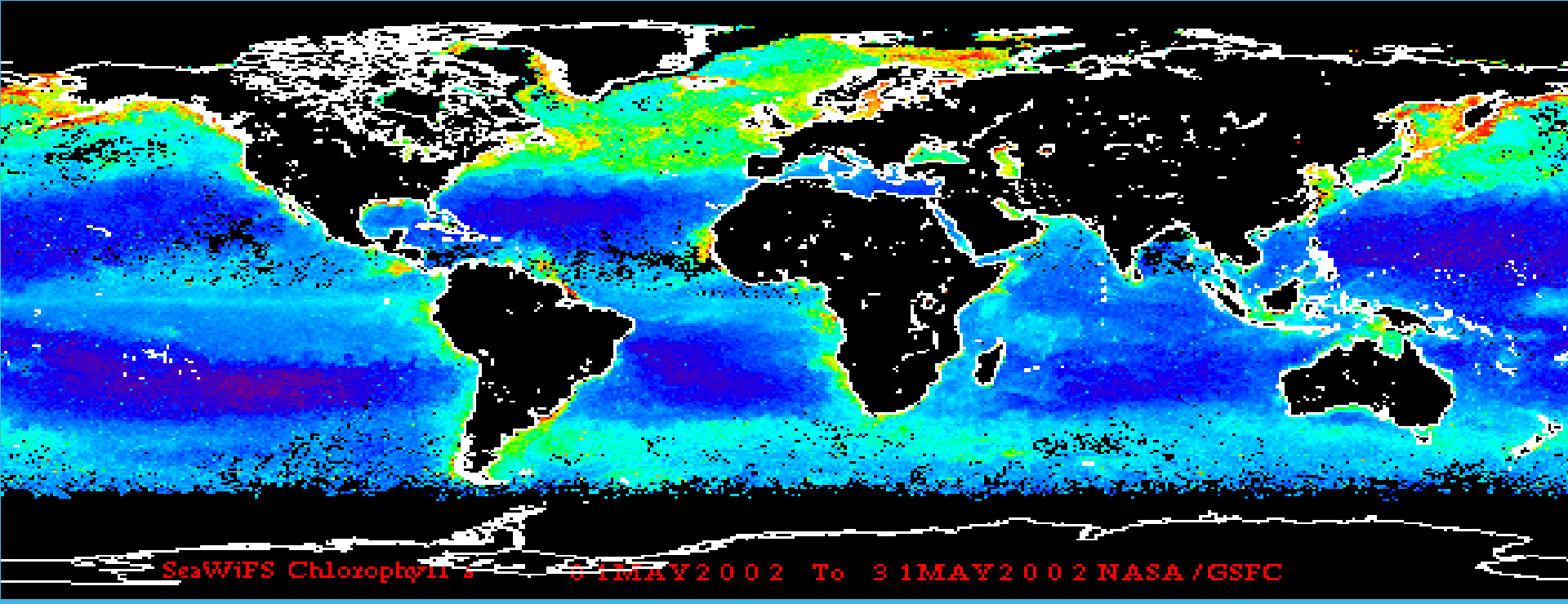


In situ/laboratory classification of phytoplankton types - database: efforts and goals

Lesley Clementson (CSIRO), Ray Barlow (BCRE) and Toru Hirawake (HU)

IOCS meeting, Darmstadt, 06-08 May 2013

CSIRO MARINE AND ATMOSPHERIC RESEARCH
www.csiro.au

International Working Group for PFT Algorithm Development

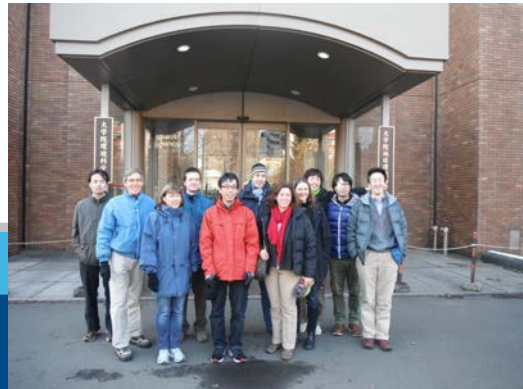
First Meeting
- Sapporo, Japan, November 2011

Tasked with establishing a dataset to be used by scientists developing a PFT algorithm.

The rationale was that PFT algorithms could then be compared on a “level playing field” – tested on a common dataset

It was acknowledged that a significant effort had already been made to construct various phytoplankton databases by individual institutions and international science programmes (notably by NASA), however the workshop participants believe added phytoplankton-specific parameters would only enhance the information available to researchers.

