CMUG assessments of preliminary marine ECVs

Roger Saunders
on behalf of the CMUG
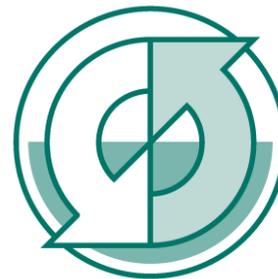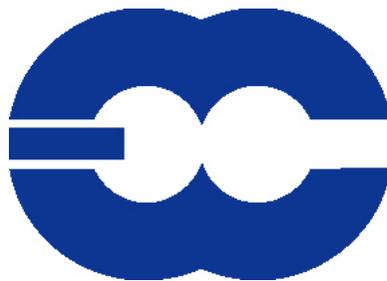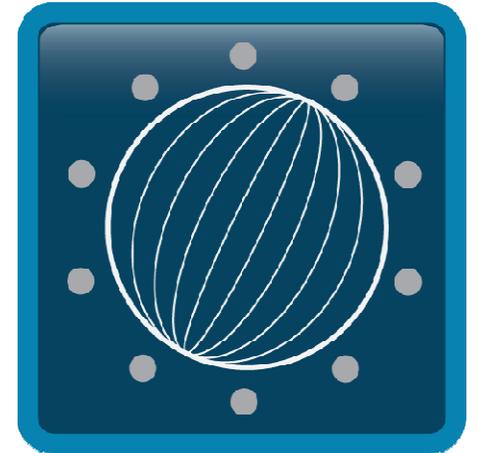
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CMUG Reports Update
http://www.esa-cmug-cci.org/

o **D1.2: User Requirement Document (v1.6) [17-12-2012] Updated to include SM and SI.**

o D2.1: Technical note on user requirements and specifications (contact CMUG for this) [26-09-2011]

o **D2.2: Technical note: CCI system requirements (v0.6) [10-05-2013]**

o D2.4: Technical note: Analysis of how the CCI datasets will meet climate modellers needs (v1.2) [06-10-2011]

o **D3.1_1A: Technical note on CMUG ECV Quality Assessment Report (v1.2) [30-08-2012]**

o **D3.1_1B: Technical note on CMUG ECV Soil Moisture Assessment Report (v0.5) [29-01-2013]**

o **D3.1_1C: Cross precursor assessment on Soil Moisture, Land Cover and Fire (v0.4) [10-05-2013]**

o **D3.3: Technical Note on the use of uncertainty in models and reanalysis (v0.7) [10-05-2013]**

o **D3.5: Technical Note on the status of ECMWF Climate Monitoring Database facility (v1.1) [10-05-2013]**

Availability of CCI datasets

ECV	version	date	comment
Aerosol	1?	now (2008)	2 years: 2000 & 2008
Cloud	1	-	v1 online in June
Fire	Protoype		
GHG	CRDP 1	May	online: 2003 - 2012
Glaciers	?		In Randolph Glacier Inventory
Ice sheets	-	-	v1 at end 2013
LC	CRDP 1	-	v1 in Aug on web site
OC	0.3	March	-
Ozone	CRDP 1	March	online: 1995 – 2011 Tot Col
SI	-	-	v1 in 2014
SSH	0.1	now	v1 in Aug 2013
SST	0.1	now	v1 in Nov 2013
SM	0.1	now	v1 TBC

Need to clarify what is status during meeting

CMUG Assessments of CCI CDRs

Why does CMUG need to assess CCI datasets?

- **Provide an _independent_ view of the datasets and associated uncertainties**

- **Study _consistency_ between ECVs**

- **Demonstrate applications for climate modelling to _accelerate_ use by the climate/reanalysis communities**

Options for assessing CDRs
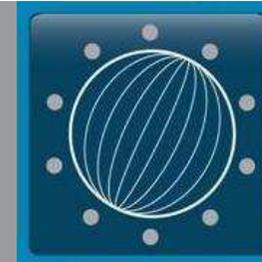
Data used to assess CDRs	Advantages	Drawbacks
Climate Model (single, ensemble)	Spatially and temporally complete	Model has uncertainties Not all variables available
Re-analyses	Spatially and temporally complete	Analysis has uncertainties Not all variables available
Precursors	Comparing like with like	Some precursors may have large uncertainties
Independent satellite or in situ measurements	Different 'view' of atmosphere/surface	May have much larger uncertainty than CDR, need to include representativity errors
Related observations (surface and TOA fluxes, temperature, water vapour)	Assures consistency with other model variables	May not be spatially or temporally complete

CMUG assessments to date

Methodology used for assessment of ECVs	Assessment of precursors (see D3.1 report series)	Initial assessment of CCI CDRs to date
Climate Model (single, ensemble)	O_3, Land Cover, SM, SSH, Cloud, Fire	O_3, Land Cover, SM, SSH
Re-analyses	SST, O_3	SST, O_3, SM, Aerosols
Precursor datasets		OC, SSH, SST, Landcover
Independent satellite or in situ measurements	SST, O_3	SST, O_3, OC
Related observations (surface and TOA fluxes, temperature, water vapour)	Fire	SM
Assimilation	OC	OC

CMUG assessments of marine ECVs

Ocean Colour
Test version

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Ocean Colour Data Assimilation

- Initial comparisons for 2003 using v0.3 OC data
- Comparing OC-CCI and GlobColour products by assimilating chlorophyll into FOAM-HadOCC ocean model
- Assess impact on the carbon cycle model
- Will compare reanalyses for 1997–present

The carbon cycle model is HadOCC (Hadley Centre Ocean Carbon Cycle model)

- This model is used for operational short-range prediction as well as climate studies

- It is the biological component of the Met Office's HadGEM2-ES model and contributes to IPCC AR5
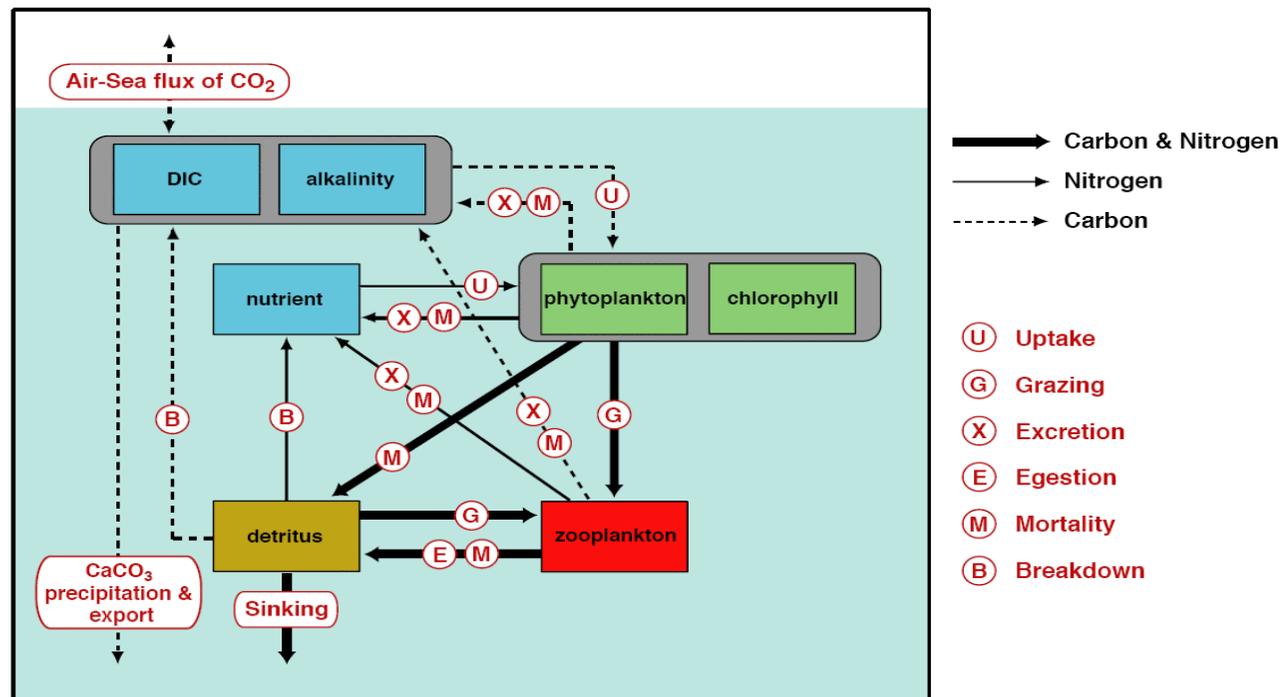
Observations – 1st Jan 2003 log₁₀(chlorophyll)

