September 2009 Annual report on SCOR WG 131
The Legacy of in situ iron enrichment: Data Compilation and Modeling

Pre-amble

The last twelve months have seen some interesting developments in the field of in situ iron enrichments. In early 2009, the vessel being used by the joint Indo-German scientific expedition (Lohafex) to the Atlantic sector of the Southern Ocean was ordered to remain in port, for allegedly contravening the de facto moratorium, issued by the UN Convention on Biodiversity on ocean fertilization. The expedition was later allowed to continue, but this incident illustrates that it will probably become more difficult to mount such scientific experiments in the future.

There has also been continued debate in the literature and at workshops etc regarding how much carbon can be exported to the oceans interior by ocean iron enrichment. This has implications for the potential role of natural iron enrichment in the geological past to modulate atmospheric carbon dioxide concentrations and hence influence global climate (the rationale for these eleven in situ scientific studies). Large scale purposeful iron enrichment has also been proposed as a geoengineering scheme to help reduce the impact of climate change. Modelling studies have come up with a wide range of estimates of carbon sequestered per unit iron supplied.

Both of these developments point to the value of the datasets being compiled under WG131, and the need to transition from data compilation to synthesis and modelling in the third year of this WG. To that end, Peter Liss, the outgoing chair of SOLAS has sent Ed Urban a letter of support for our proposed synthesis and modelling workshop in early 2010.

Report

Progress in obtaining a set of observations from in situ iron enrichment experiments was hindered in late 2008 and early 2009 by two factors – first a reluctance by some groups to supply data that had not yet been published, and second mis-matches between datasets we received (in both time- and position-stamping). Both of these issues have largely been resolved and the status of the data compilation for each experiment is as follows:

IronEX I – 60% complete, data at BCO-DMO with some on the BCO-DMO database[1]
IronEX II – 60% complete, data at BCO-DMO with some on the BCO-DMO database[1]
SOIREE – complete and on the BCO-DMO database
EisenEx – 90% complete and on the German PANGAEA database[2]
SEEDS I – complete and being loaded onto the BCO-DMO database
SOFEX-S – complete and on the BCO-DMO database
SOFEX-N – complete and on the BCO-DMO database
EIFEX - 10% complete and on the BCO-DMO database[3]
SERIES - complete and being loaded onto the BCO-DMO database
SEEDS II - complete and being loaded onto the BCO-DMO database
SAGE - complete and being loaded onto the BCO-DMO database

Notes

[1]Thanks to the efforts of Kenneth Coale (MLML) and Ken Johnson (MBARI) datasets from over 15 years ago are coming in steadily. 3 PI's (Landry, Behrenfeld, Cochlan) have promised datasets in the next month (Landry and Cochlan are currently travelling, Behrenfeld has some prior NASA commitments) and this should virtually complete IronEX I and II.

[2]Benjamin Pfeil (CarboOcean data manager) has kindly offered to make a mass download for all the EisenEx data in Pangaea, make a link to this download on the Pangaea system and send a link to the BCO-DMO database on where to find this mass download (by the end of September)). This will avoid the time consuming download of many individual files (see email comment below from Cyndy Chandler at BCO-DMO).

[3]Virtually nothing has been published from this experiment, and until publication we cannot access these data. We propose to make one more plea to the Chief Scientist Prof. Smetacek, and if unsuccessful to abandon the data compilation for this experiment.

From Cyndy Chandler

"the fact that Benjamin has offered to package the data types for more convenient access is a significant step. We can at least make the connections on our end as we did for the Dissolved Iron data. A more seamless transformation script will take longer, but we will research that as well, and Benjamin is correct that the data coming from PANGAEA in this way are much easier to work with, and technically it should be possible to do."

"I have worked with Benjamin on other projects, am very familiar with his quality work and look forward to having his help organizing the Eisenex data."

We are therefore pleased to report that we have made considerable progress in year two of the WG. We are now confident, that with the exception of EIFEX, we have a quality-assured database of high resolution observations needed to validate a wide range of different models (from 1-D water column to 3-D general circulation models with embedded biogeochemistry).

Proposed timetable for year 3

October 2009 to December 2009

a) complete the IronEX I, II data compilations, load any remaining data onto BCO-DMO, develop transformation scripts between BCO-DMO and PANGAEA.
b) Make a final request for datasets to the EIFEX community
c) Solicit feedback on the database from a selected subset of modellers from the international community (Ken Denman (Canada) 1-D foodweb and 2-D biogeochemistry models; Robert Armstrong (USA) 1-D foodweb models; Le Clainche (Canada) modeling of production of biogenic gases (DMS); Corinne LeQuere (UK) Laurent Bopp (France) and Keith Moore (USA) 3-D biogeochemistry GCM's with a particular focus on export and CO_2.
d) Plan a synthesis and modeling workshop for May 2010, and publicize the database and workshop via websites, email circulation lists such as OCB at Woods Hole, and using the SOLAS website and a short piece in the AGU journal

Eos. Invite key participants with a focus on synthesis and modeling on the controversial issue of factors controlling carbon sequestration and the production of other climate reactive biogenic gases such as DMS.

January 2010 – August 2010

a) Finalize a list of invited participants and provide regular advice and feedback on the central issues to address with a nested suite of models (from 1-D water column to 3-D general circulation models).
b) Seek additional funding support (SOLAS, other national funding agencies) to ensure widespread international participation in the workshop.
c) Communicate workshop program and organize workshop (Europe or E coast the US)
d) Workshop May 2010
e) Publish main workshop findings in *Eos*, and also publish a popular article (such as in Oceanography magazine) and articles in the literature (special section of a journal such as Biogeosciences or JGR-Oceans).

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