjourn**

EPSMW closes with a traditional Maine lobster bake