GlobColour

Better coverage

CCI

$\log_{10}(\text{mg/m}^3)$

-2   -1.5   -1   -0.5   0   0.5
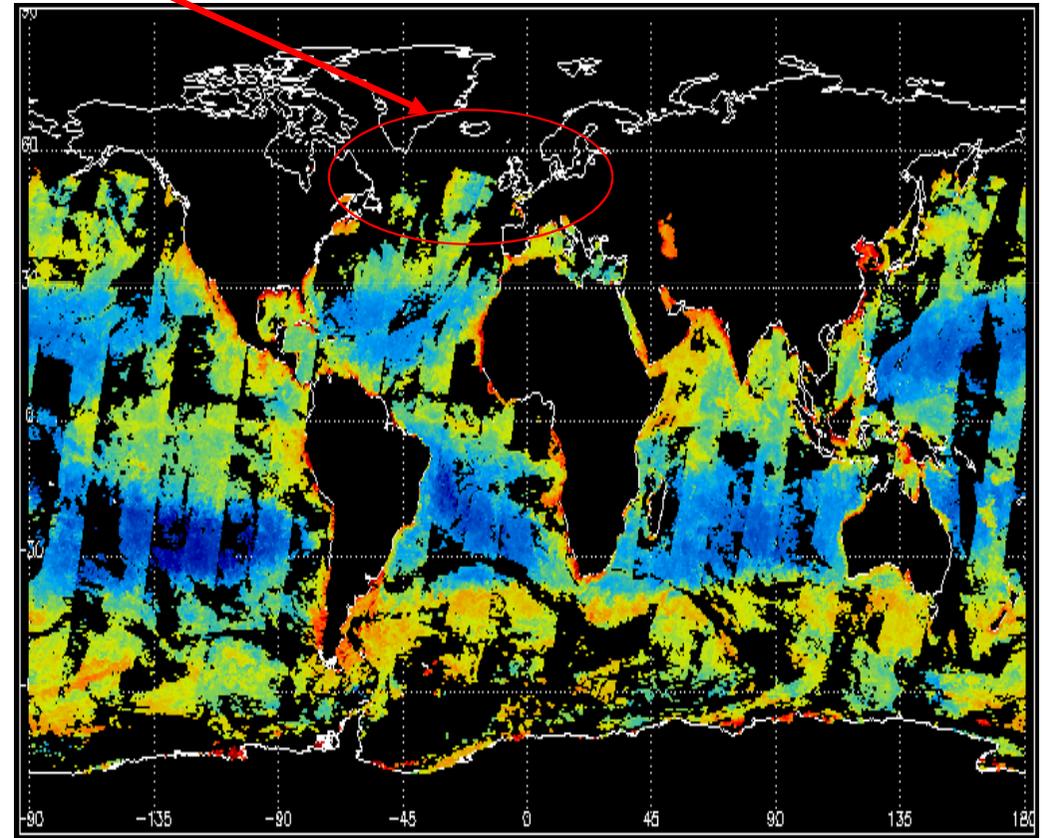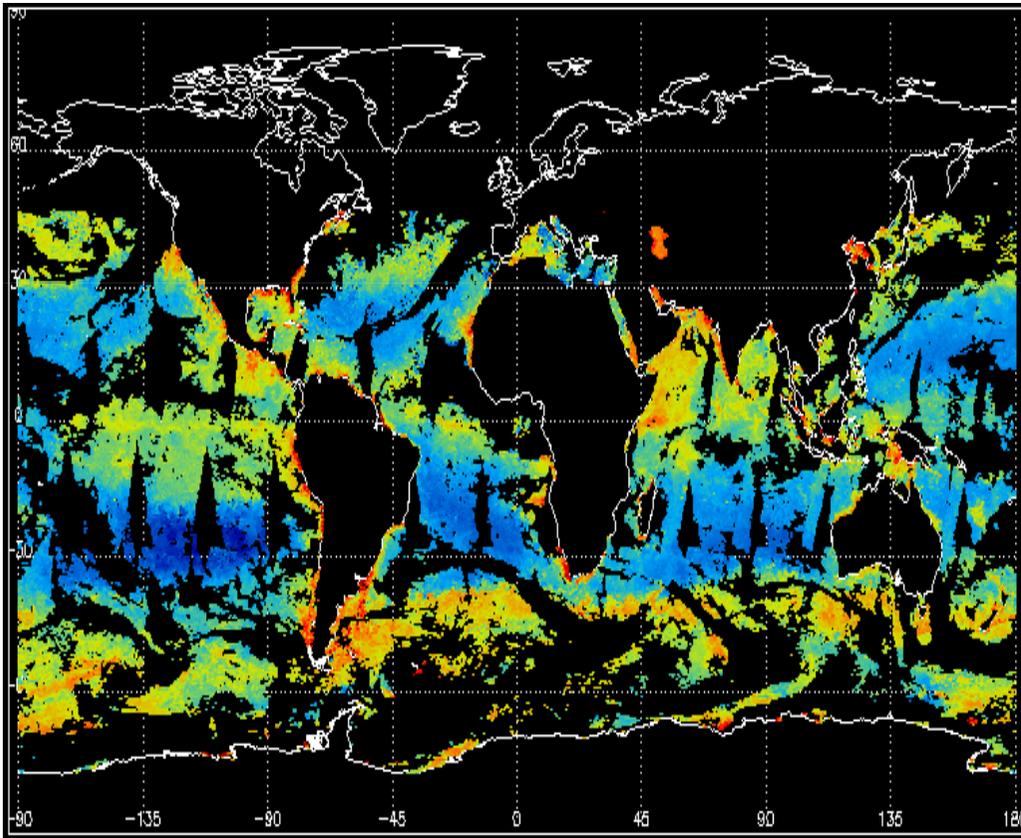
July 2003 mean chlorophyll

GlobColour

CCI
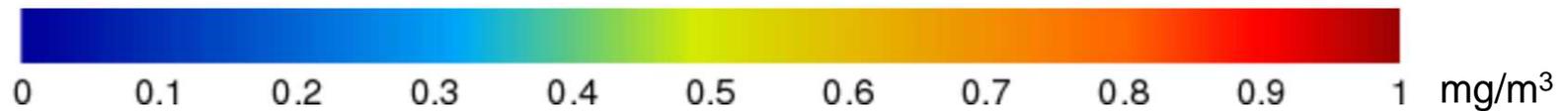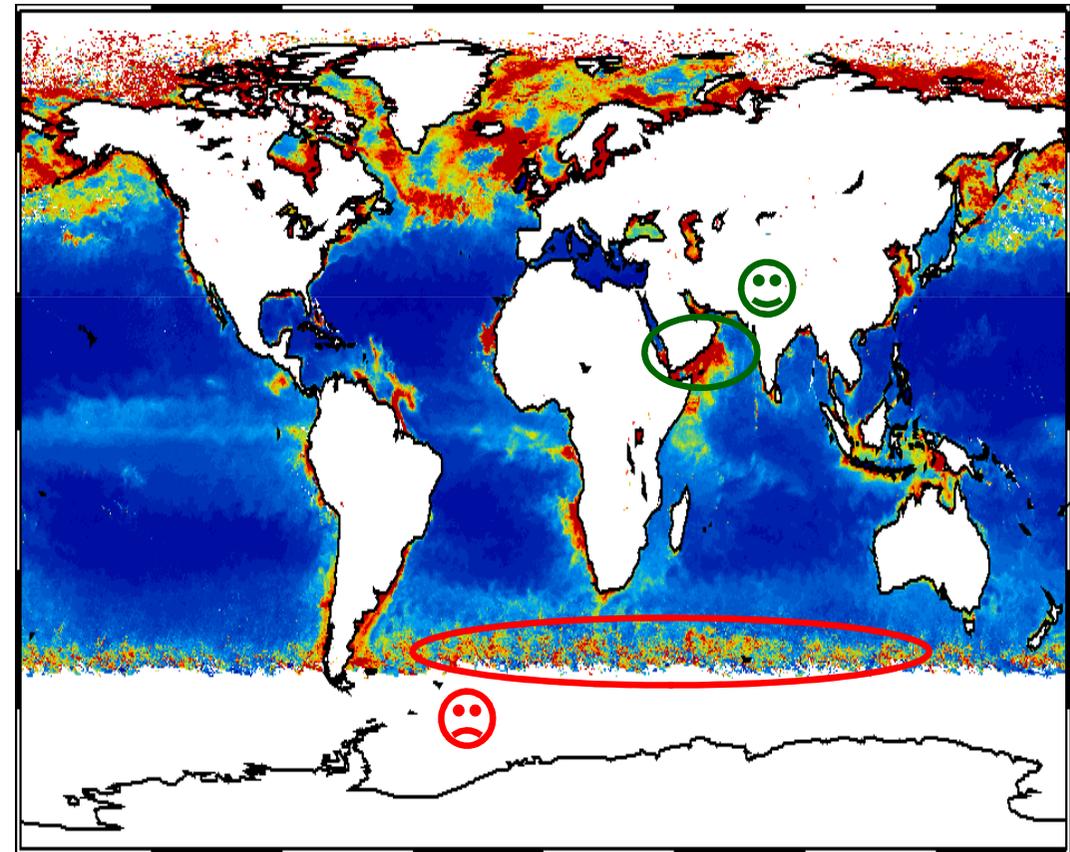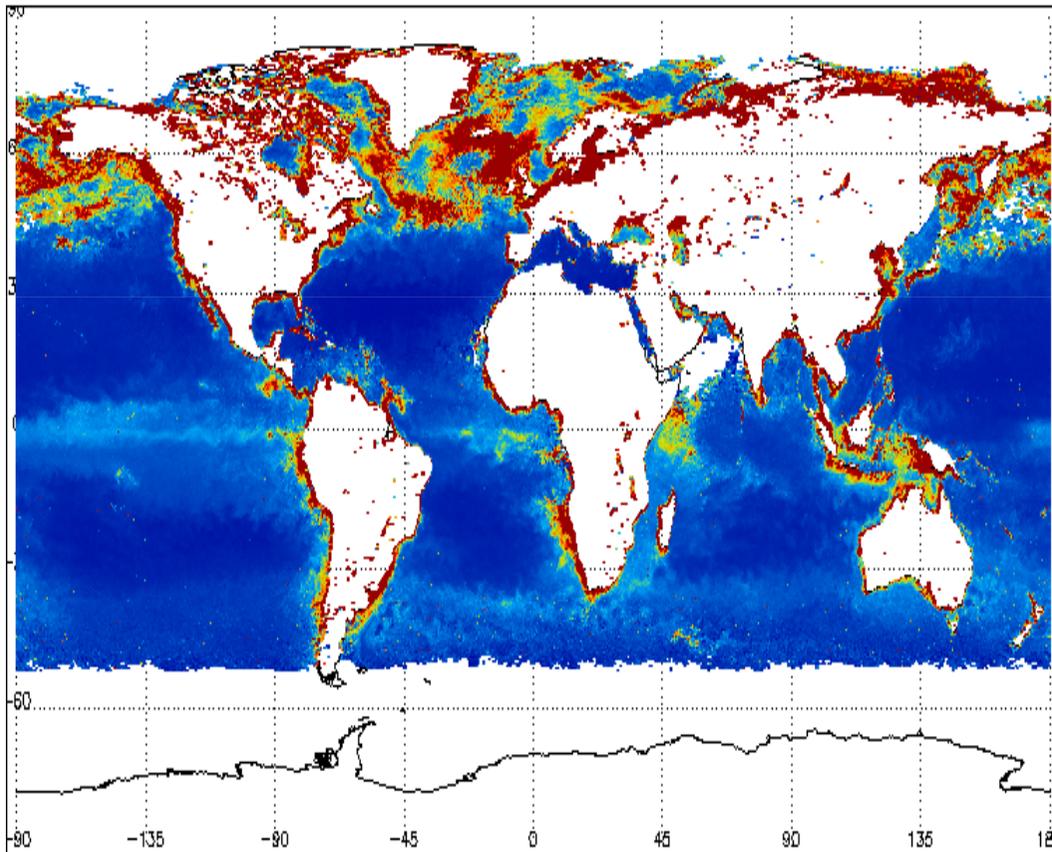
July 2003 mean chlorophyll

