



Ciências
ULisboa



Sessão Interações Atlânticas, por
ocasião dos 500 anos da viagem
de circum-navegação

Circum-navigation of the living ocean as seen from satellite

Vanda Brotas

With the collaboration of: Oliver Clements, Steve Groom, Glen Tarran, Shuba
Sathyendranath, Trevor Platt (PML, UK)

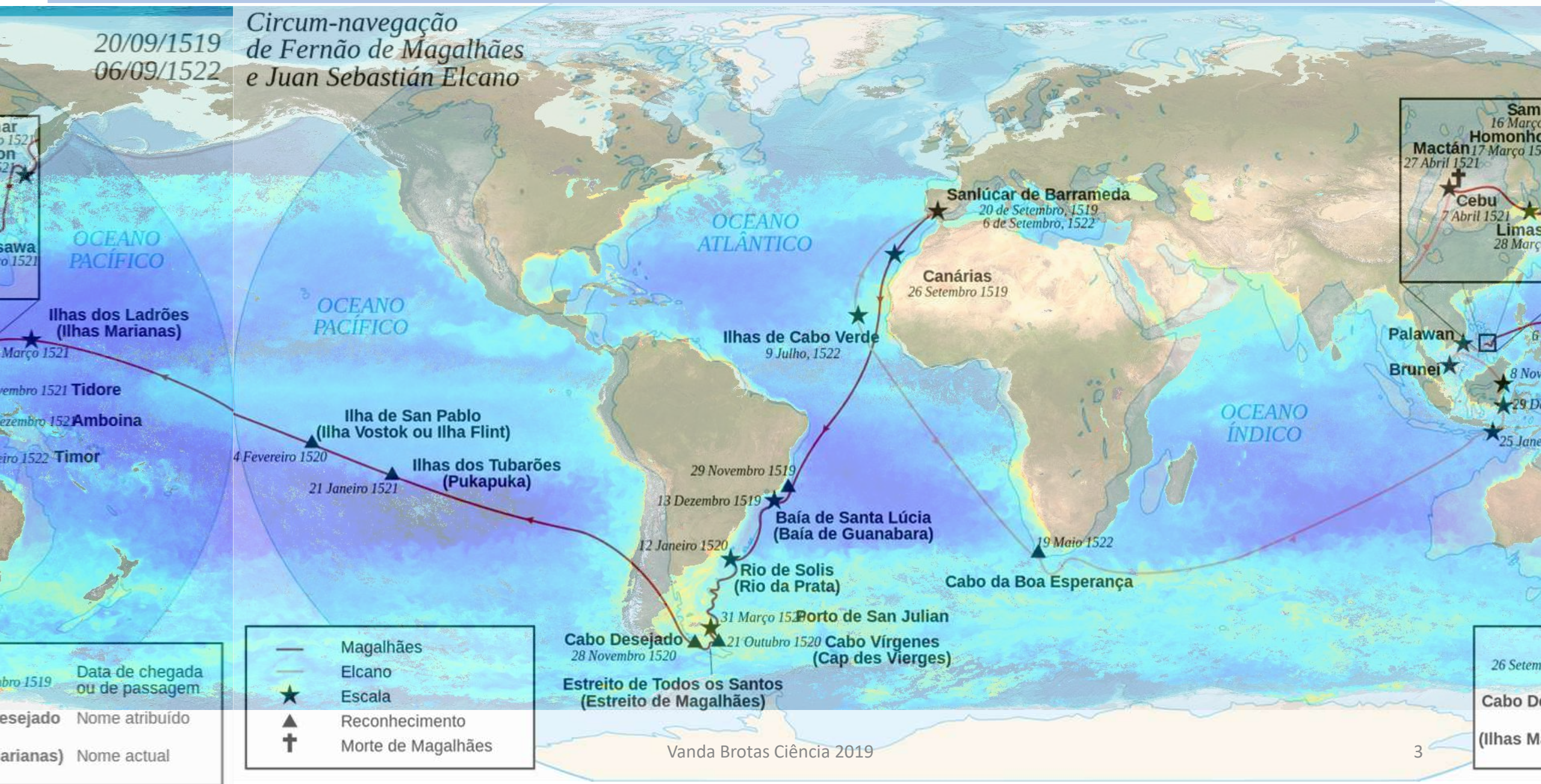
Afonso Ferreira, Andreia Tracana, Ana Brito, Carolina Sá, André Valente (MARE-
ULisboa)

Ana Dogliotti (IEFE, Argentina)

