

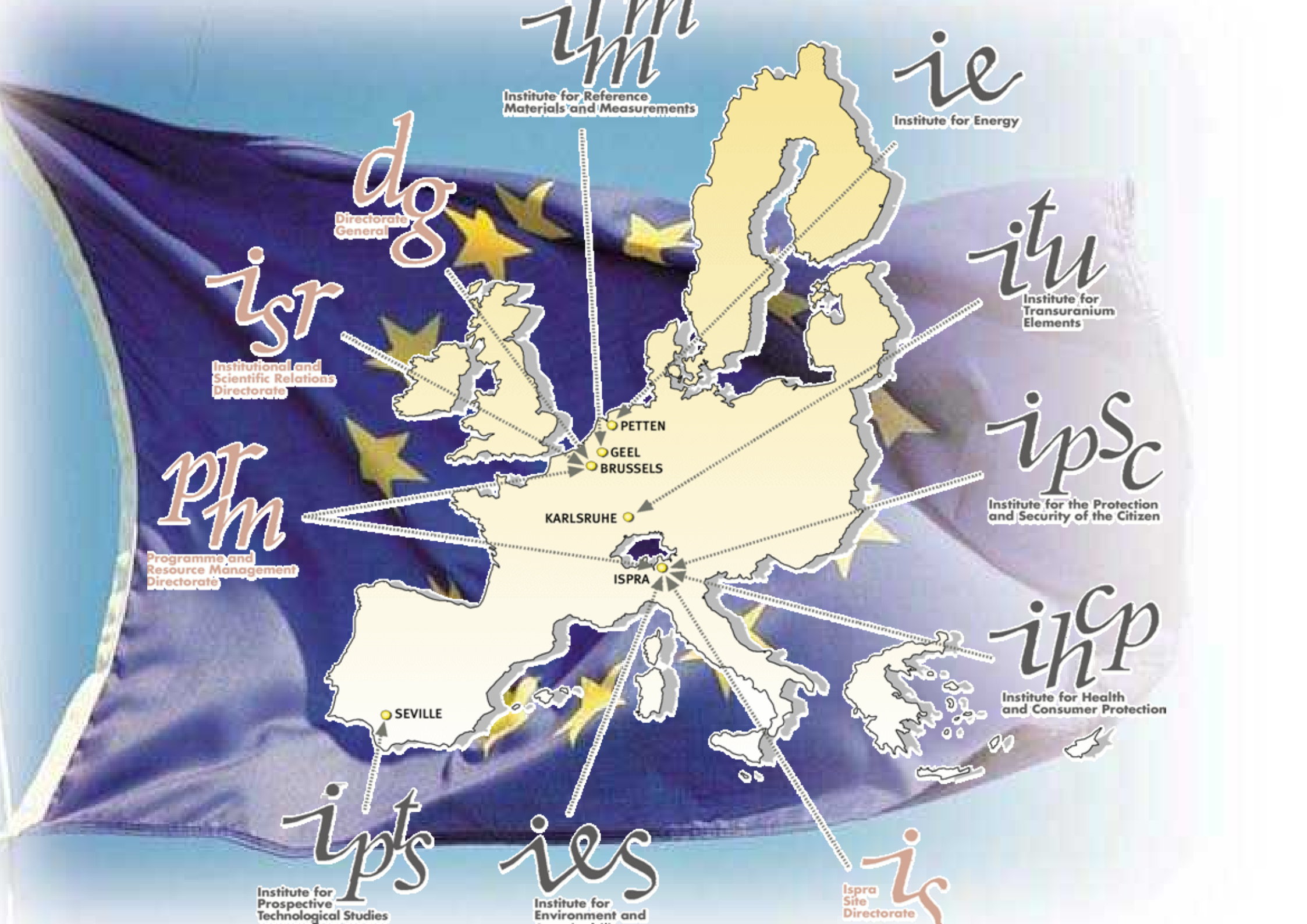
MARE PICTUM

20 YEARS OF COLLABORATIVE BIO-OPTICAL RESEARCH
TO MAP THE "COLOURED" SEA



VITTORIO BARALE

JOINT RESEARCH CENTRE OF THE EUROPEAN COMMISSION



im m
Institute for Reference
Materials and Measurements

ie
Institute for Energy

dg
Directorate
General

itu
Institute for
Transuranium
Elements

isr
Institutional and
Scientific Relations
Directorate

ipsc
Institute for the Protection
and Security of the Citizen

pr m
Programme and
Resource Management
Directorate

PETTEN
GEEL
BRUSSELS

ihp
Institute for Health
and Consumer Protection

KARLSRUHE

ISPra

SEVILLE

ipts
Institute for
Prospective
Technological Studies

ies
Institute for
Environment and

is
Ispra
Site
Directorate

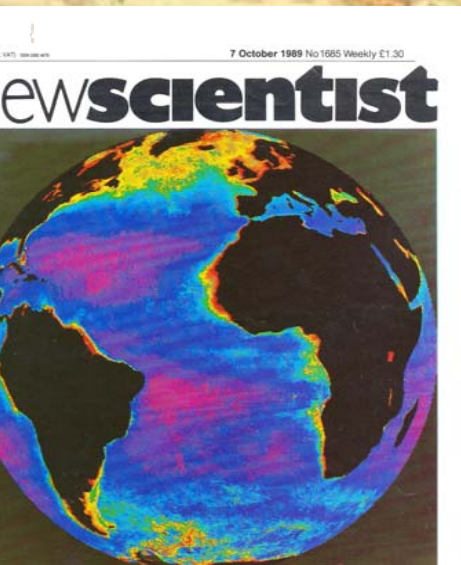
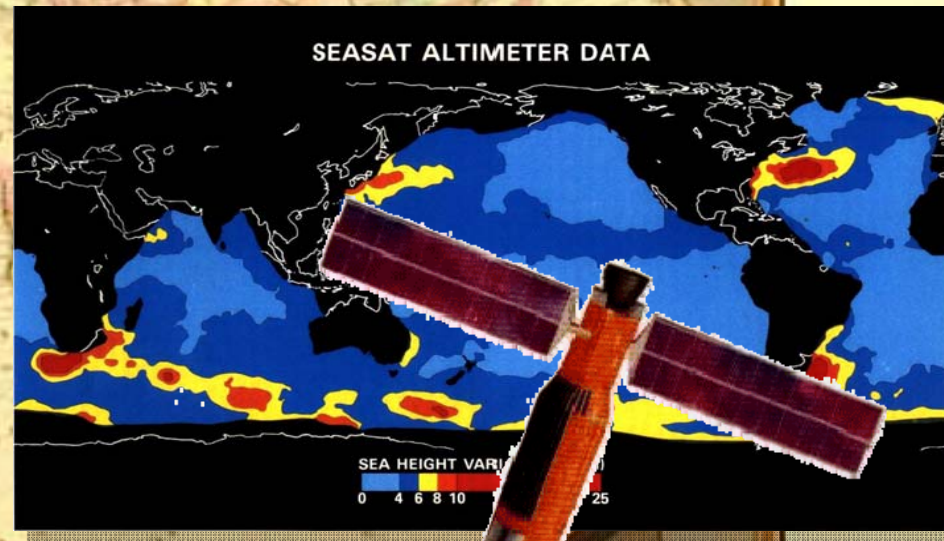
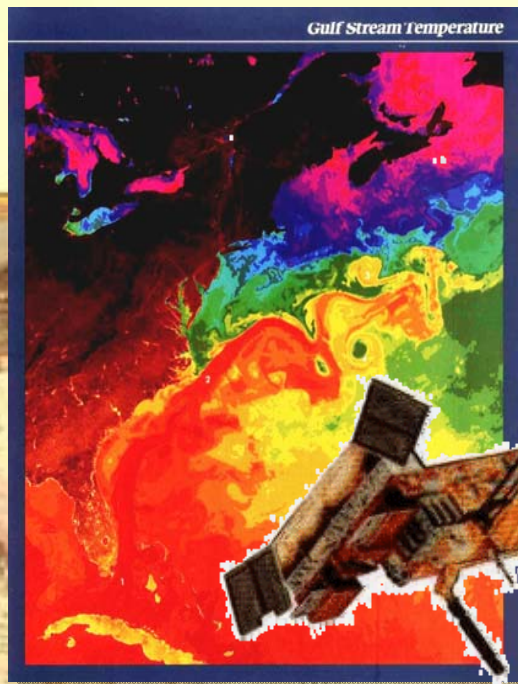




N COLOR ...