Control

CCI obs

CCI assim
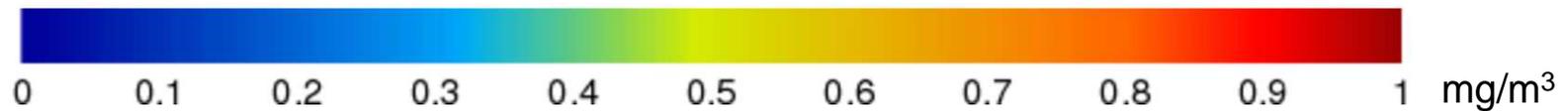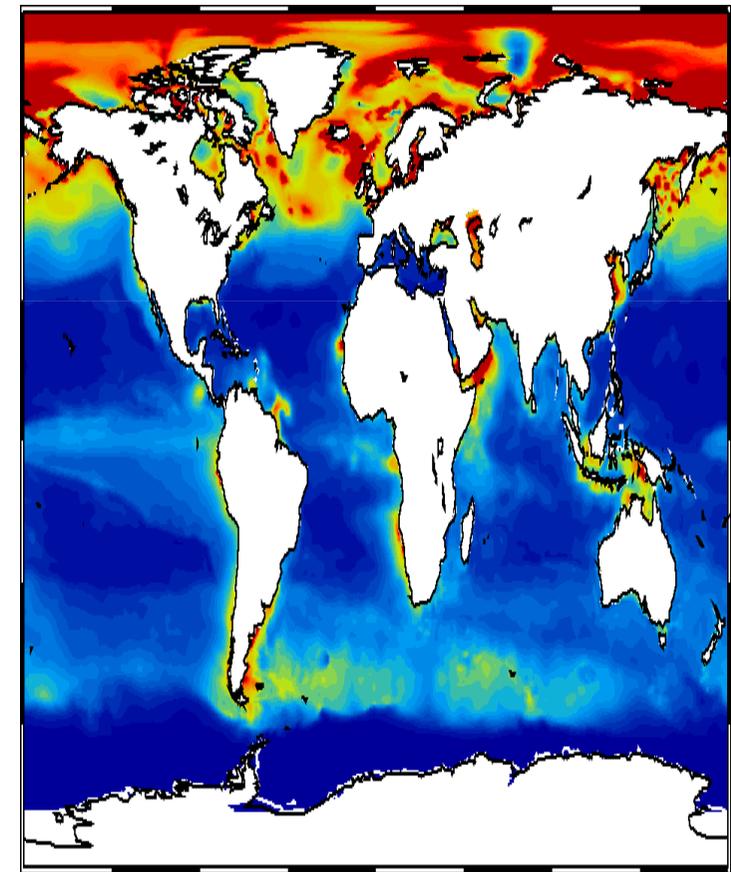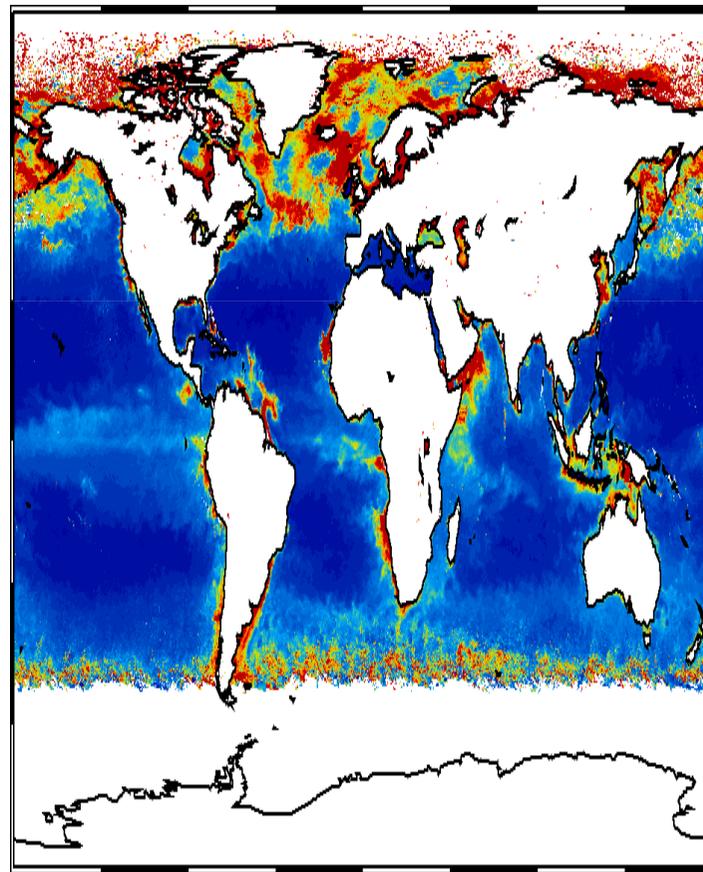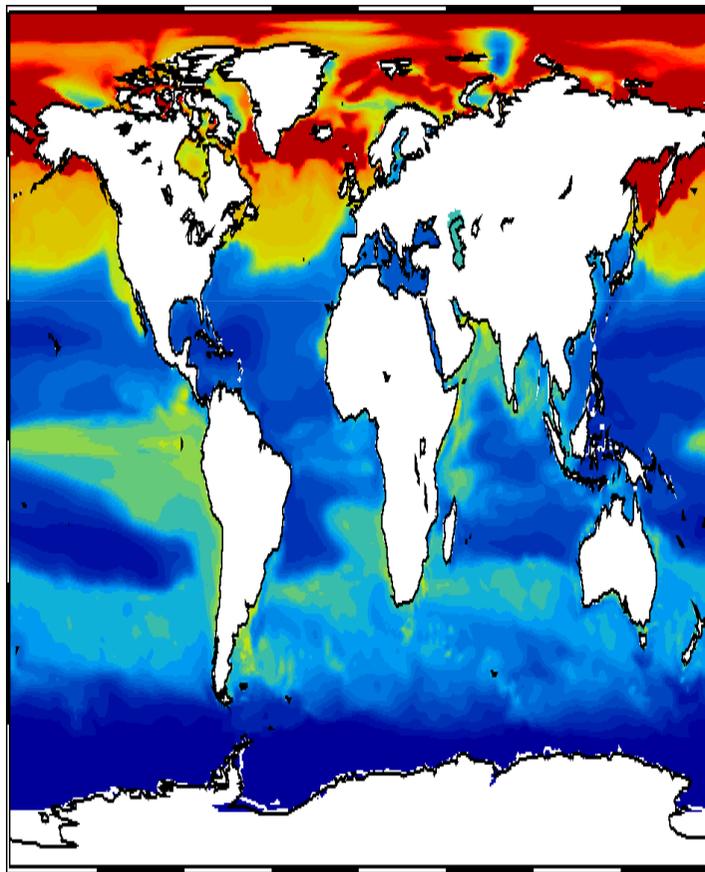
July 2003 mean chlorophyll