First circumnavigation of the Earth, 1519-1522

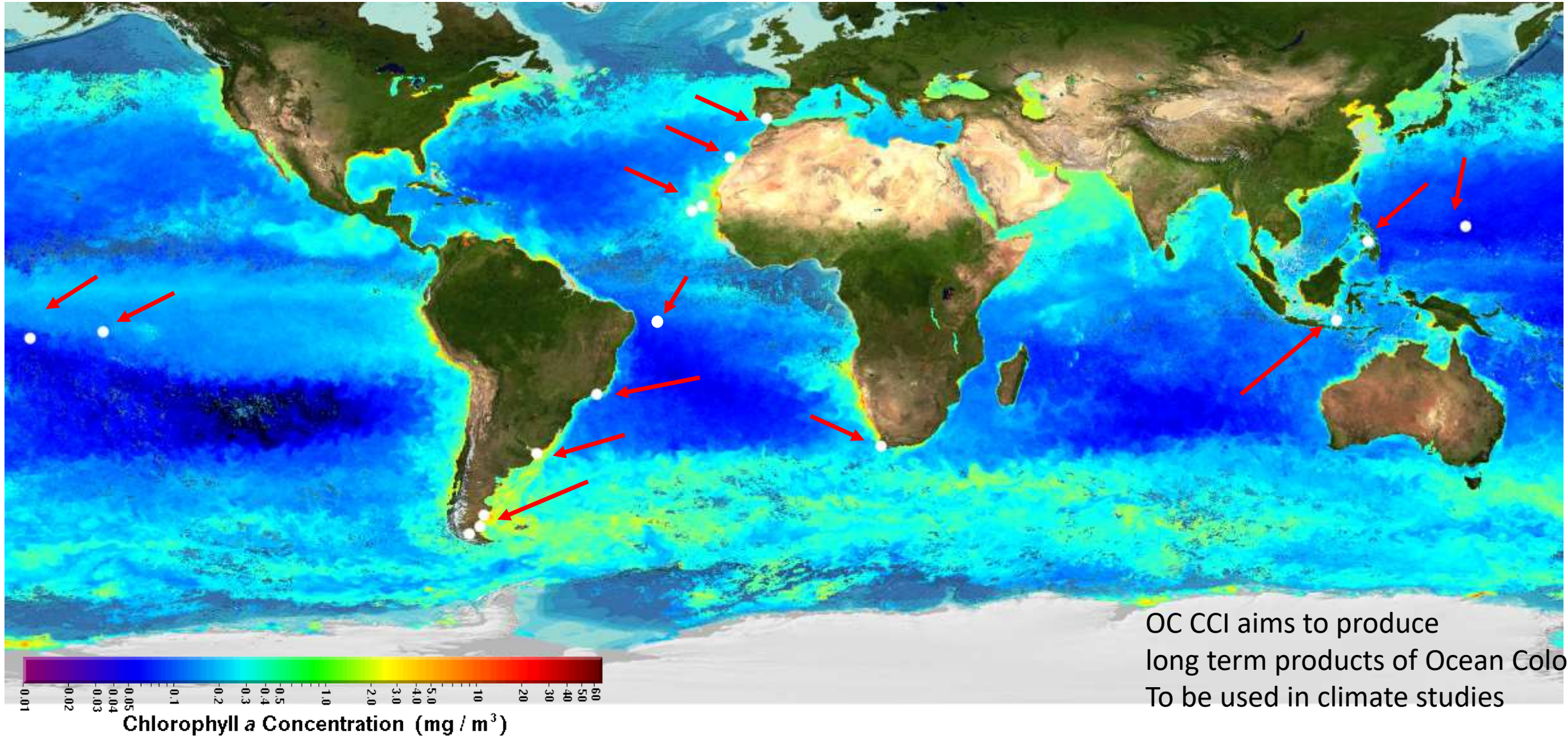


Ocean colour as seen from satellites



Ocean seen by satellite remote sensing of Ocean Colour

Ocean Colour Climate Change Initiative, <https://esa-oceancolour-cci.org/>, ESA Project, lead by PML, UK