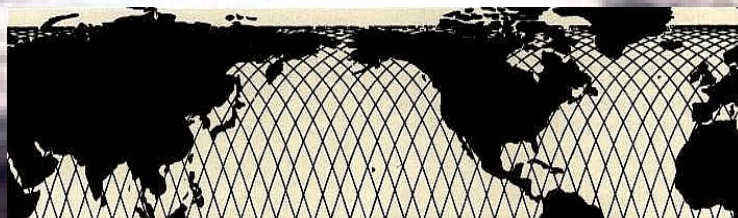
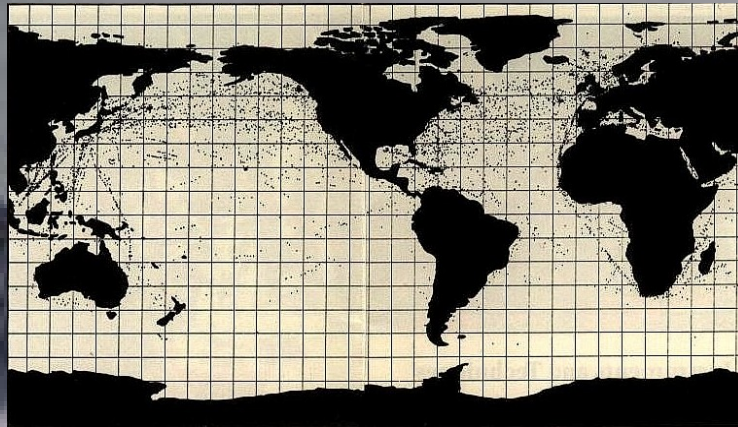
1978

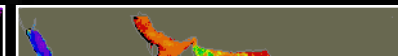
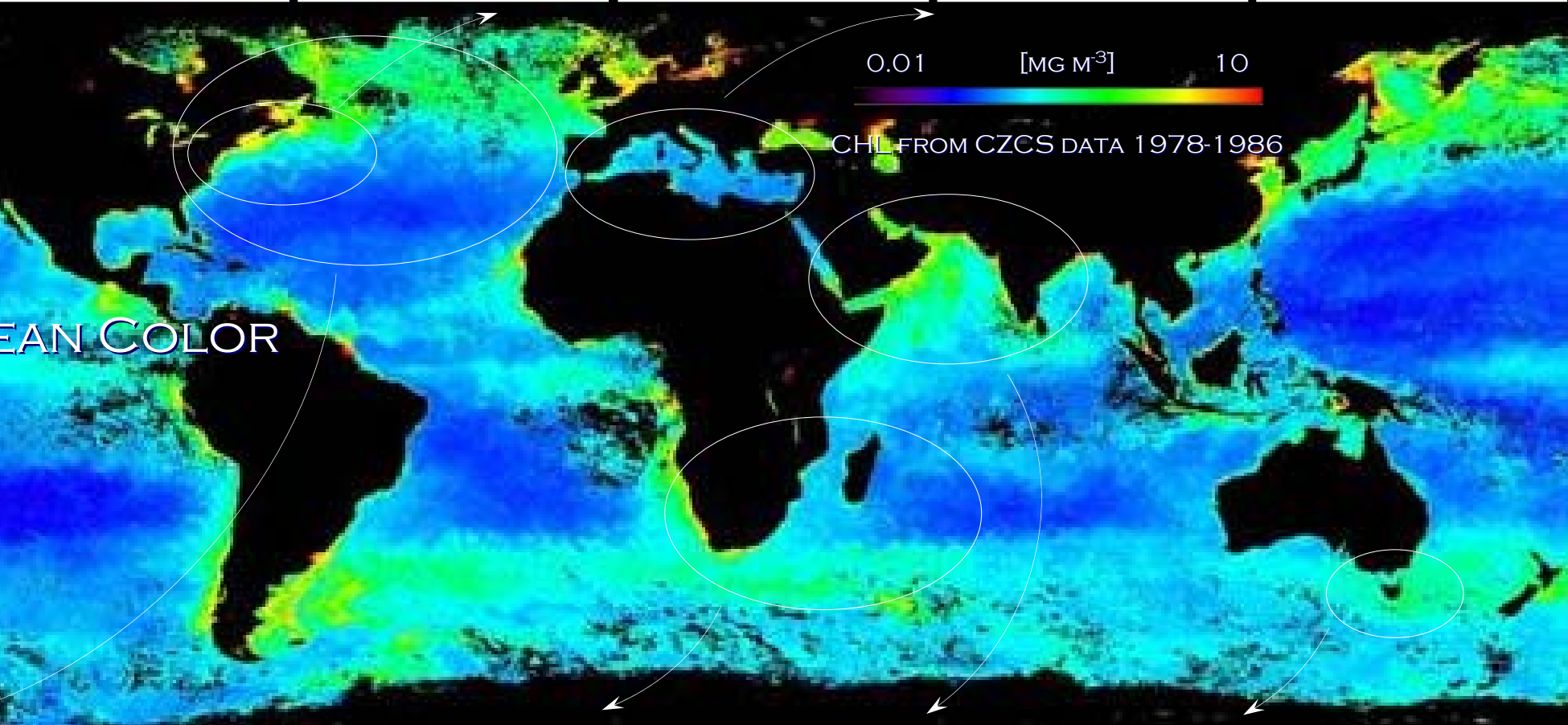
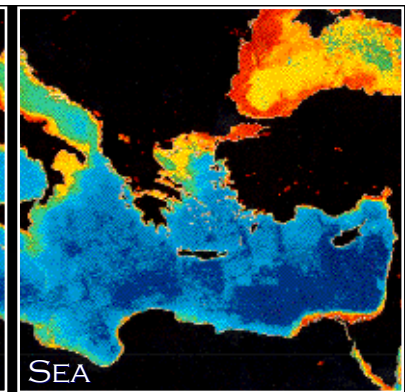
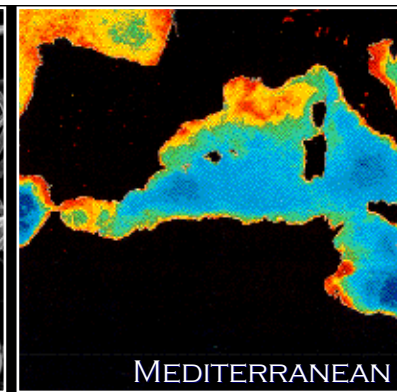
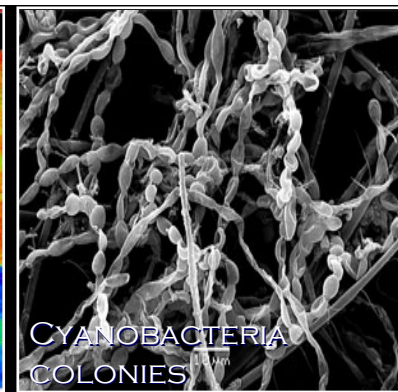
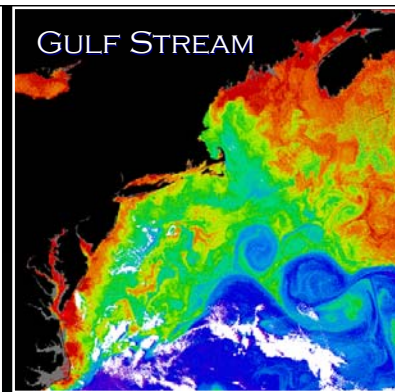
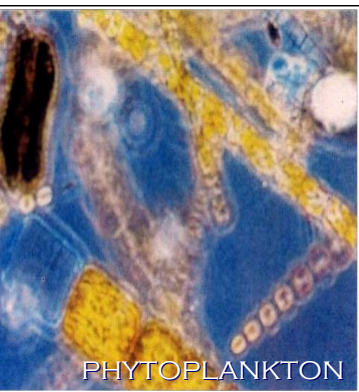


THE SENSING OF THE SEA?

IN SITU SURVEYS POSE SEVERE OPERATIONAL PROBLEMS ...

3-DAY GLOBAL COVERAGE OBTAINED
FROM CONVENTIONAL SHIP WEATHER
REPORTS (9-11 AUGUST 78)



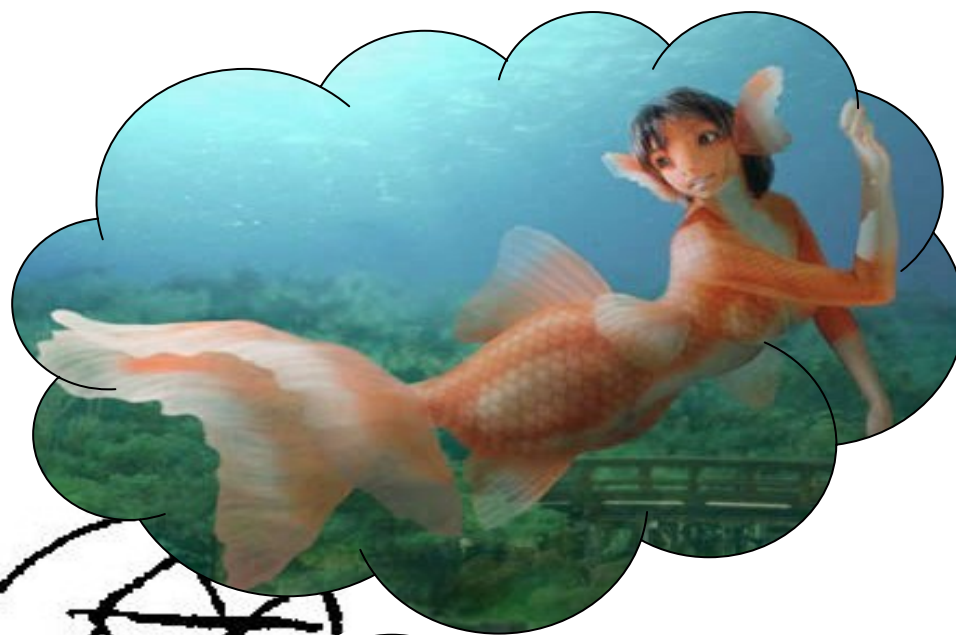


NOW, LISTEN TO ME.
WORDS TO REMEMBER:
FIRST, OCEAN.
SECOND, COLOUR.