The aim was to have more than just pigment data



Since the first meeting

The MARine Ecosystem DATa (MAREDAT) initiative

pigment data from 136 surveys around the globe (35,634 values)

J. Peloquin et al (2013), Earth Syst. Sci. Data, 5, 109-123

But remember the aim of The International Working Group for PFT Algorithm Development **was to have more than just pigment data**

Why more than pigments

Two key uncertainties are highlighted, related to the use of

(1) fucoxanthin (fucox) as a diagnostic pigment for diatoms and microphytoplankton (>20 μm)

Fucox is primarily associated with diatoms but can also be the dominant pigment in some dinoflagellates and prymnesiophytes. Furthermore, some fucox-containing small diatoms exist in the nano size range (<20 μm).

(2) 19'-hexanoyloxyfucoxanthin (hex) as a diagnostic pigment for the nano-eukaryotes.

Hex is recognised as a diagnostic pigment for prymnesiophytes, however, this group exists in both the nano and pico size ranges, the latter comprising a significant proportion of the pico-eukaryotes.

The wish list

Data types

in situ Radiometry
HPLC
IOPs – absorption, backscatter
Fractionated chlorophyll
Microscopy
Flow cytometry

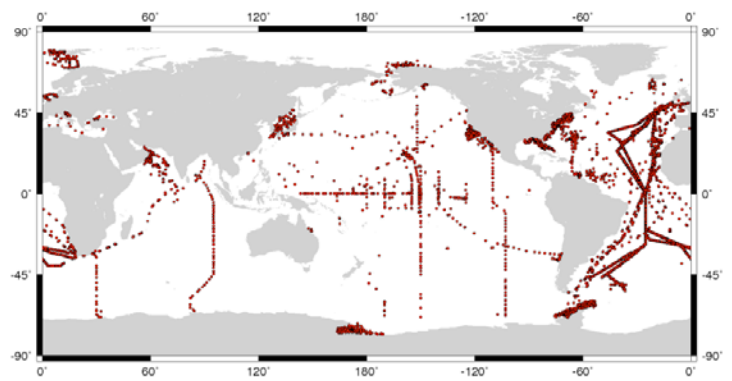
microscopic counts give a measure of the number of cells rather than the contribution of cells to the total chlorophyll concentration, and these measures are not equivalent. Using the locations where both sets of measurements exist to better understand the magnitude of the uncertainties

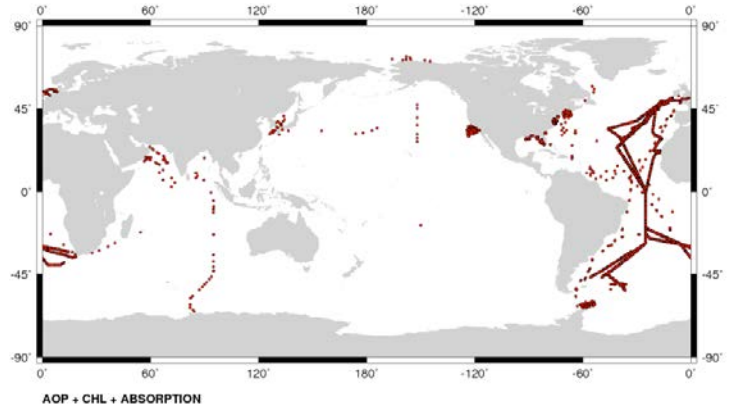
many methodological uncertainties and there is no established protocol for taking these measurements. Stacked filters vs parallel; pressure vs vacuum filtering; fluorimetric vs HPLC

Bio-optical algorithm data sets

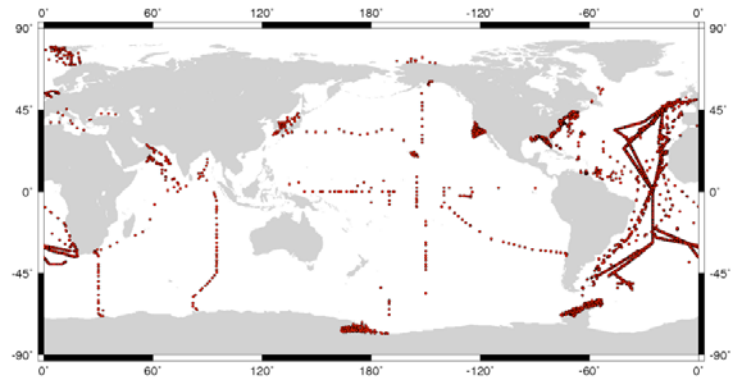
- SeaBASS (taken from Werdell, OOW, Glasgow, Scotland, UK, 07 October 2012)