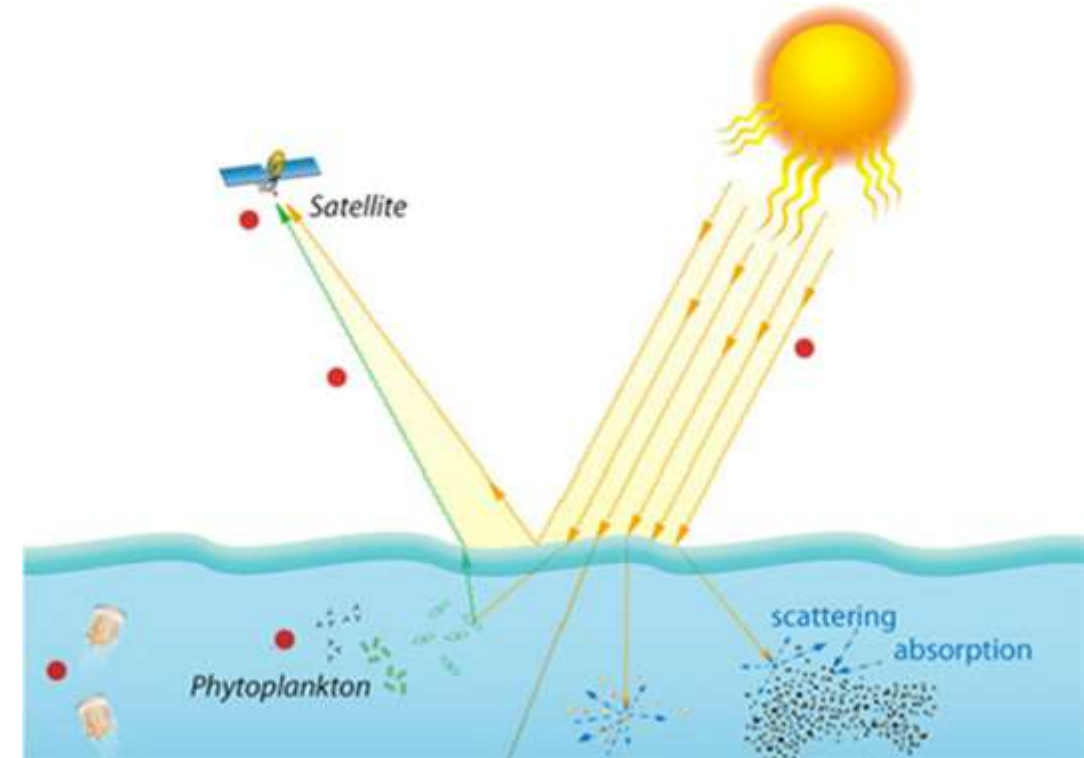


What is the colour of the ocean?

How is it measured by satellite remote sensing?

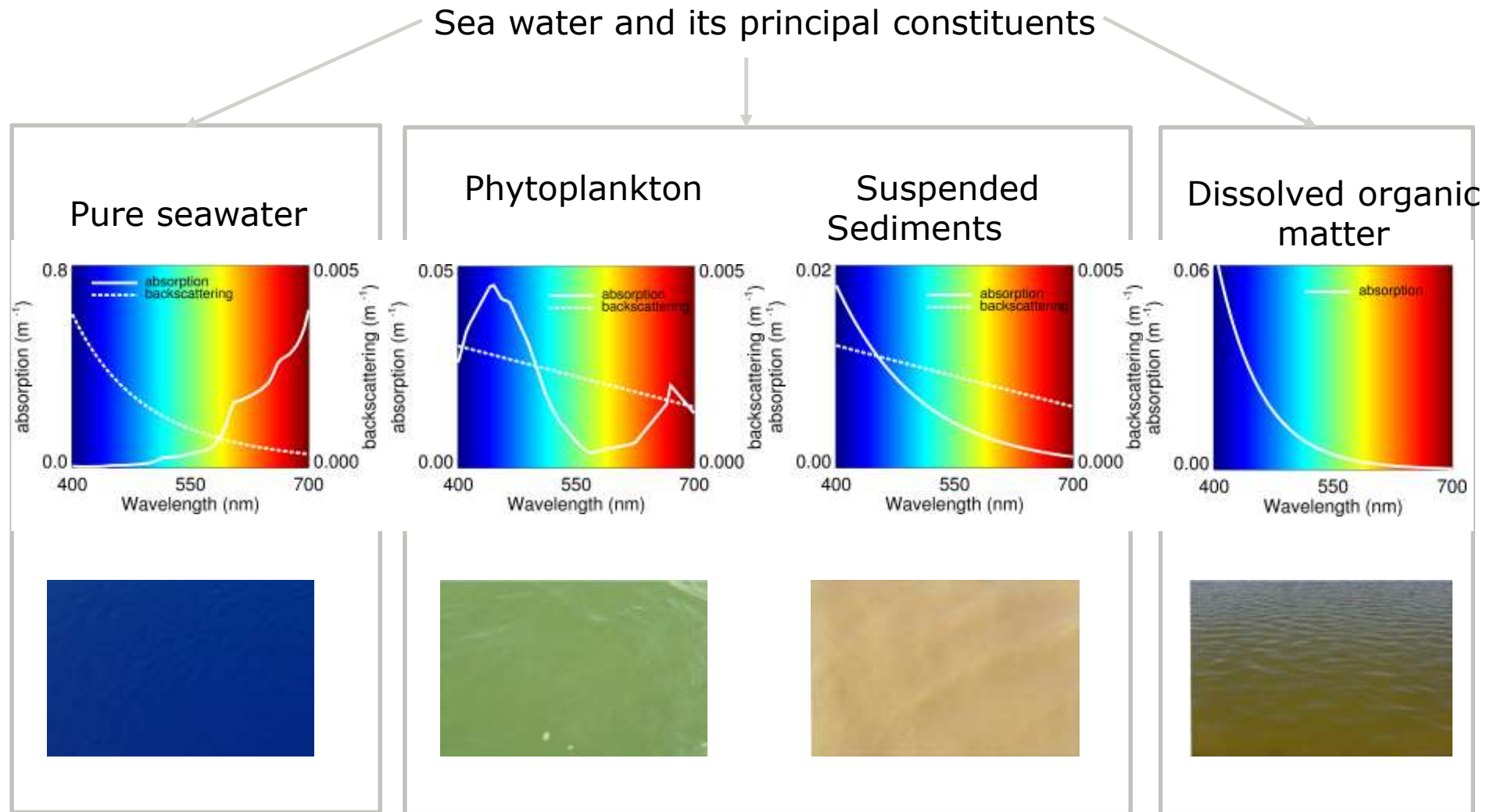


The light reflected from the ocean carries information on phytoplankton = plant plankton, suspended sediments, dissolved organic material