...

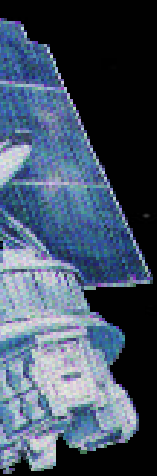


YOU'RE NOT LISTENING ...
WHAT'S ON YOUR MIND?

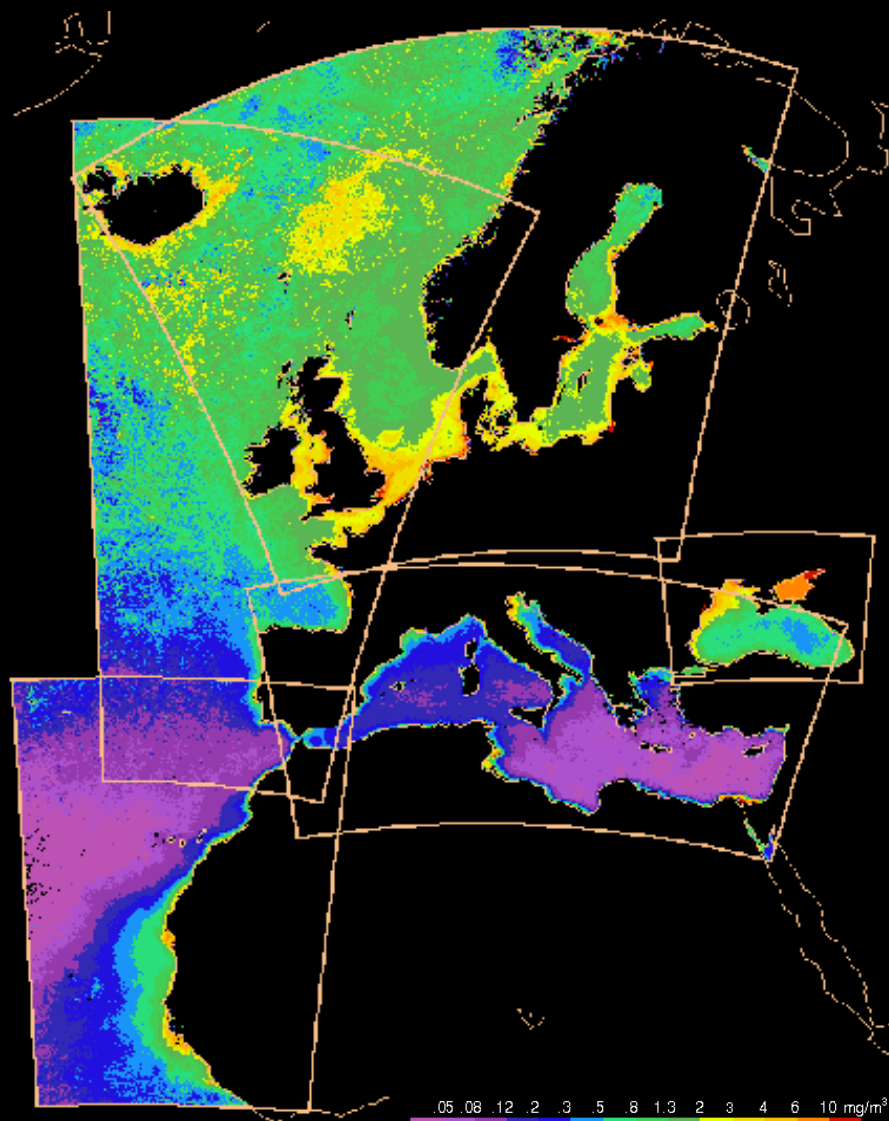


T

PROCESSING OF EUROPEAN CZCS DATA SET
LINE BASINS OF EUROPEAN INTEREST
DEMONSTRATION PROGRAMME
ESA PARTNERSHIP



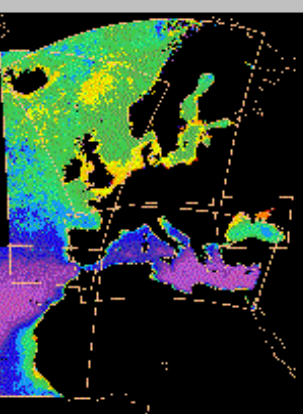
DATA ARCHEOLOGY
STANDARD PRE-PROCESSING
SPECIAL REGIONAL ALGORITHMS
DATA DISTRIBUTION TO RESEARCH GROUPS



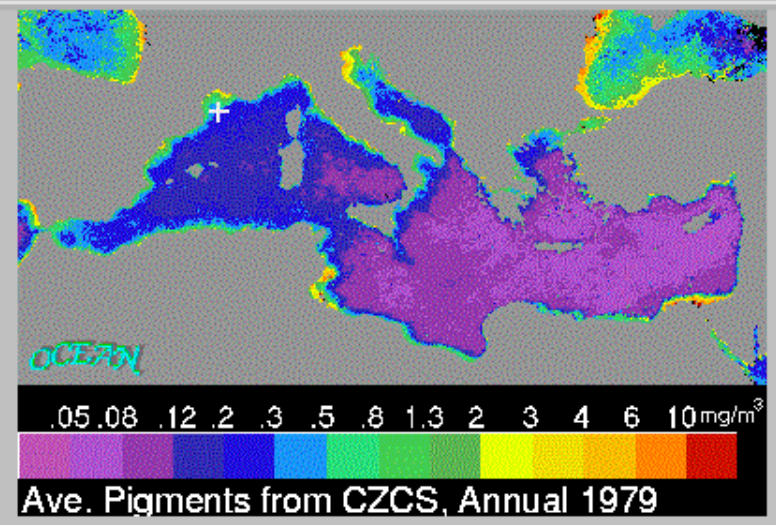
.05 .06 .12 .2 .3 .5 .8 1.3 2 3 4 6 10 mg/m³
Ave. Pigments from CZCS, 1979-85



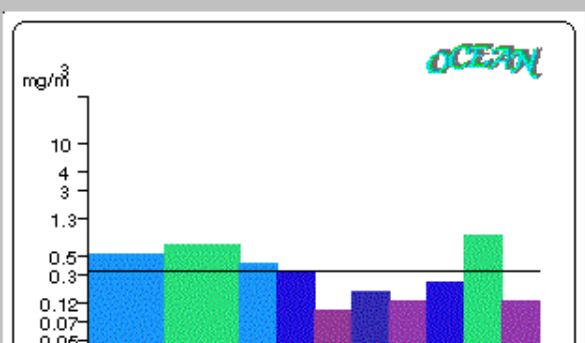
OCEAN Project



The OCEAN Project, was established in 1990 as a research Centre (JRC) of the European Commission (EC), with the support of the European Space Agency (ESA). The aim of the project is to use CZCS data for the European seas, and to set up the OCEAN Project has



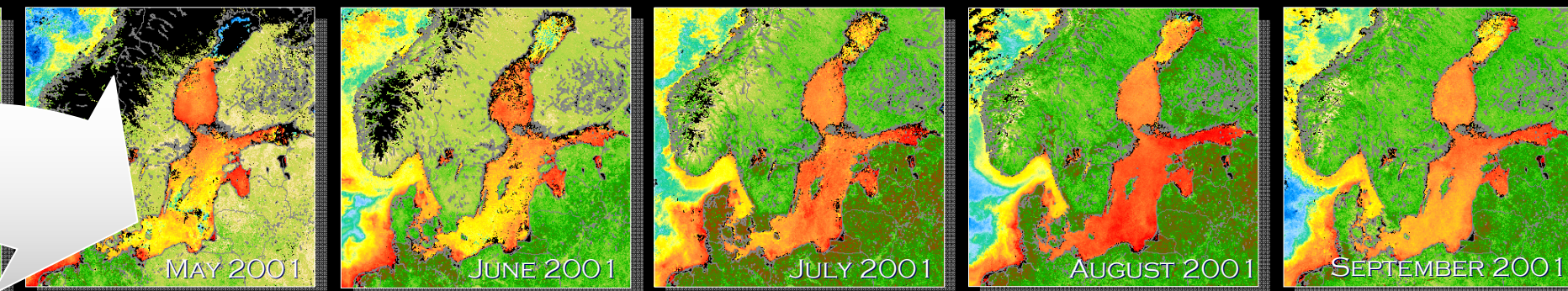
1979	1980	1981	1982	1983	1984	1985	79-85					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg