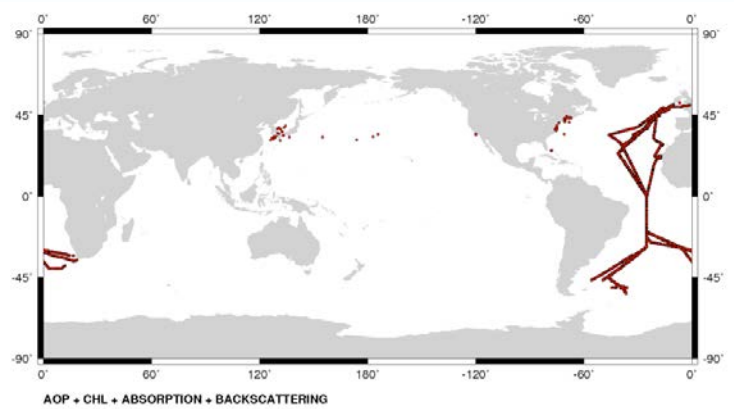
Rrs





Rrs & Chl





Rrs & Chl & absorption

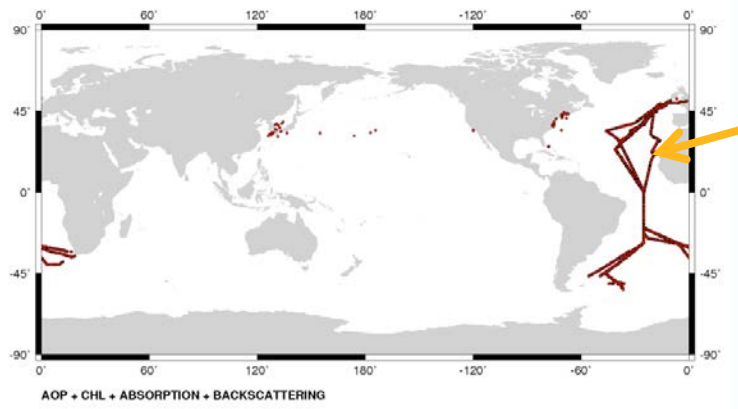
Rrs & Chl & absorption & backscattering

Challenges

NOMAD (Feb 2012)

a (a_p, a_g, a_d) (20 λs); bb (fitted - 20 λs); bbr (original - 14 λs); fluorometric chl-a; HPLC pigments; Kd (20 λs); Lw (20 λs);

4459 samples – 1381 pigment results Not all samples have all parameters



AMT
Great for pigment data
Not so great for coincident data

Rrs & Chl & absorption & backscattering

AMT

					Parameters													
Cruise code	start date	end date	start location	end location	Chl-a Fluor (bottle)	Chl-a Fluor (uway)	Chl-a size fraction	HPLC pigments (bottle)	HPLC pigments (uway)	P/plankton ID - Lugols	picoplankton- flow cytometry	Phytoplankton flowCAM	Primary production	aCDOM	aph	Particle multisizer	SPM conc
AMT5	14-September-1997	17-October-1997	UK	Falklands	Y	Y		Y	Y	Y			Y				
AMT6B	04-April-1998	04-May-1998	Falklands	UK				Y						Y		Y	Y
AMT6B	14-May-1998	15-June-1998	Sth Africa	UK	Y	Y		Y		Y	Y		Y		Y		X
AMT7	14-September-1998	25-October-1998	UK	Falklands	Y	Y		Y		Y			Y				
AMT8	25-April-1999	07-June-1999	Falklands	UK	Y	Y	Y	Y	Y	Y			Y				
AMT9	15-September-1999	13-October-1999	UK	Montevideo	Y	Y	X							Y			
AMT10	12-April-2000	08-May-2000	Montevideo	UK	Y	Y	Y	Y		Y			Y	Y			
AMT11	12-September-2000	11-October-2000	UK	Montevideo	Y	Y	Y	Y					Y	Y			
AMT12	12-May-2003	17-June-2003	Port Stanley	UK	Y			Y			Y		Y	X	X		
AMT13	10-September-2003	14-October-2003	UK	Port Stanley	Y	Y	Y	Y		X		Y	Y	Y			
AMT14	28-April-2004	01-June-2004	Port Stanley	UK	Y	Y	Y	Y	Y			Y	Y	Y	X		
AMT15	17-September-2004	29-October-2004	UK	Cape Town	Y	Y	Y	Y		X			Y	Y	X		
AMT16	20-May-2005	29-June-2005	Cape Town	UK	Y	Y	Y	Y					Y	X			
AMT17	15-October-2005	28-November-2005	Sth Africa	UK	Y	Y		Y		X			Y		X		
AMT18	03-October-2008	10-November-2008	UK	Falklands		Y		Y					Y	Y			
AMT19	13-October-2009	28-November-2009	UK	Chile	Y	Y		Y	Y				Y				
AMT20	12-October-2010	25-November-2010	UK	Chile	Y	Y		X		X			Y	Y	X		
AMT21	29-September-2011	14-November-2011	UK	Chile	Y	Y		X					Y	X	X		