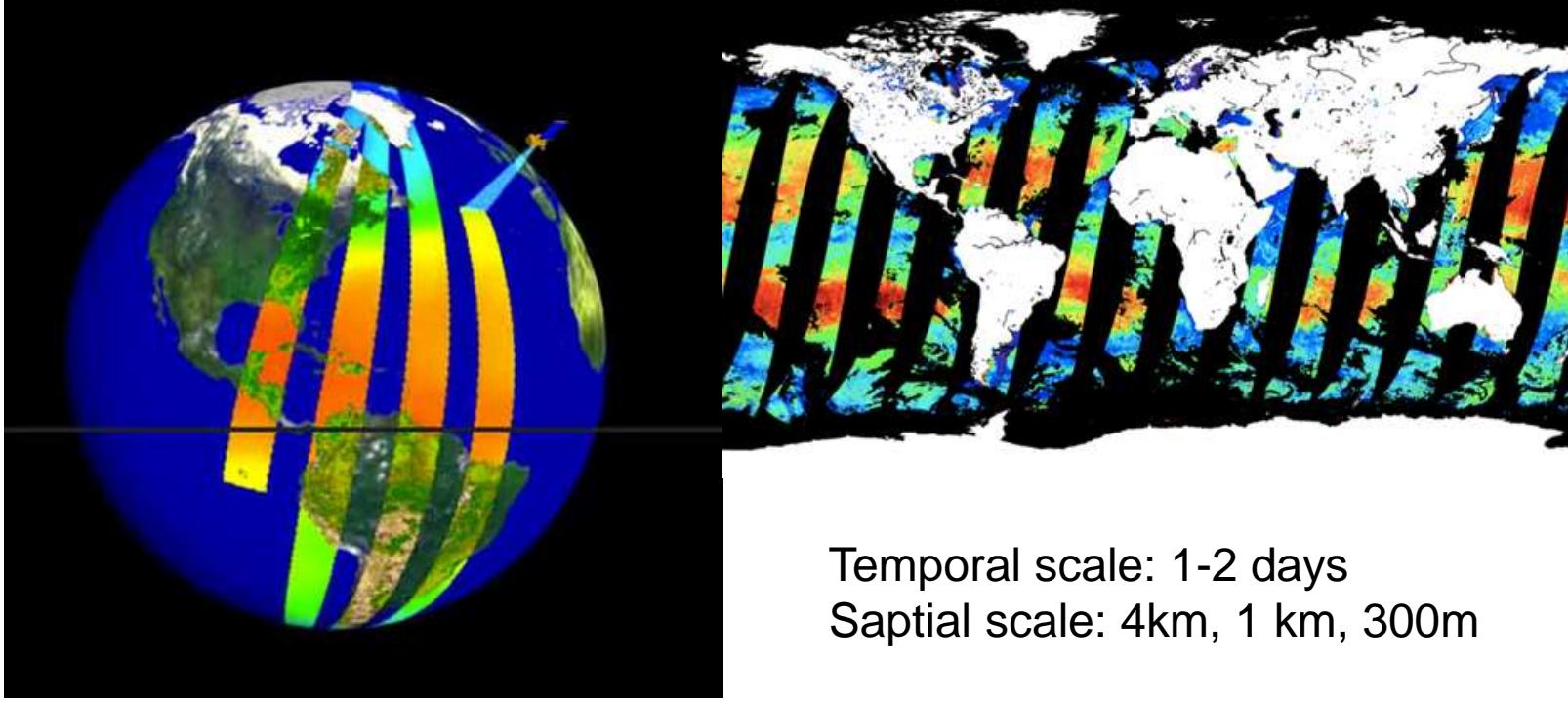
Two optical processes determine the fate of photons that penetrate into the ocean: absorption and scattering

What is the colour of the ocean?