*SENSORS
SATELLITES
MORE DATA ...*



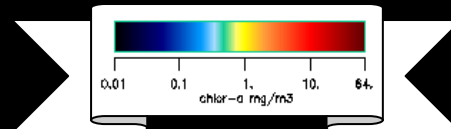
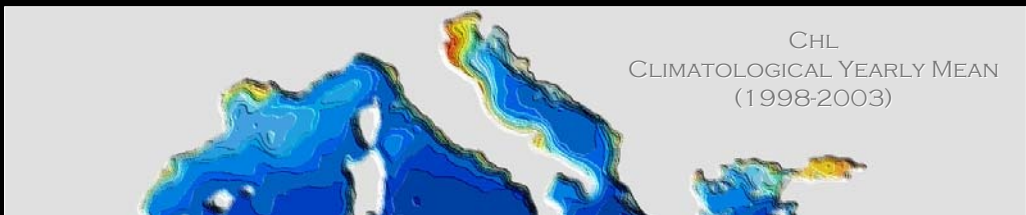
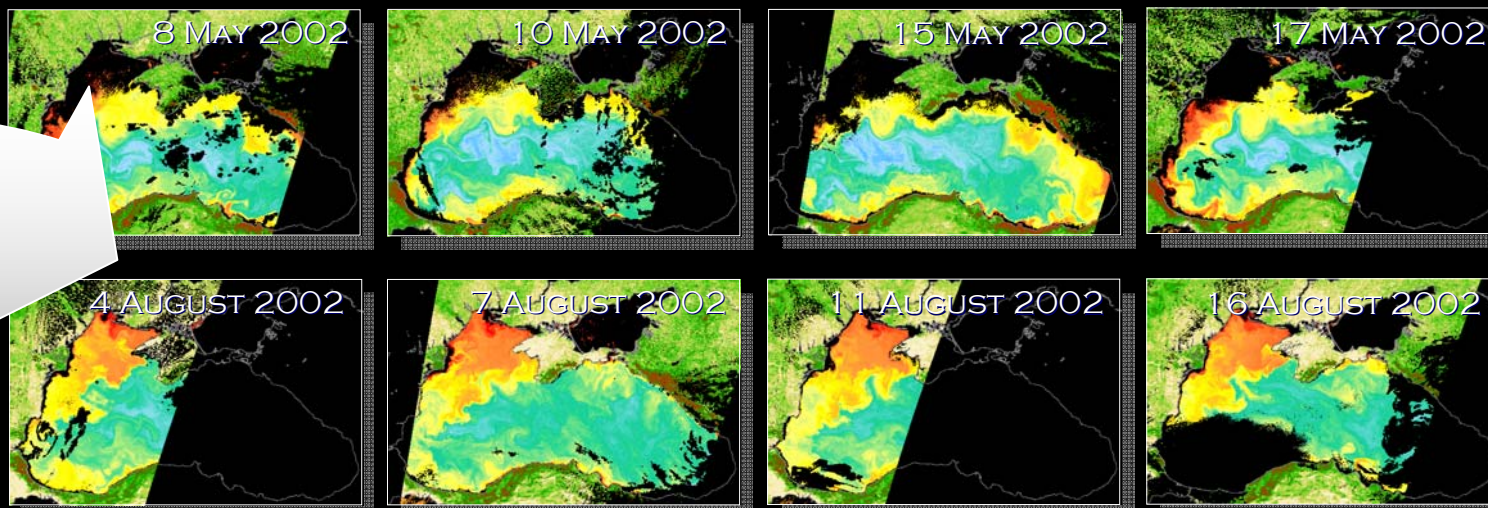
OPTICAL SIGNATURES OF THE EUROPEAN SEAS ...