GlobColour assim

CCI assim

0   0.1   0.2   0.3   0.4   0.5   0.6   0.7   0.8   0.9   1   mg/m³
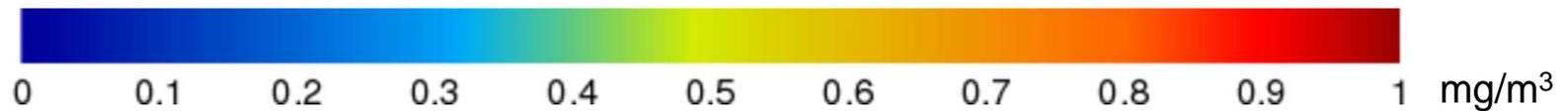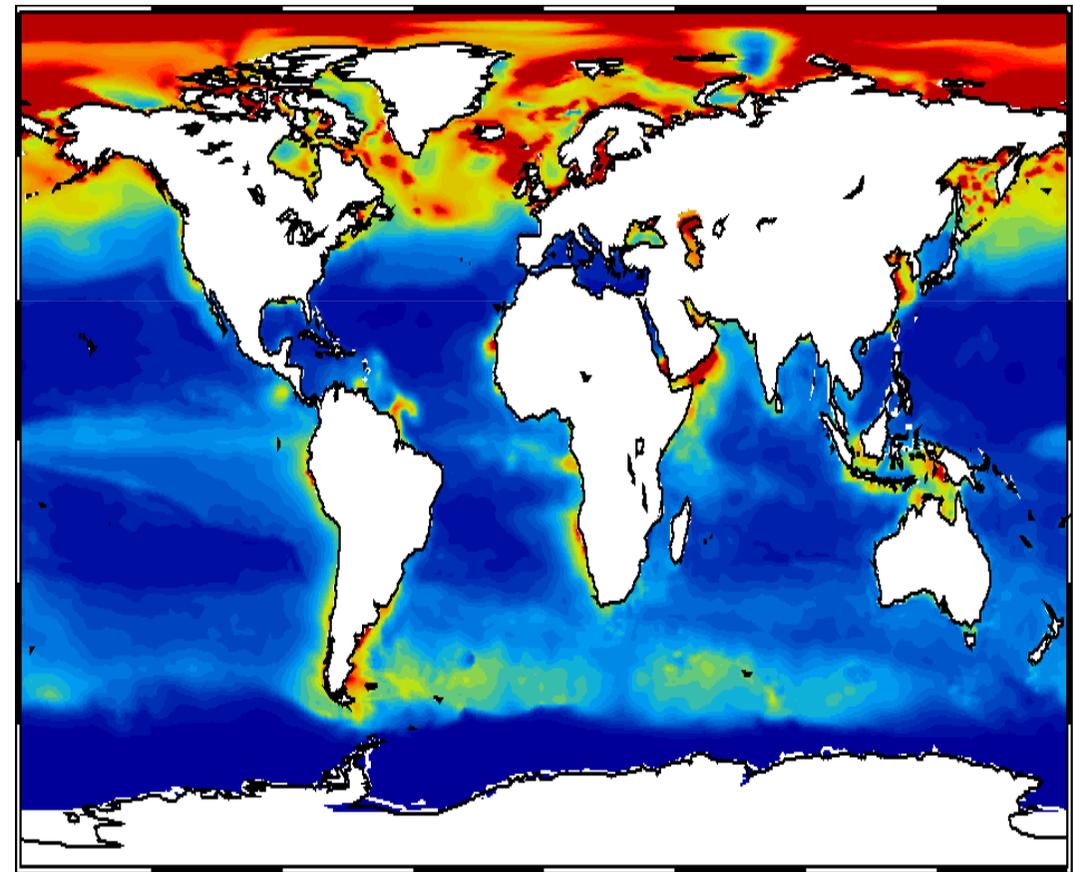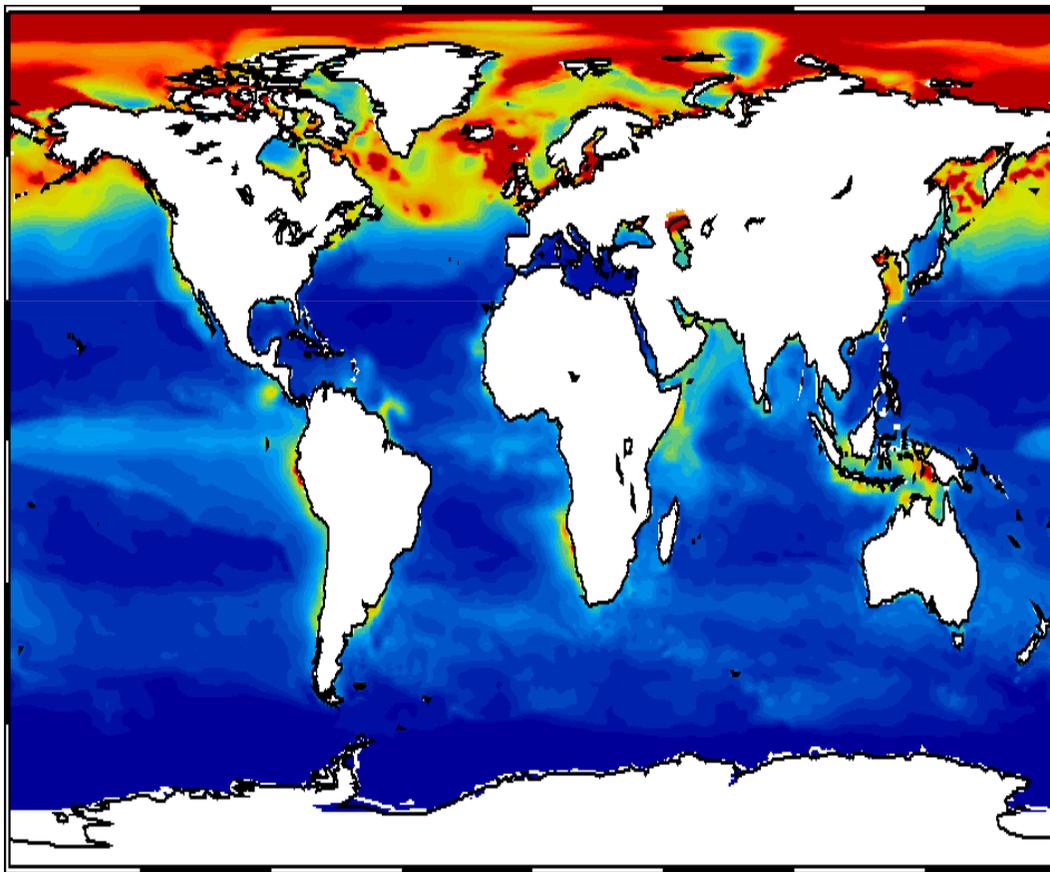
log₁₀(chlorophyll) error North Atlantic
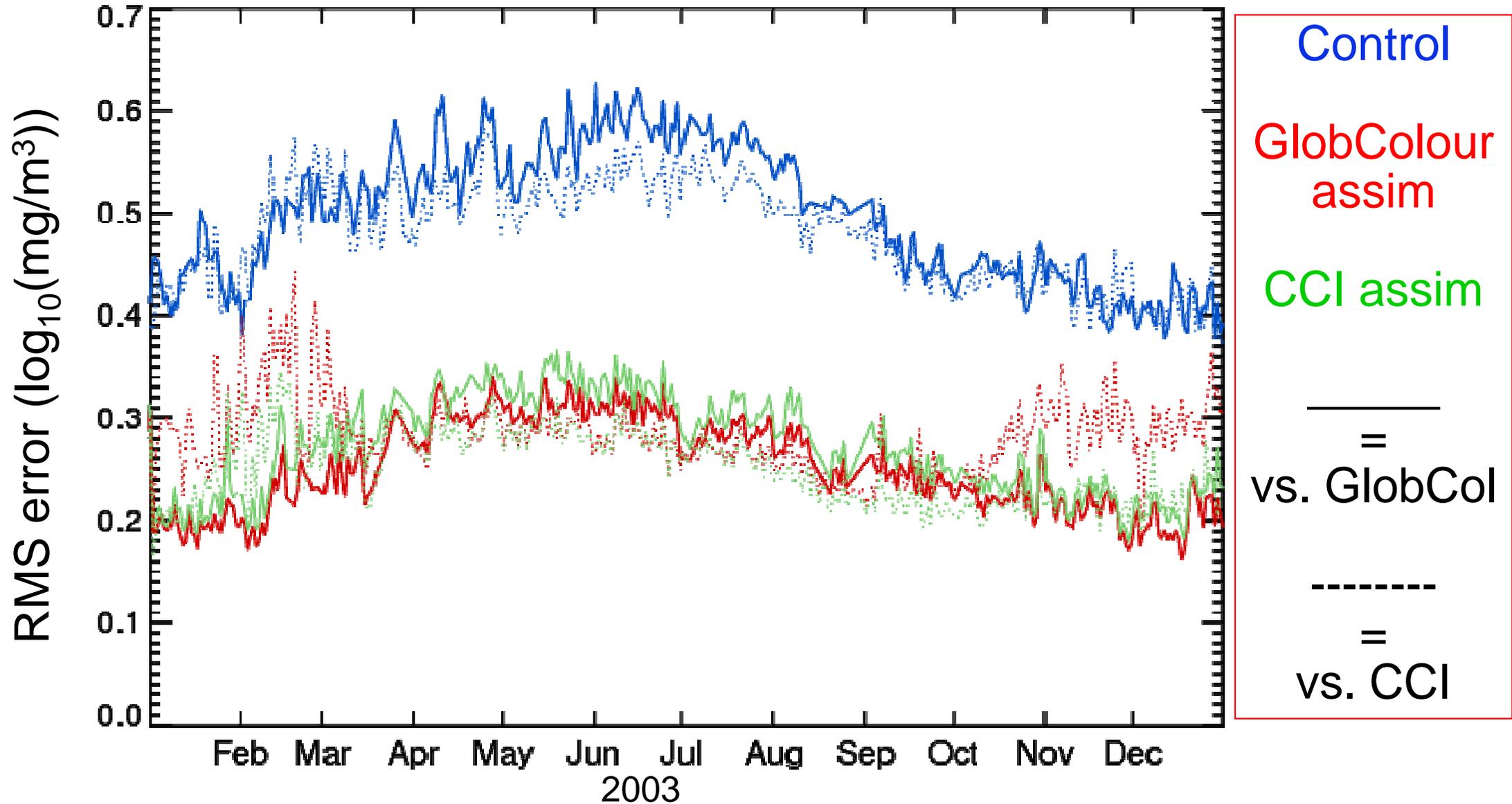
December 2003 mean chlorophyll