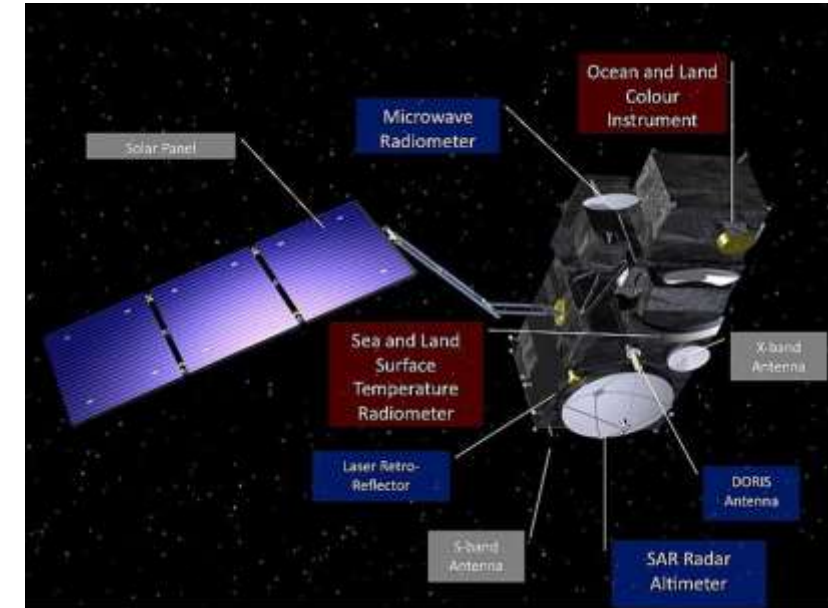


Optical properties of water and its constituents

Satellite remote sensing of ocean colour

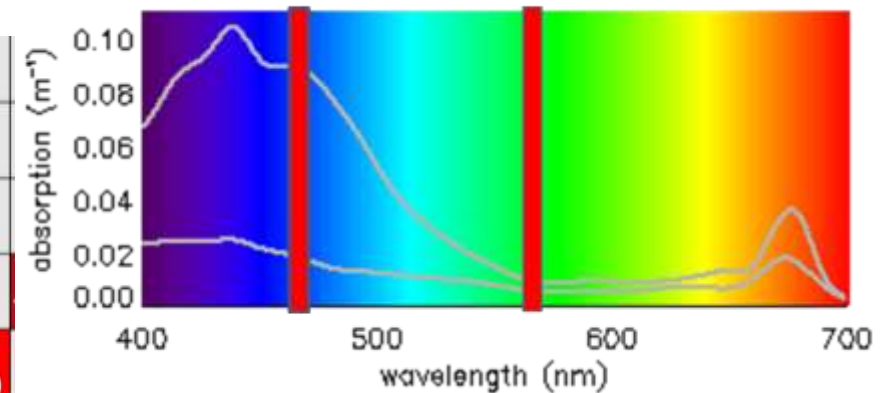


ESA Sentinel 3

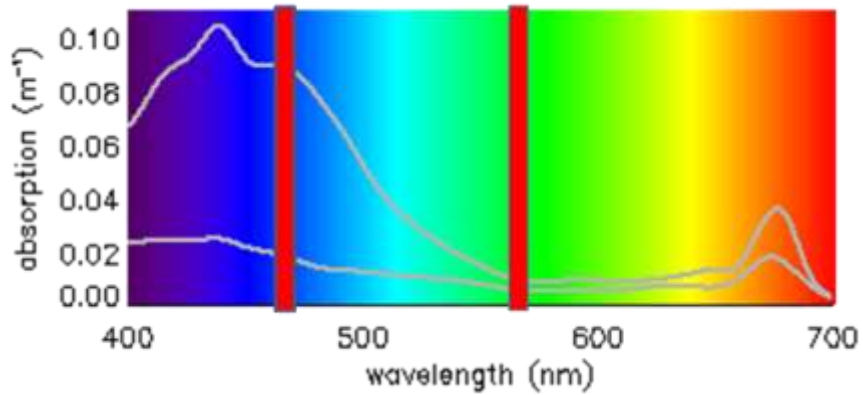


Satellites
With Ocean Colour sensors

SeaWiFS		412		443	490	510		555		670								
MERIS			412.5	442.5		490	510		560	620	665				681	705		
MODIS-A			412.5		443	488		531	547		667			678				
VIIRS		412		443	486			555			672							
S3A OLCI	400		412.5	442.5		490	510		560	620	665		674	681		709		
S3B OLCI	400		412.5	442.5		490	510		560	620	665		674	681		709		