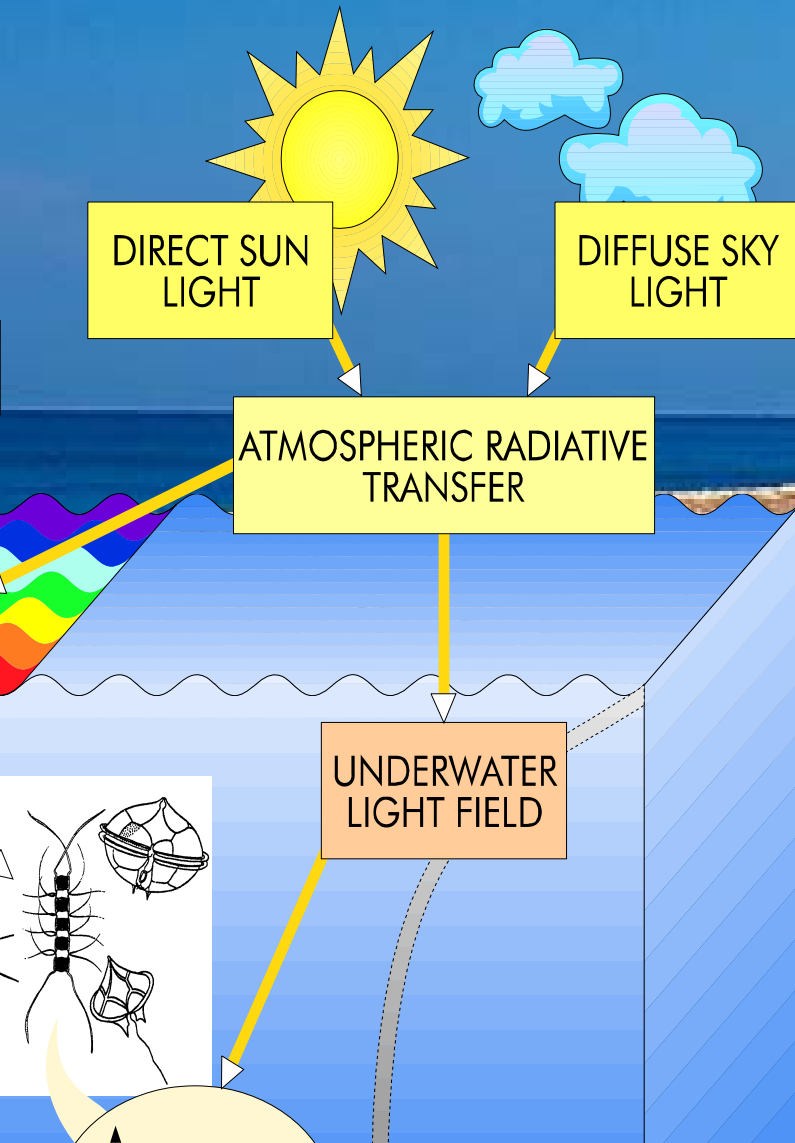
ADRIATIC SEA

BLACK SEA

IONIAN SEA
THE Aegean
AS



PRIMARY PRODUCTION MODELING



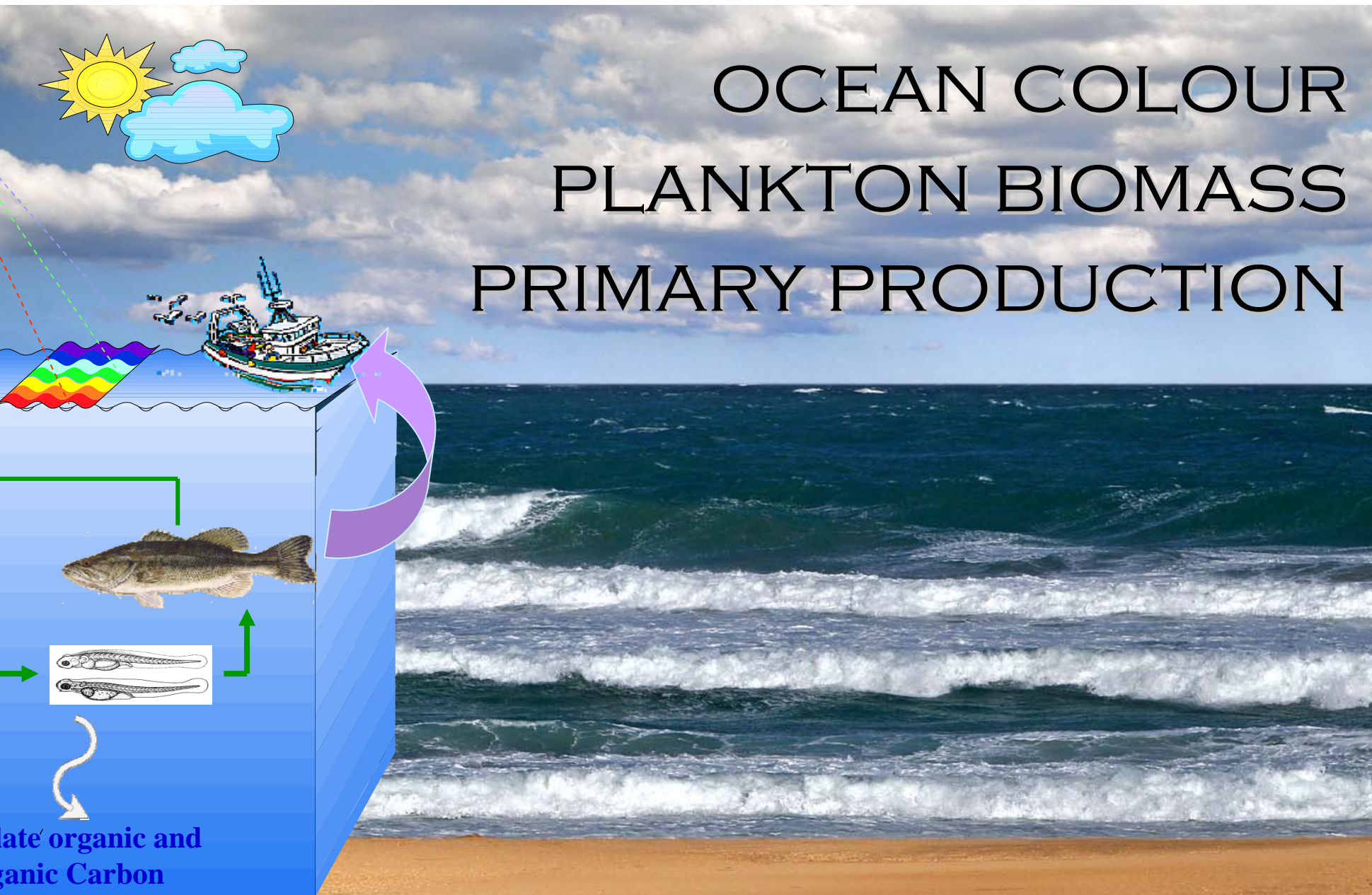
PRIMARY PRODUCTION, INTEGRATED OVER THE WATER COLUMN IS A FUNCTION OF:

- BIOMASS (CHL CONCENTRATION)
- SURFACE RADIATION (LIGHT FIELD)
- PHOTOSYNTHETIC PARAMETERS

$$P_{EU} = f(CHL, PAR, \Phi)$$

$$\Phi = g(T^{\circ})$$

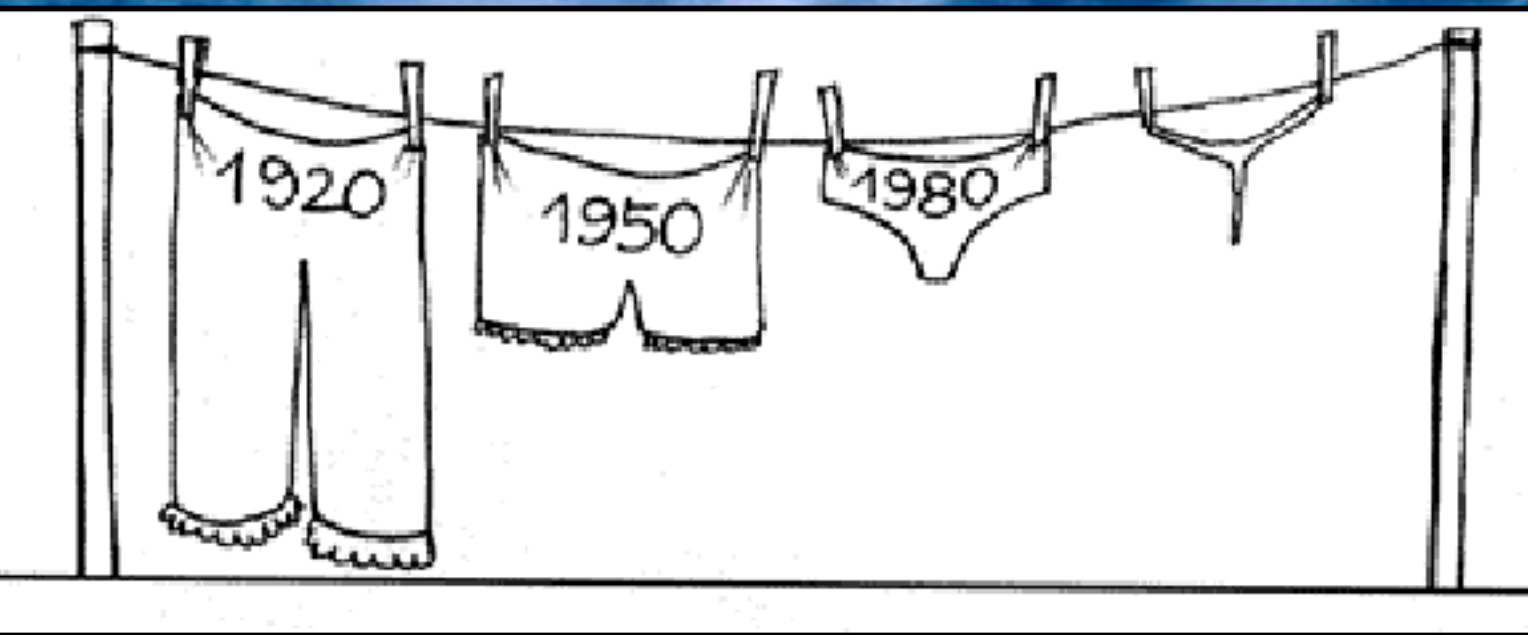
OCEAN COLOUR PLANKTON BIOMASS PRIMARY PRODUCTION



FORMATION OF ORGANIC MATTER BY

PRIMARY REDUCTION OF INORGANIC CARBON

NEW INDICATORS OF CLIMATE CHANGE ...



OPERATIONAL VALIDATION ON EUROPEAN VALIDATION EXPERIMENTS COASTAL/SHELF WATER REMOTE SENSING

OBJECTIVES (1997-1998)

ASSESSMENT OF IN SITU MEASUREMENT PROTOCOLS, CALIBRATION & INTER-CALIBRATION METHODS, PROCESSING SCHEMES AND ARCHIVING TOOLS, TRANSFERABLE TO FUTURE OPERATIONAL NETWORKS SUPPORTING EUROPEAN COASTAL/SHELF WATER MONITORING THROUGH SATELLITES.



L & SHELF WATER MONITORING
COME A PRETTY TIRING PROCESS ...



COASTAL REGION LONG-TERM MEASUREMENTS FOR COLOR REMOTE SENSING DEVELOPMENT AND VALIDATION (MAST III)

ESTABLISH AN EUROPEAN NETWORK OF REPRESENTATIVE SITES AT WHICH A SYSTEMATIC PROGRAM OF LONG-TERM WATER AND ATMOSPHERE IS CARRIED OUT.

(1998-2000):

OPTICAL AND BIO-GEO-CHEMICAL MEASUREMENTS OF THE MAJOR TYPES OF EUROPEAN COASTAL ATMOSPHERE/WATER (MEDITERRANEAN SEA, ENGLISH CHANNEL AND NORTH SEA);

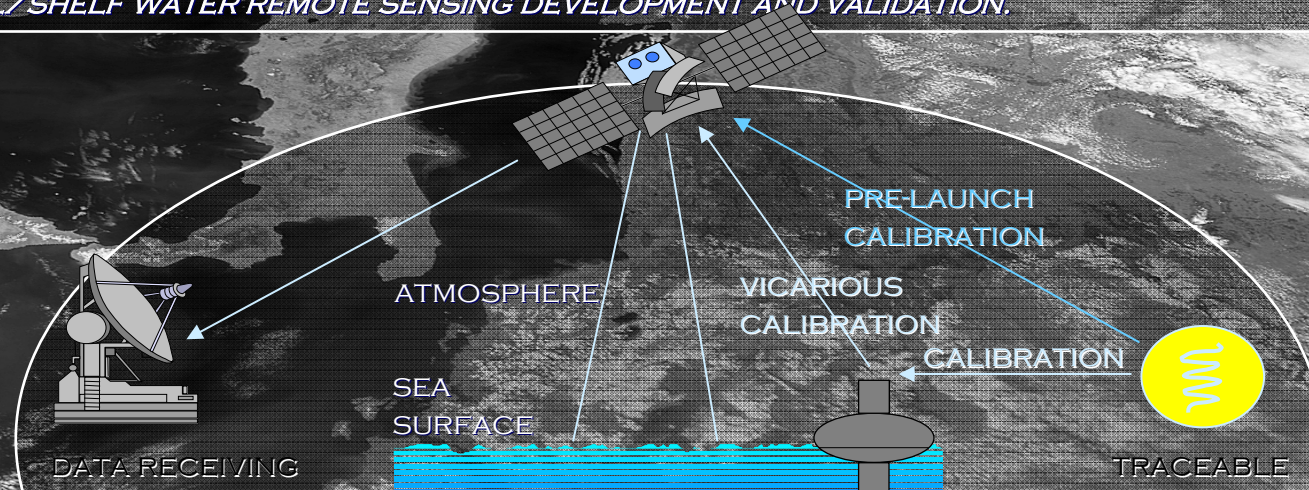
DEVELOPMENT OF OPTICAL AND ATMOSPHERIC MODELS/ALGORITHMS FOR COASTAL/SHELF AREAS, AND VALIDATION OF THESE MODELS USING IN SITU MEASUREMENTS;

DEVELOPMENT OF METHODS FOR THE INTERPRETATION OF SATELLITE REMOTELY SENSED DATA OF EUROPEAN SEAS, AND VALIDATION OF THESE METHODS USING OPTICAL AND ATMOSPHERIC MODELS/ALGORITHMS.