GlobColour

CCI
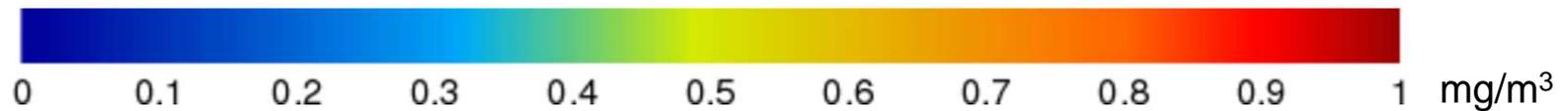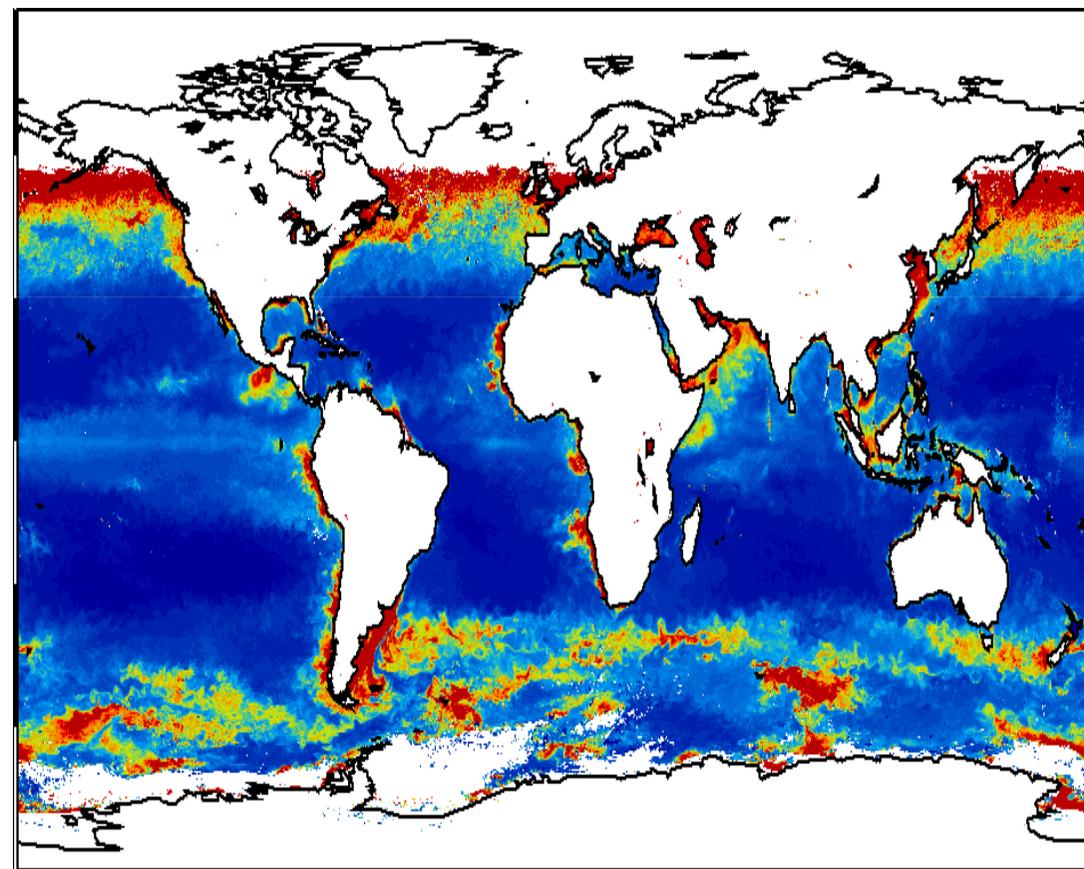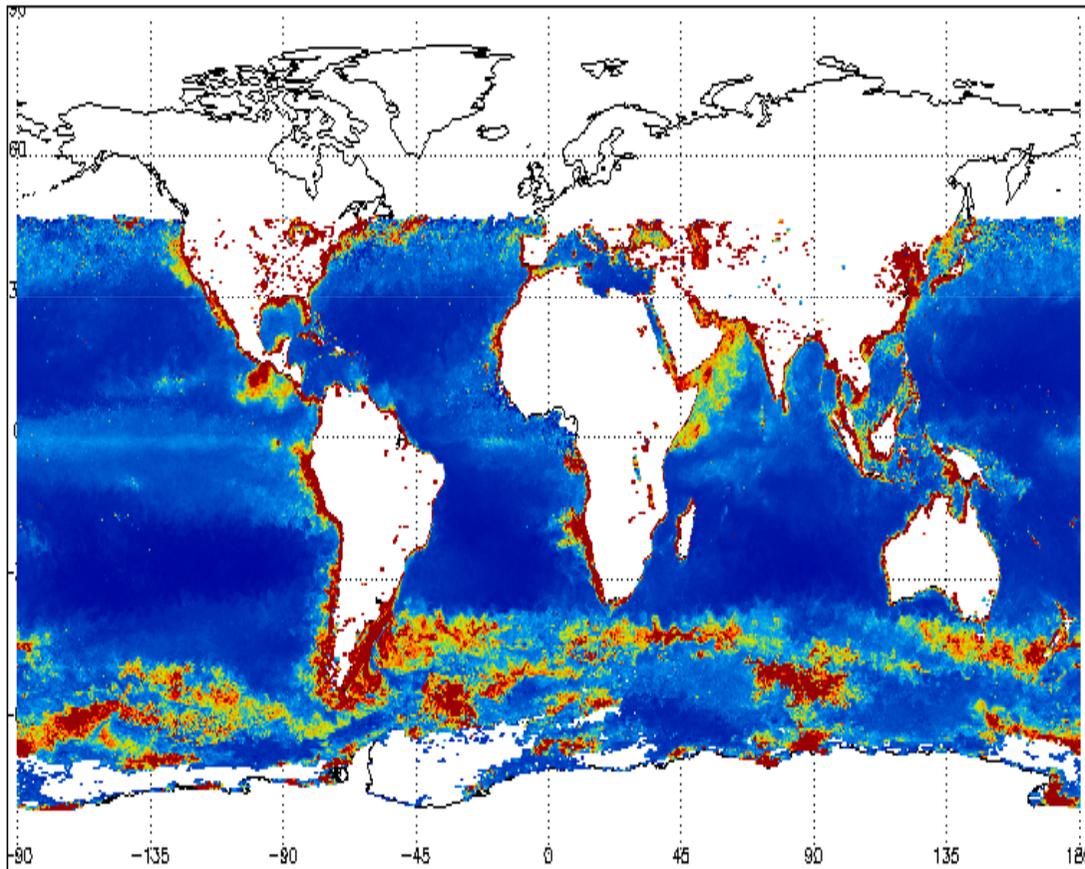
Global fCO$_2$ error (2003)
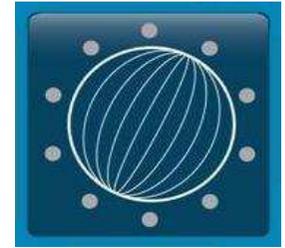
	RMS error (µatm)	Correlation
Control	84.2	0.06
GlobColour assim	70.8 (-16%)	0.38
CCI assim	68.0 (-19%)	0.44

In situ fCO$_2$ observations from SOCAT
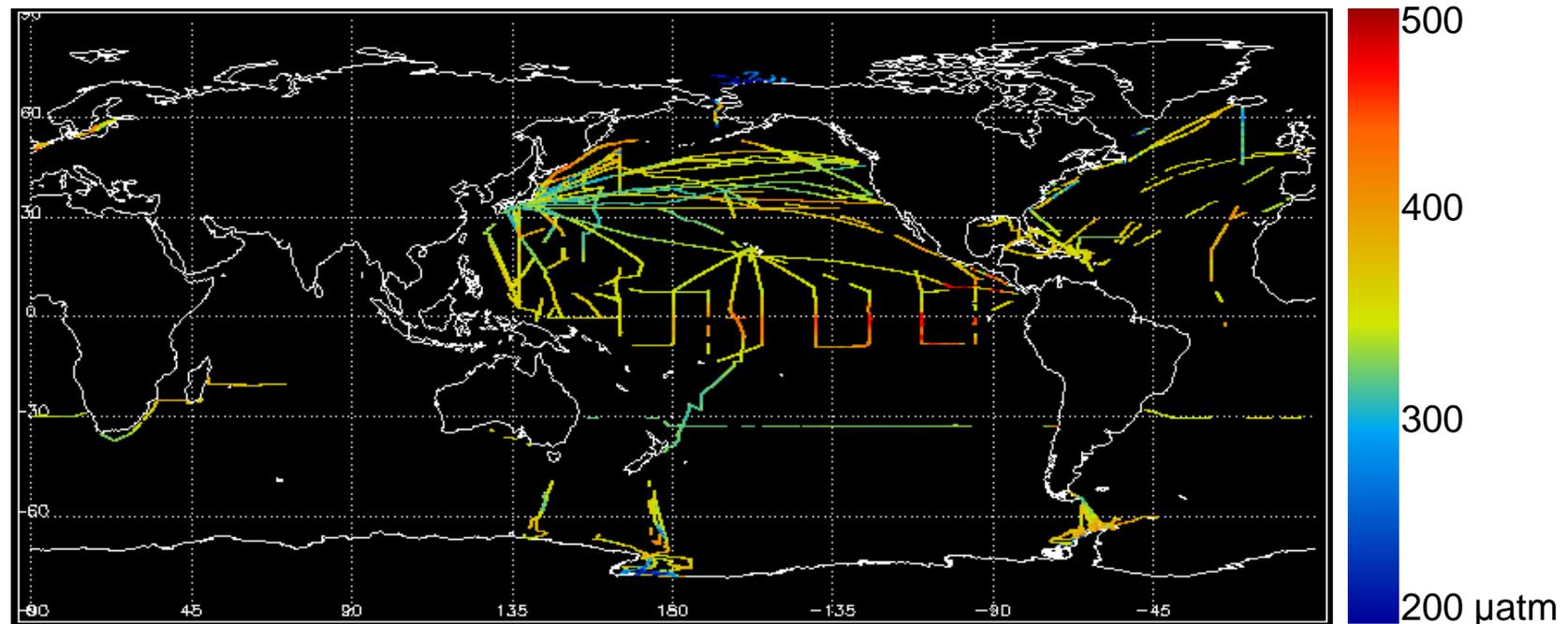
CMUG assessments of marine ECVs