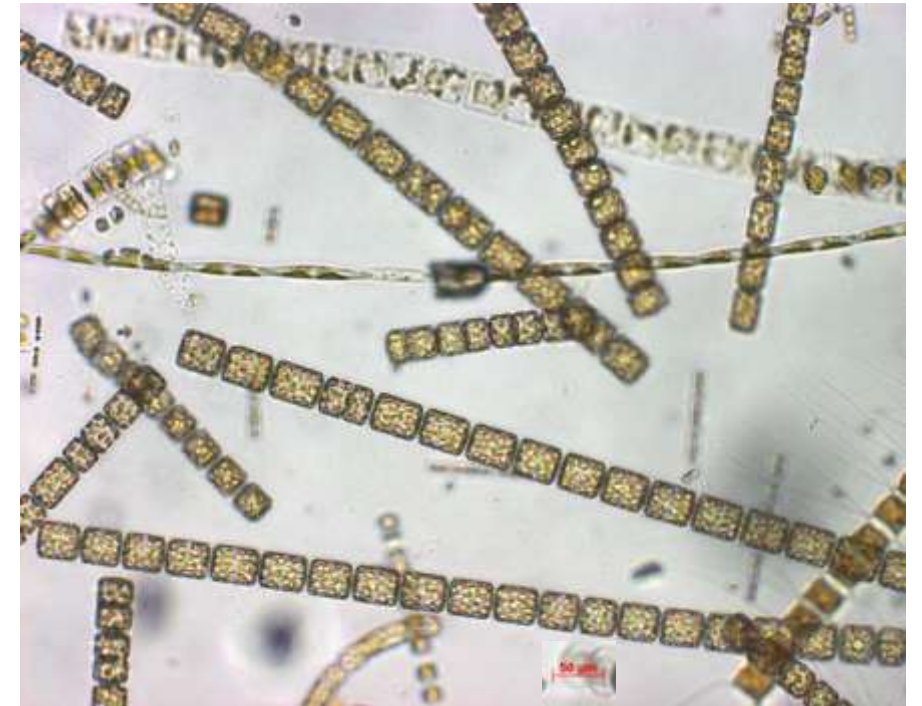
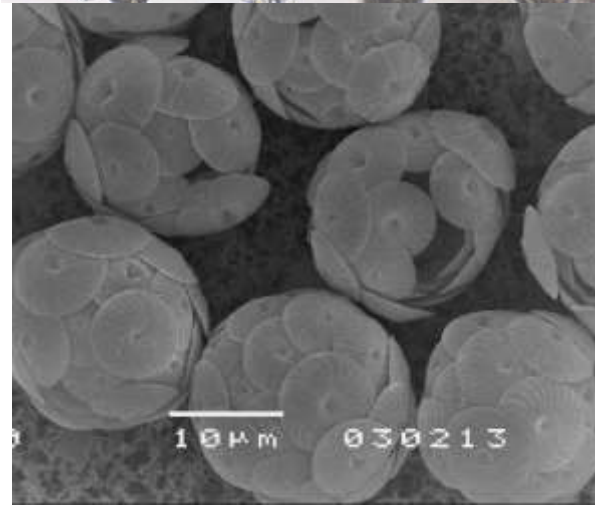
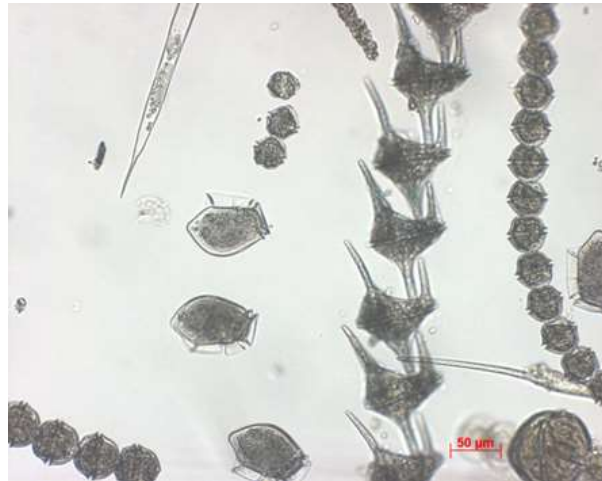
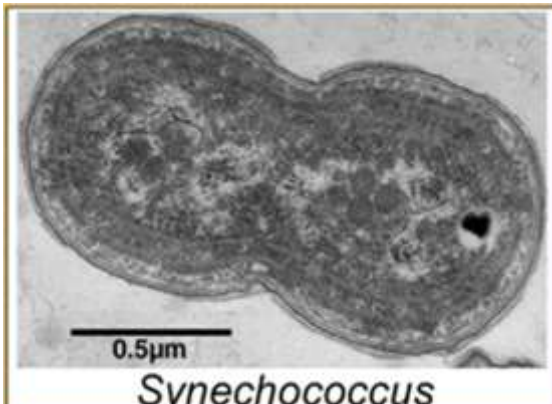
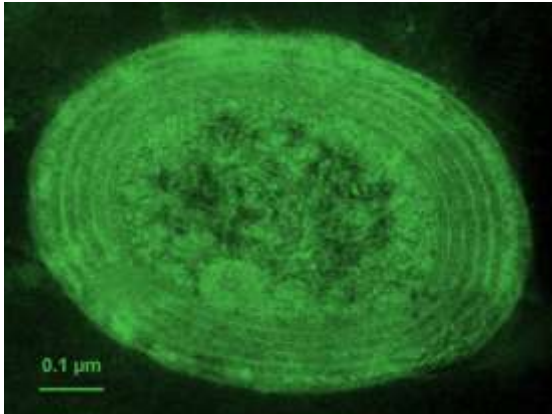