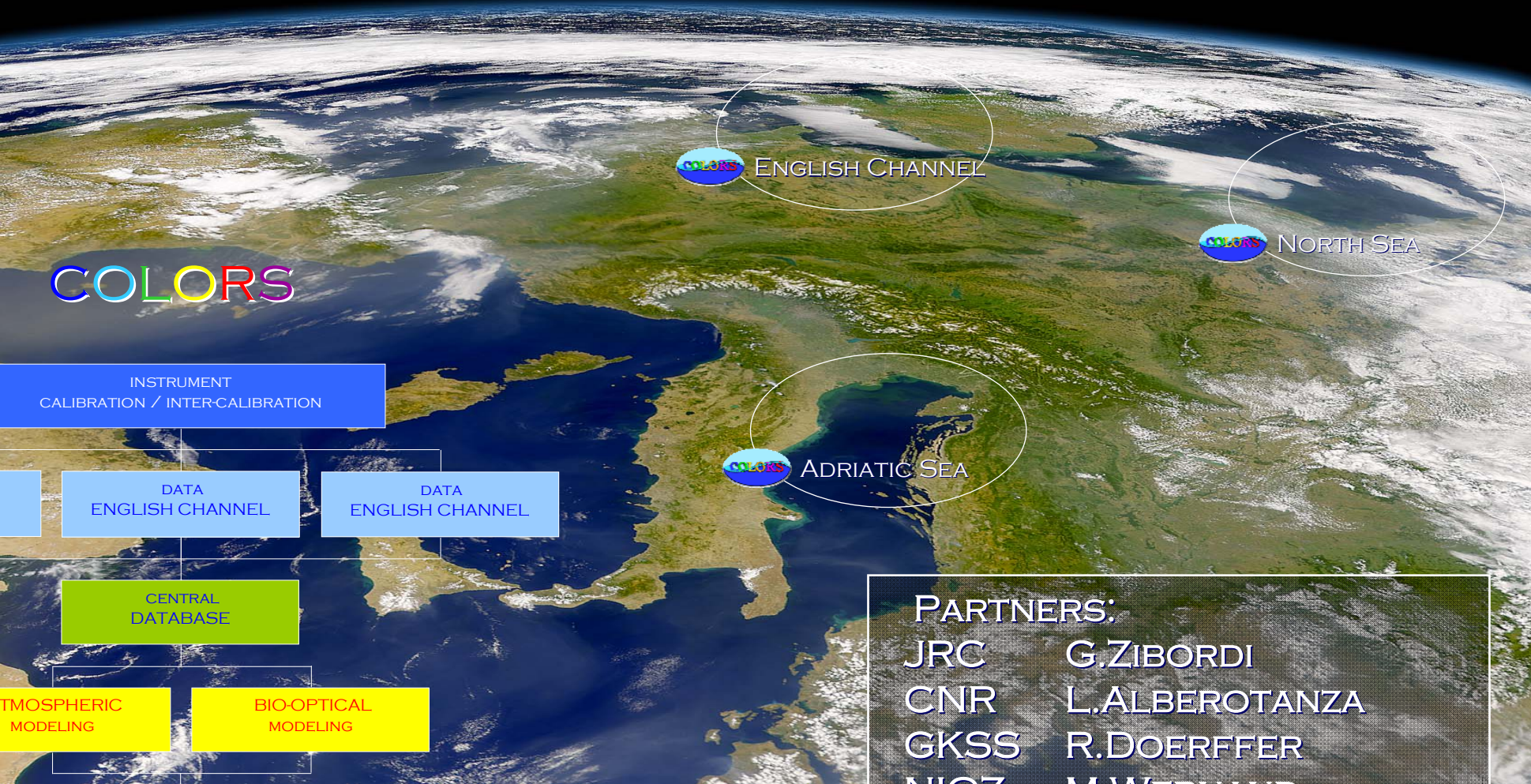
ATTEMPT

TO ESTABLISH AN EUROPEAN NETWORK FOR COASTAL/SHELF WATER REMOTE SENSING DEVELOPMENT AND VALIDATION.

LIVAL



COASTAL REGION LONG-TERM MEASUREMENTS FOR COLOR REMOTE SENSING DEVELOPMENT AND VALIDATION (MAST III)



COLORS

ENGLISH CHANNEL

NORTH SEA

ADRIATIC SEA

INSTRUMENT
CALIBRATION / INTER-CALIBRATION

DATA
ENGLISH CHANNEL

DATA
ENGLISH CHANNEL

CENTRAL
DATABASE

ATMOSPHERIC
MODELING

BIO-OPTICAL
MODELING

PARTNERS:

JRC G.ZIBORDI
CNR L.ALBEROTANZA
GKSS R.DOERFFER
NIOZ M.WEISSMANN



SET OF MEASUREMENTS COLLECTED AT SUCCESSIVE TIMES ...

Y OF DATA ENSURES VALUE TO TIME-SERIES

QUIREMENTS ENSURING CONSISTENCY OF TIME SERIES ARE:

ASSESSED PROTOCOLS FOR MEASUREMENTS AND INSTRUMENTS CALIBRATION,
OF MEASUREMENTS ACCURACIES,
COLLECTION OF DATA.

BLEMS IN THE CREATION OF A TIME SERIES ARE DUE TO:

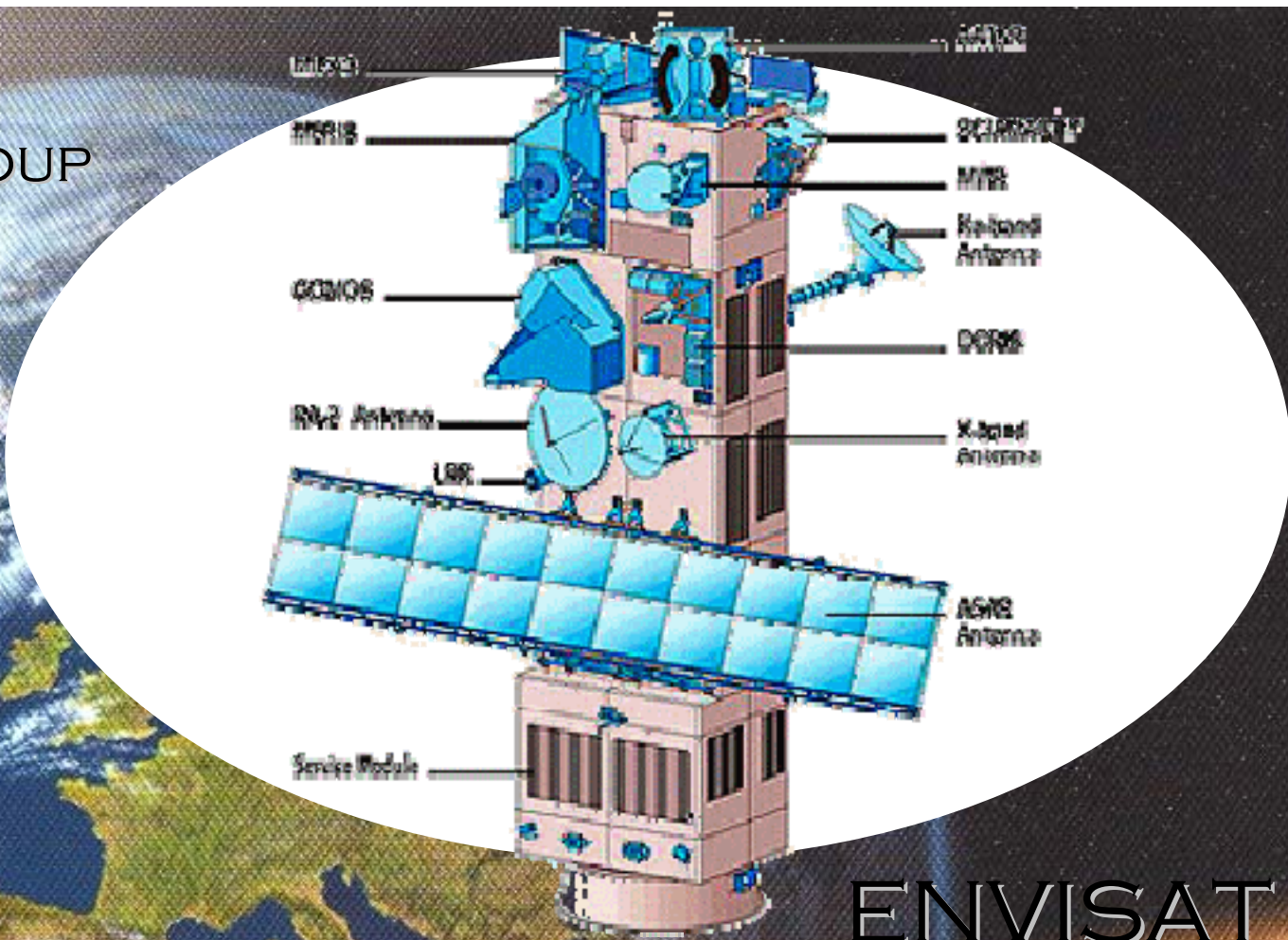
S IN THE MEASUREMENT PROTOCOLS OR IN CALIBRATION STANDARDS.