Sea Surface Temperature Test version

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Data coverage ARC vs CCI

CCI AATSR

Drifting buoy
Match ups
Jan-June 2009
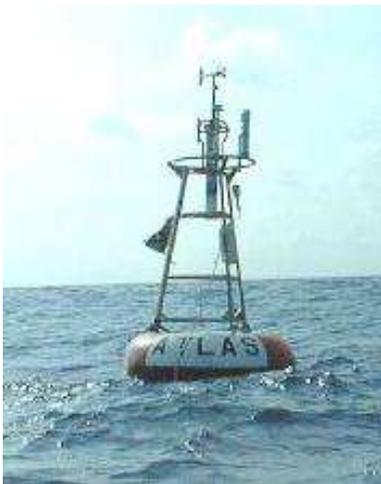
CCI SST (AATSR 3ch, 20cm depth) - buoy SST for Jan-Jun 2009
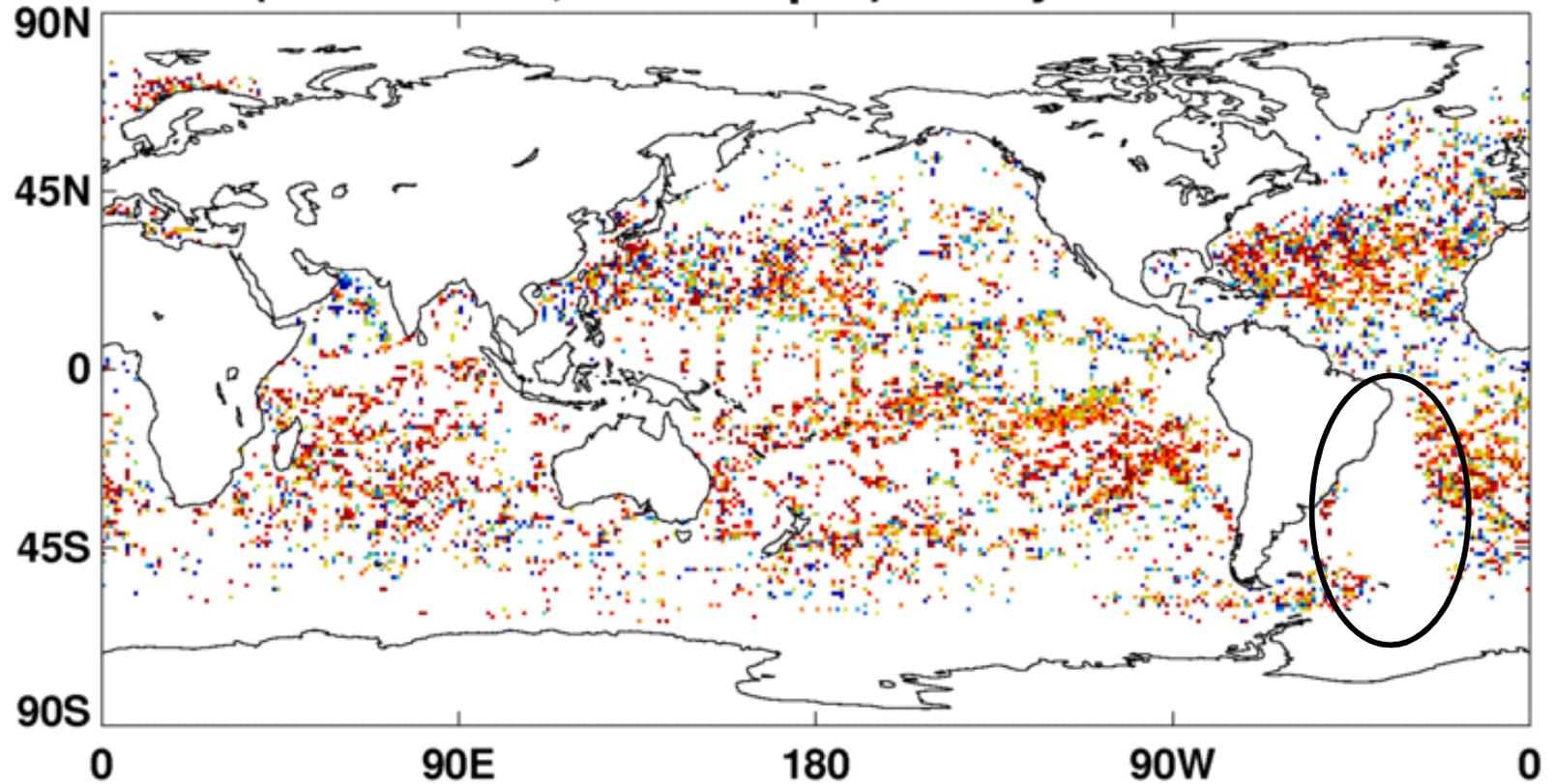
Assessment of SST v0.1

- **CCI data received 2 weeks ago so only 6 months processed**
- **Applied same buoy matching as demonstrated with ARC**
- **Comparison of ARC and CCI data below**
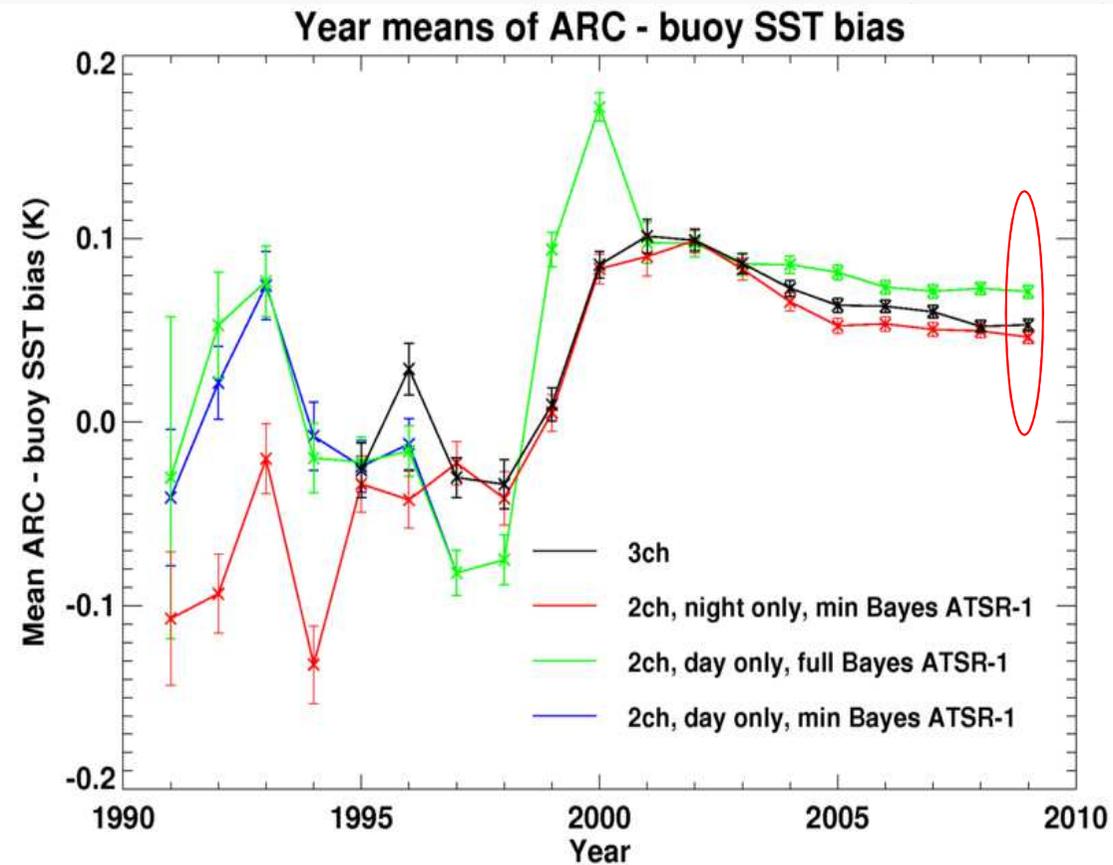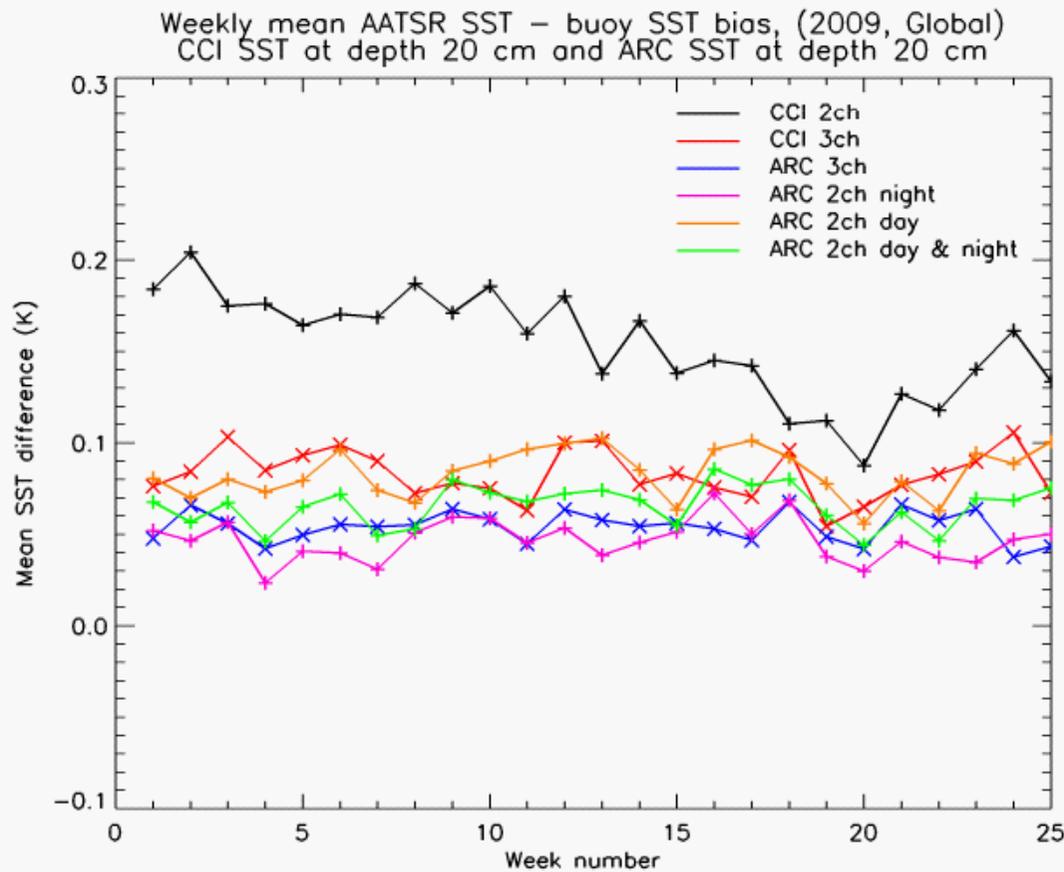
Validate observational uncertainty