Satellite remote sensing of ocean colour



Concentration of Chlorophyll a in the water

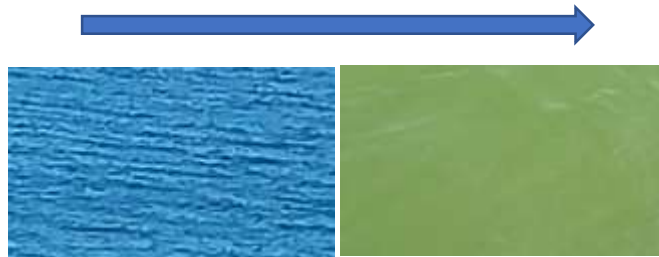
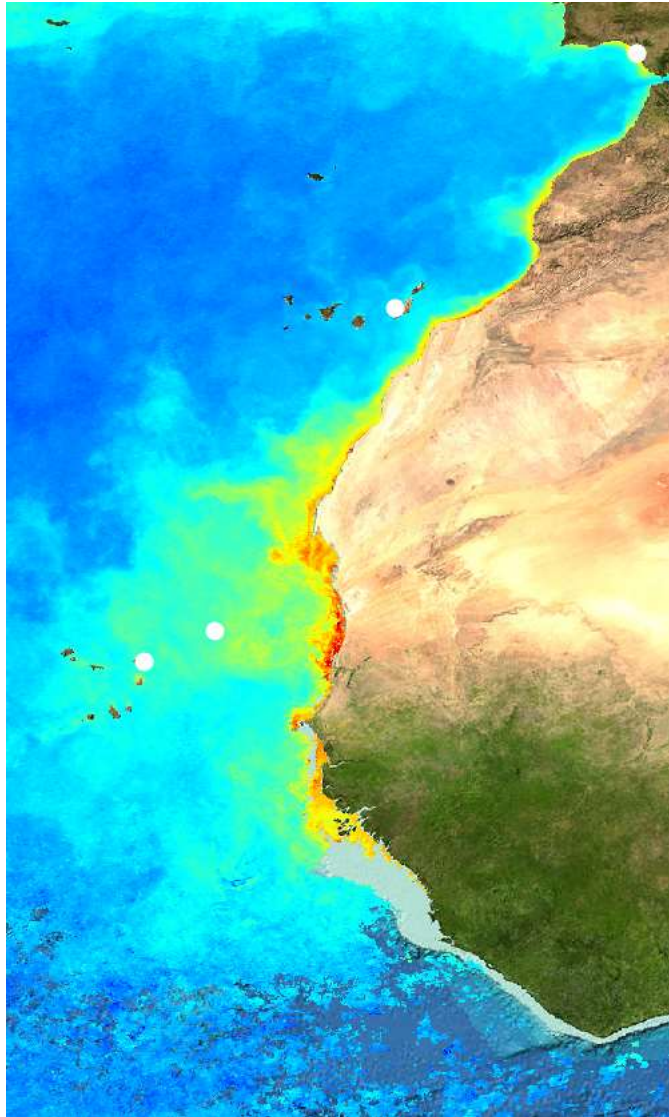
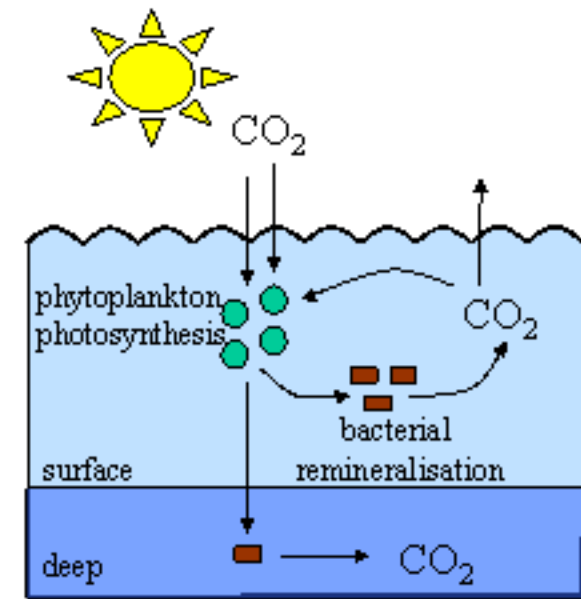
Proxy for Phytoplankton Cell concentration in the water