ENVISAT



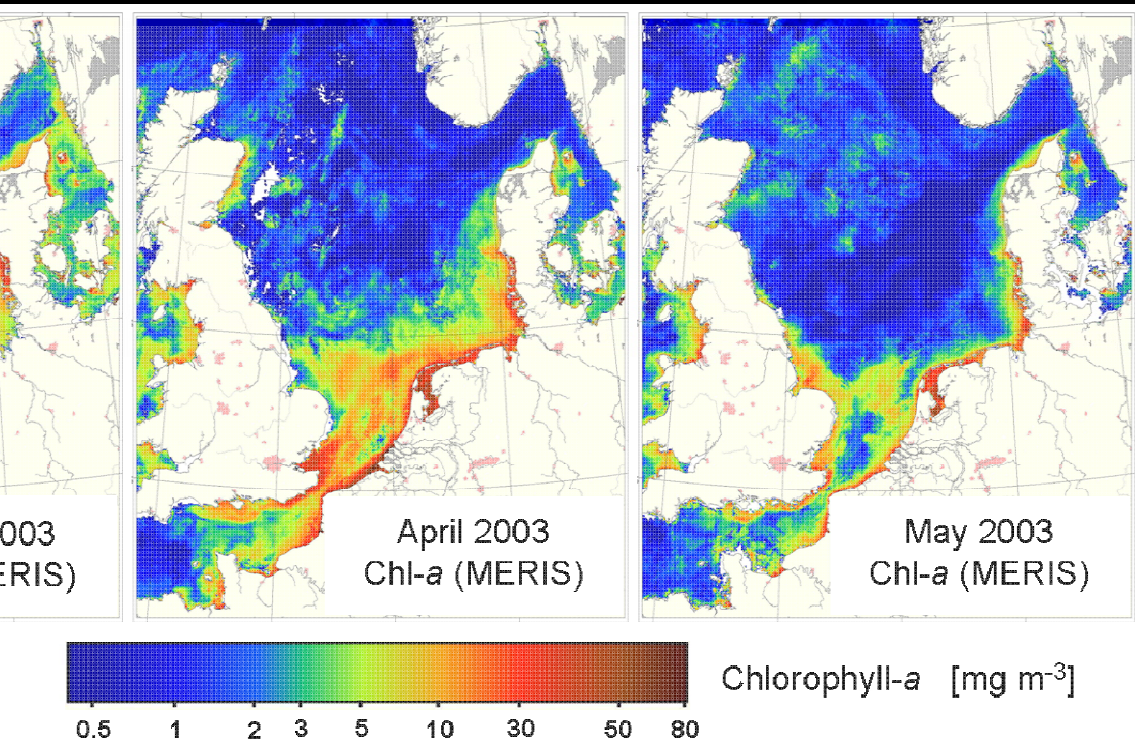
ADVISORY GROUP

AL CONCEPT
CTERISTICS
S
ENT
HAIN
MS

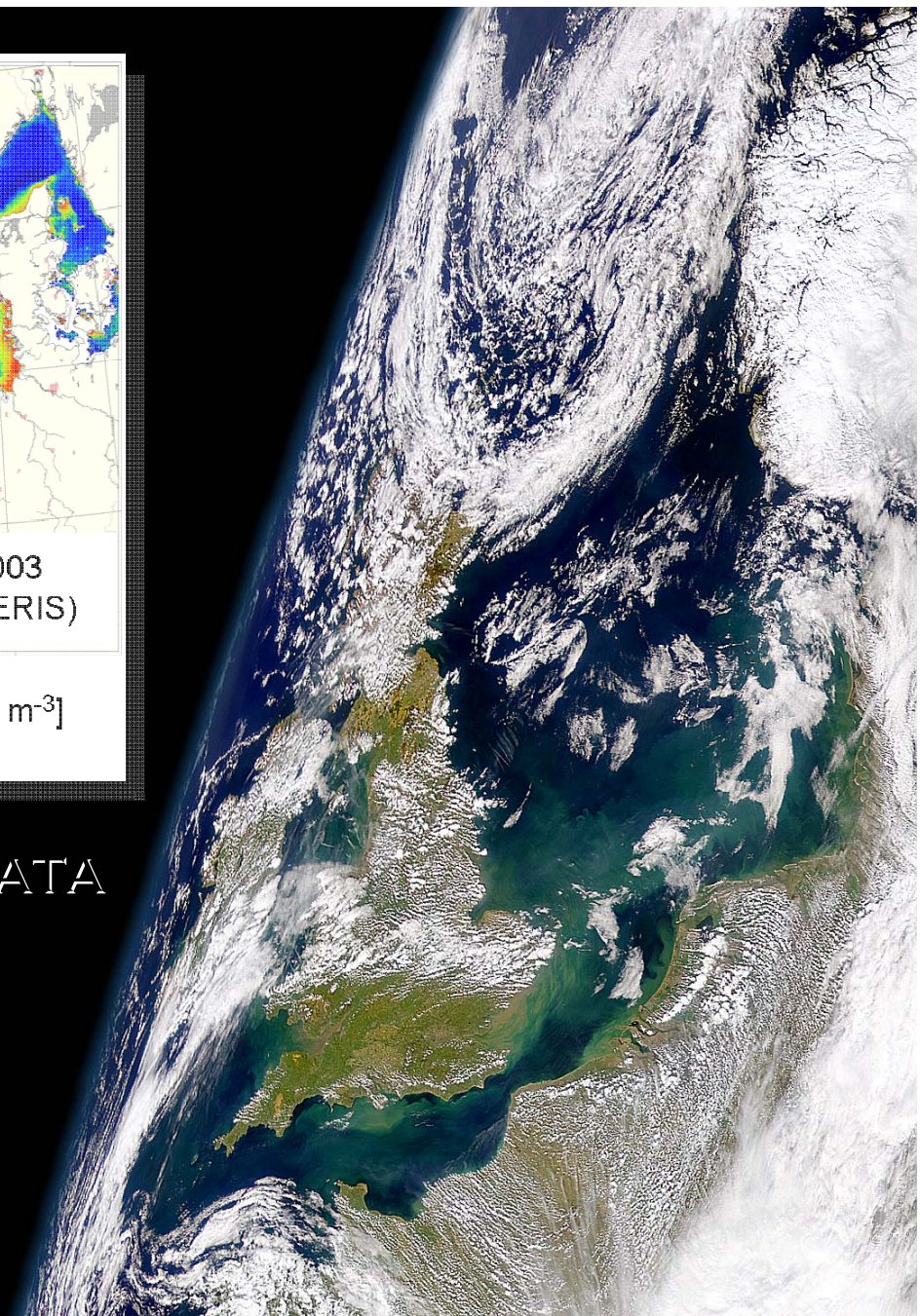
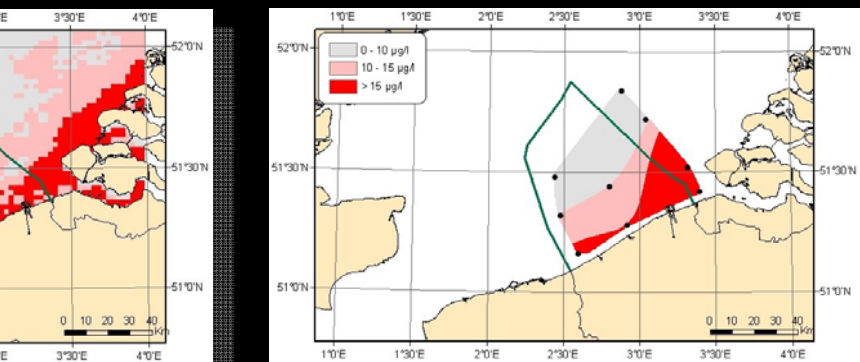