Use Buoy SSTs to validate uncertainties provided with ATSR record
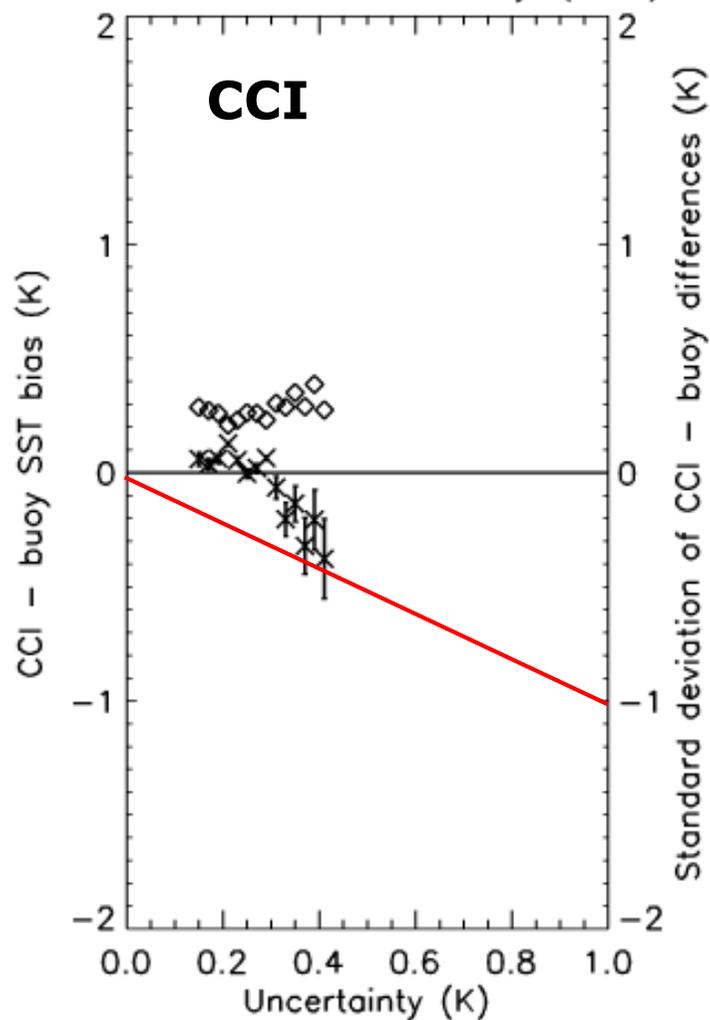
Uncertainty in ATSR SST
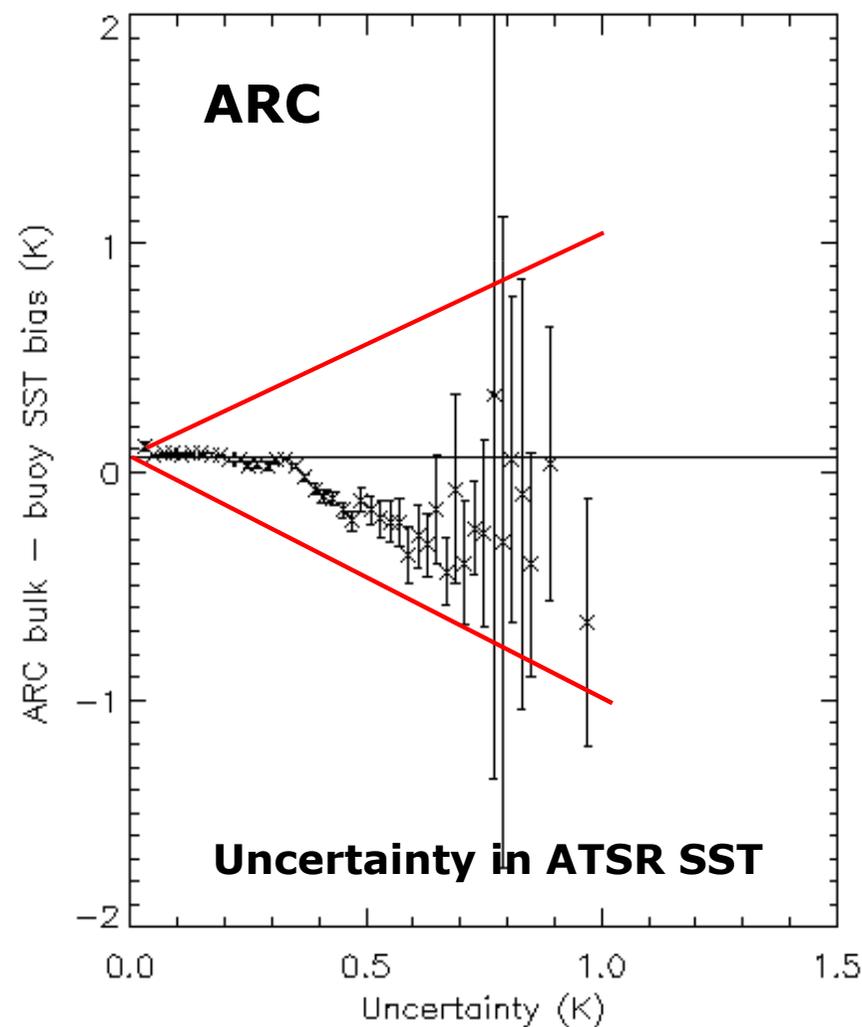
Conclusions on assessment of SST CCI

- Different coverage between ARC and CCI

- 2ch bias in SST anomalously high for short segment of data tested

- 3ch bias slightly higher than ARC

- First look at uncertainties of CCI product suggests they are OK

- Will analyse over full time series both (A)ATSR and (A)ATSR + AVHRR

Sea Surface Height
Version ?

The RCSM4 coupled regional model

ALADIN-Climat V5

Regional climate model

(Colin et al., 2010)

Horizontal resolution 50km, 31 vertical levels

Spectral nudging (toward ERA-Interim reanalysis)

NEMOMED8

Regional version of NEMO-V2

with filtered free surface (Madec, 2008)

Horizontal resolution $1/8°\times1/8°\cos(\Phi)$, 43 vertical levels

An Atlantic buffer zone (3D T-S and SSH toward COMBINE reanalysis)

fully coupled RCSM
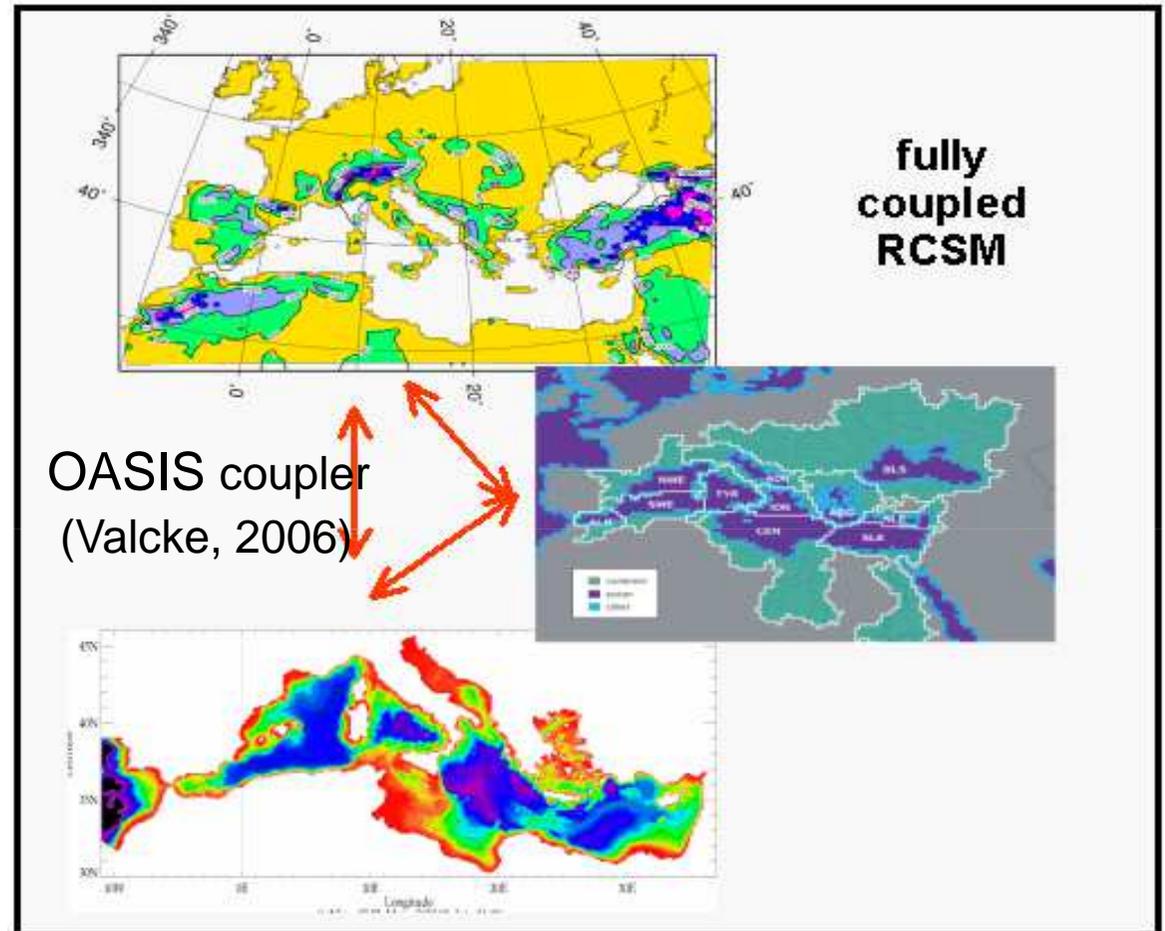
OASIS coupler
(Valcke, 2006)