Challenges continued

The collection of coincident data is not an easy task as the different types of data are often collected on the one voyage by different scientists, not necessarily from the same institute.

this is certainly part of the issue with the AMT data

HPLC is the most commonly used data source in the parameterisation of algorithms.

- relatively large number of data points available in all ocean environments

However there uncertainties involved in the HPLC data

- not all HPLC data the same
- Sea-HARRE reports (NASA)

Challenges continued

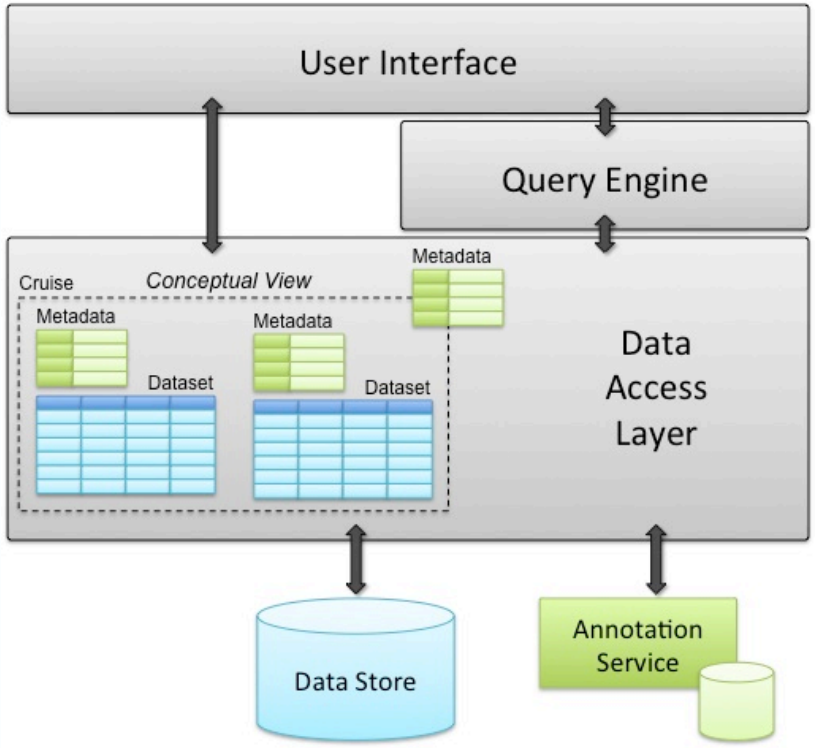
Also with the pigment data, care must be taken to avoid validating against parameterisation data.

Should we re-parameterise the HPLC-based algorithms with a common HPLC dataset to ensure this does not overlap with the validation dataset?

The real challenge is to pull together coincident data

Australian PFT dataset - poster

An interrogative database of bio-optical parameters for Australian waters is being established by the AEsOP project, funded by the EOI-TCP. This database will provide in situ data for the development of robust regional algorithms, the validation of PFT algorithms and, the enhancement of standard global algorithms in the future.



Australian PFT dataset continued

The dataset will include multiple coincident parameters such as HPLC pigments (including size fractionated pigments where available), pigment concentration and composition, absorption coefficients (a_{ph}, a_d, a_g), total suspended mater (TSM), Secchi depth and processed data from radiometers, hydroscat, ac-9, ac-s and other instruments from 1997 to the present day. It is envisaged that the first version of this database will available by mid 2013.

Should we attempt to use this database design for a global database/set

How will this be maintained?

Thank you

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