ENVISAT





NORTH ATLANTIC (2003) CHL FROM MERIS DATA





NIRVANA

PROTOCOLS
&
ALGORITHMS

SEAWIFS

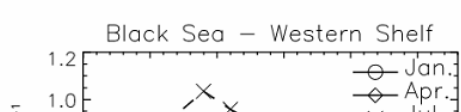
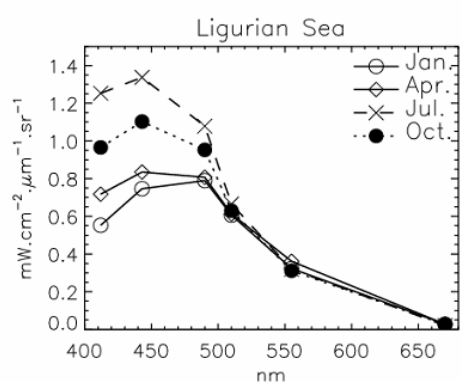
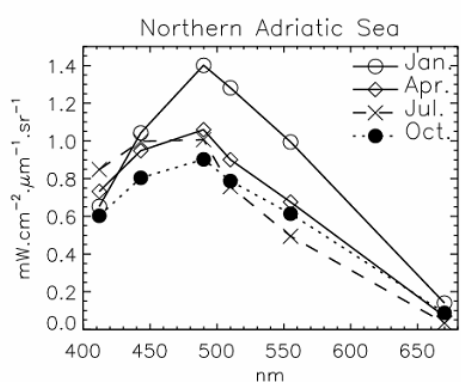
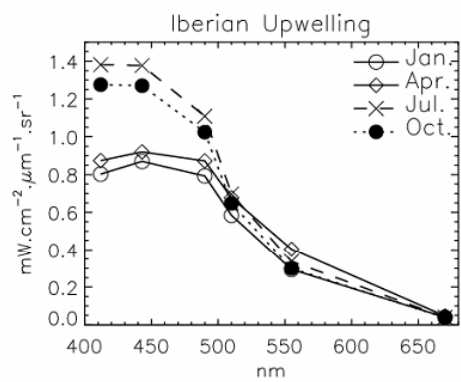
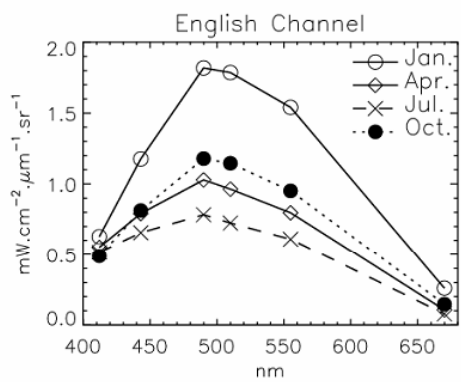
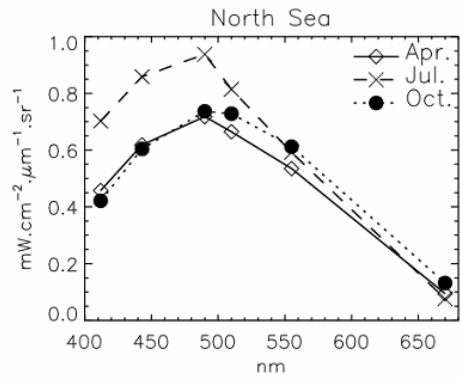
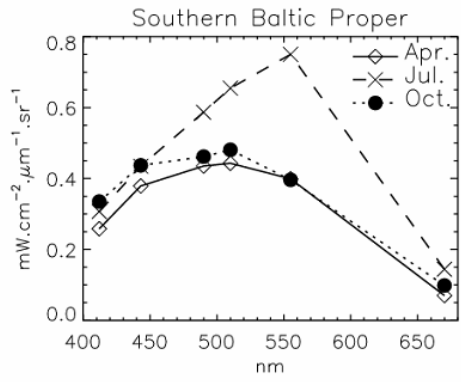
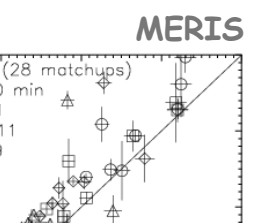
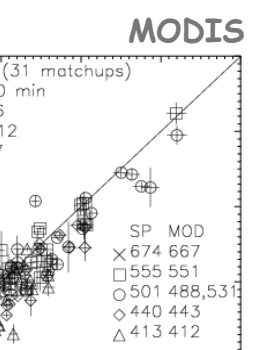
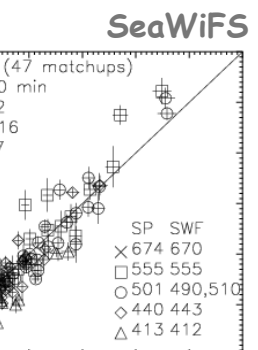
MERIS
S.A.G.

CEVEX

COLORS

MEDITERRANEAN SEAS DOMAINS

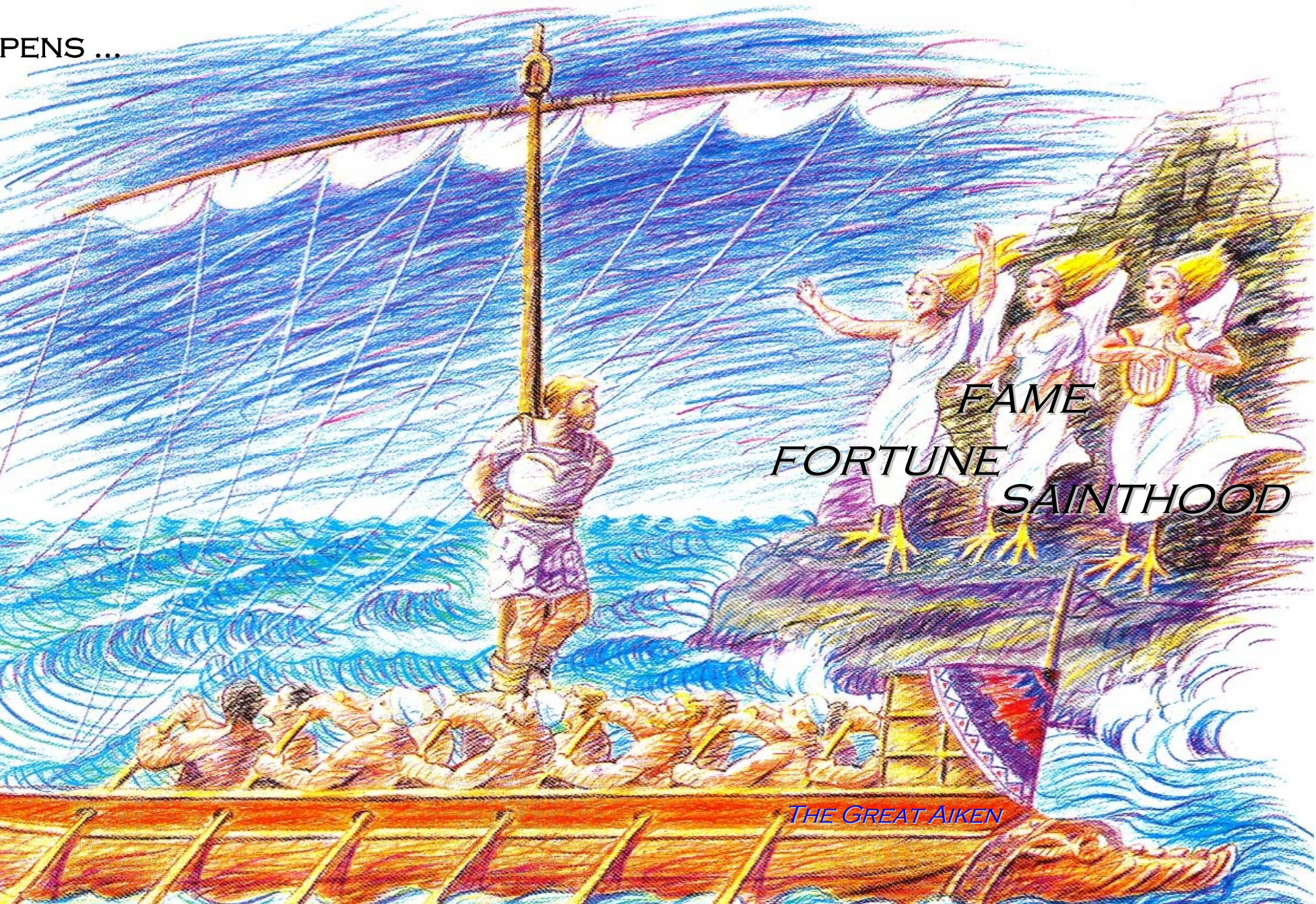
NORMALIZED WATER-LEAVING RADIANCE $L_{WN}(\lambda)$ FROM SEAWIFS (1998-2006)



WHAT NEXT? IS THE SUN SETTING OVER THE
ERA OF EUROPEAN BIO-OPTICAL RESEARCH?



PENS ...



FAME
FORTUNE
SAINTHOOD

THE GREAT AIKEN