TRIP

River routing model

(Oki and Sud, 1998; Decharme et al., 2010)

0.5° resolution of the river network

Seasonal cycle of mean sea level anomaly over the Mediterranean Sea over the period 1993-2010 (cm)
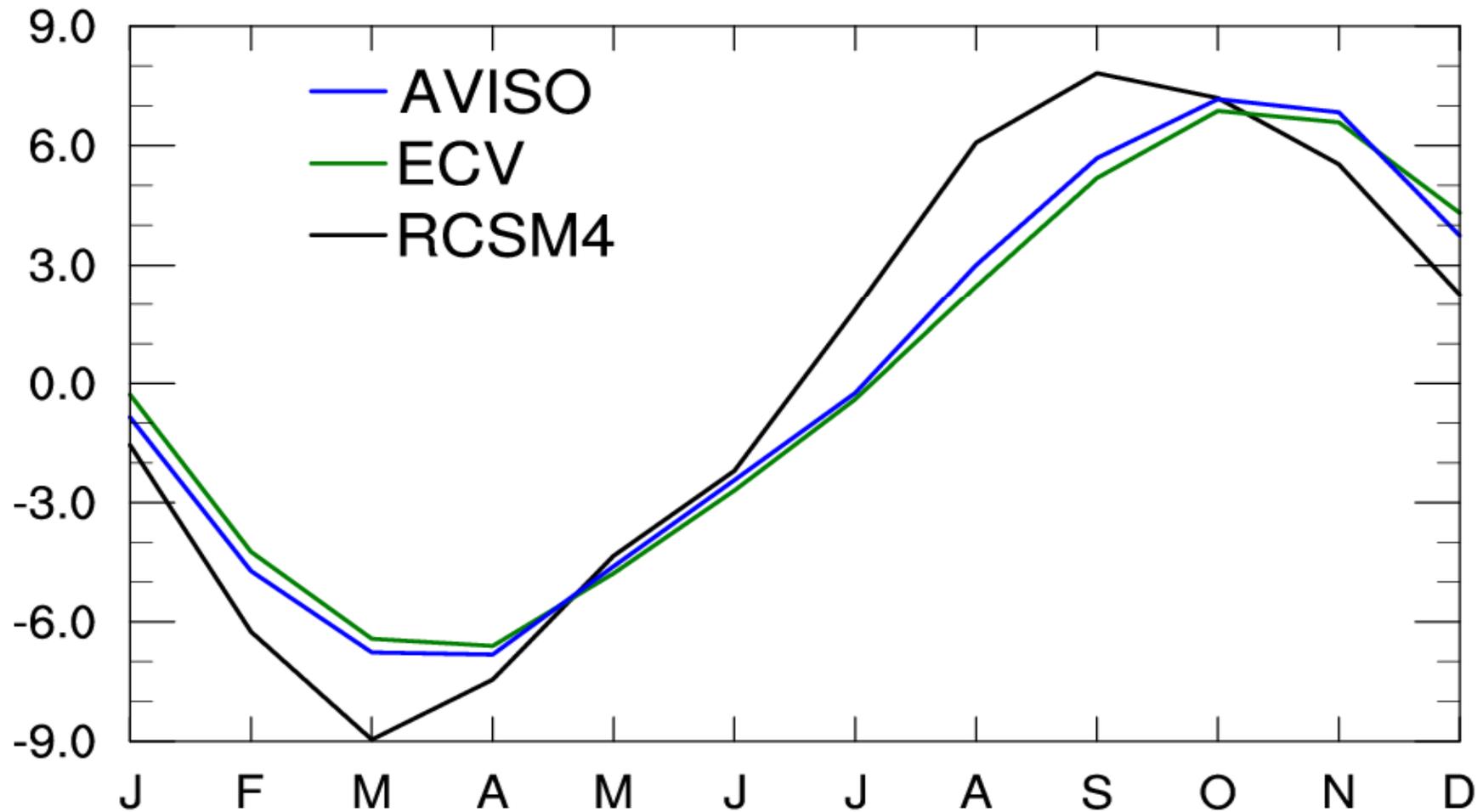
Time series of mean sea level anomalies averaged over the Mediterranean Sea for the period 1993-2010 (cm)
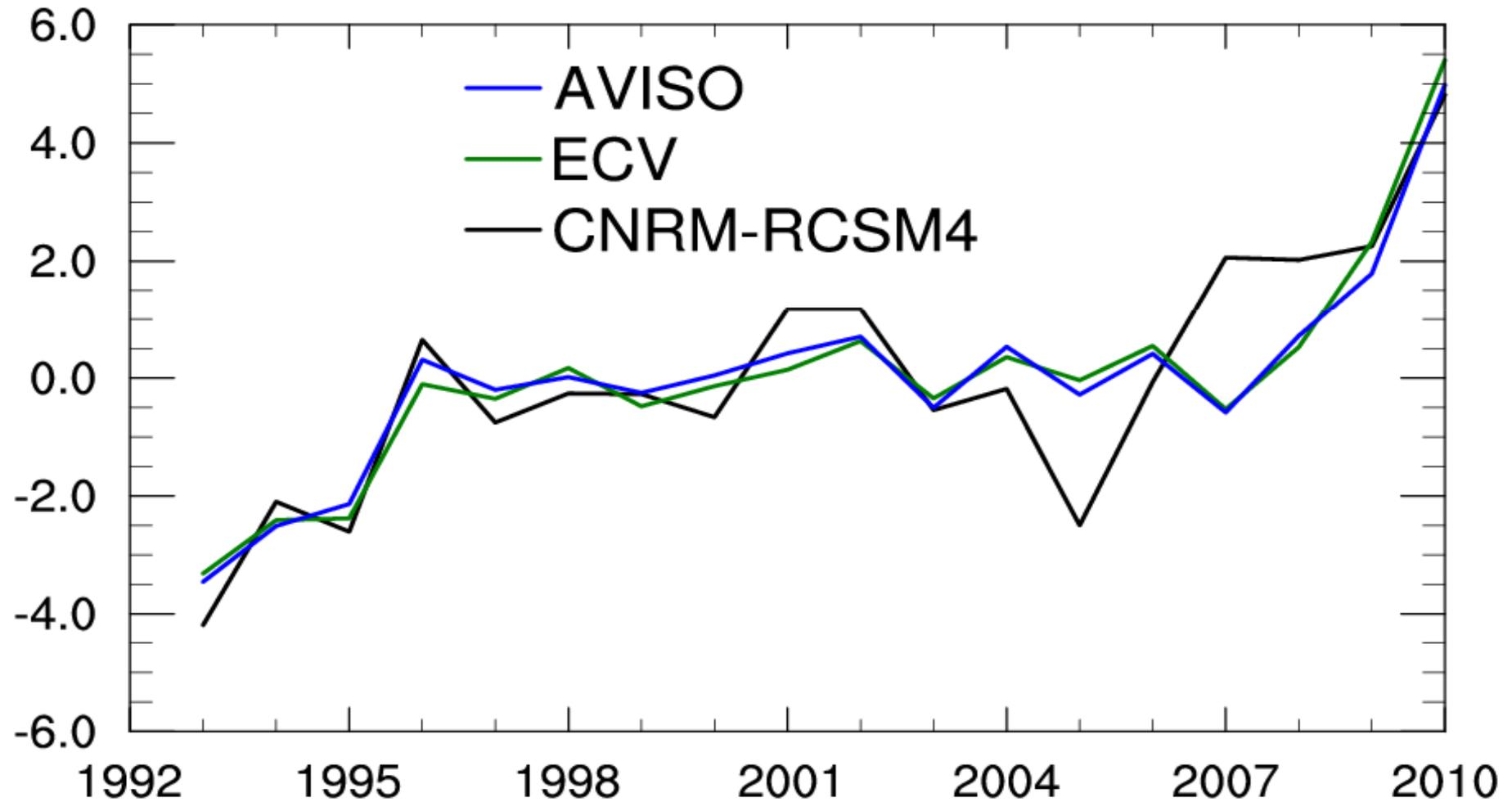
Sea Surface Height

- Evaluation of coupled or uncoupled regional climate models with CCI SSH could demonstrate the added value of the new product (improved resolution, better accuracy, …).

- Evaluation over the Mediterranean area is a good opportunity due to MedCORDEX international modelling exercise and the HyMEX field experiment starting this year.

- There is also the opportunity to evaluate consistency with other CCI products over the region (SST, aerosols, …) taking advantage of the development of regional climate system models.

CNES, 22 mai 2013

Any questions?

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