Upwelling of West Coast Africa

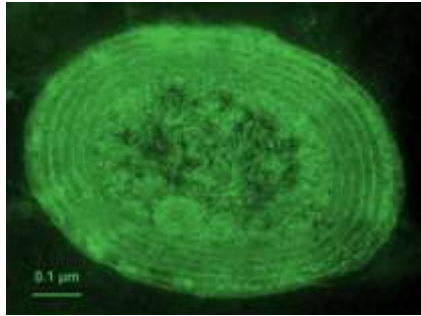
>> Phytoplankton >> Fisheries

Biological Carbon Pump



Atlantic gyres

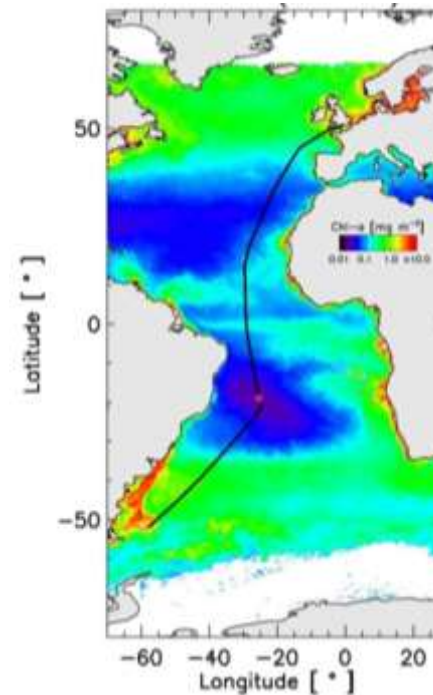
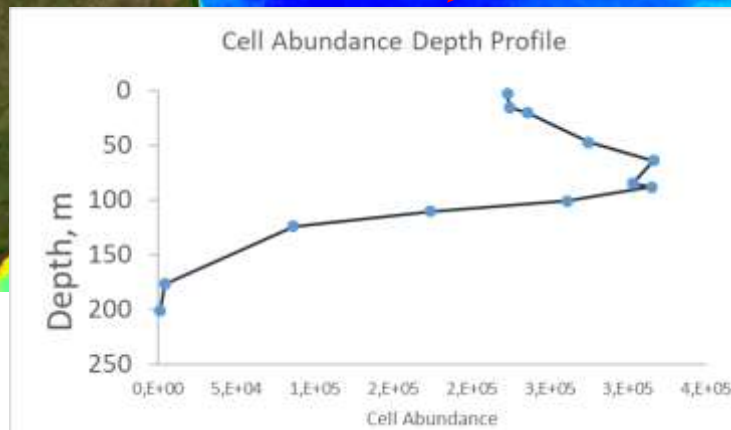
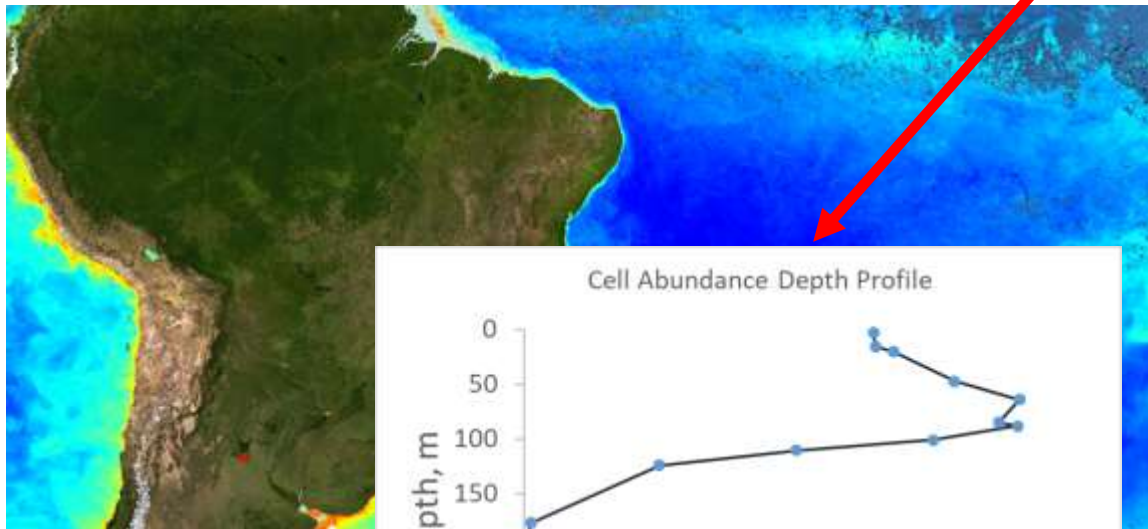
Satellite imagery complemented with oceanographic observations



Oligotrophic zones,
low Phytoplankton concentration

Prochlorococcus,
cyanobacteria

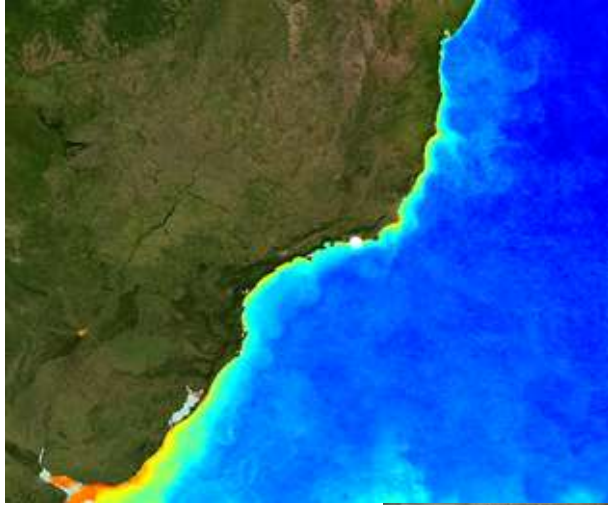
Atlantic Meridional Transect, since 1995 –
Participation of Portuguese young researchers
Through H2020 Twinning Project: Portwims



<https://www.amt-uk.org/>



Guanabara Bay, Brazil - Example of Anthropogenic Eutrophication



<https://www.ospar.org/work-areas/hasec/eutrophication>

- >> Nutrients >> growth of some phytoplankton species
 - changes in the community
 - Changes in the trophic chain
 - Excess of organic matter – Lack of oxygen

Eutrophication: Descriptor of Water Quality
Can be monitored by Ocean Colour Remote Sensing

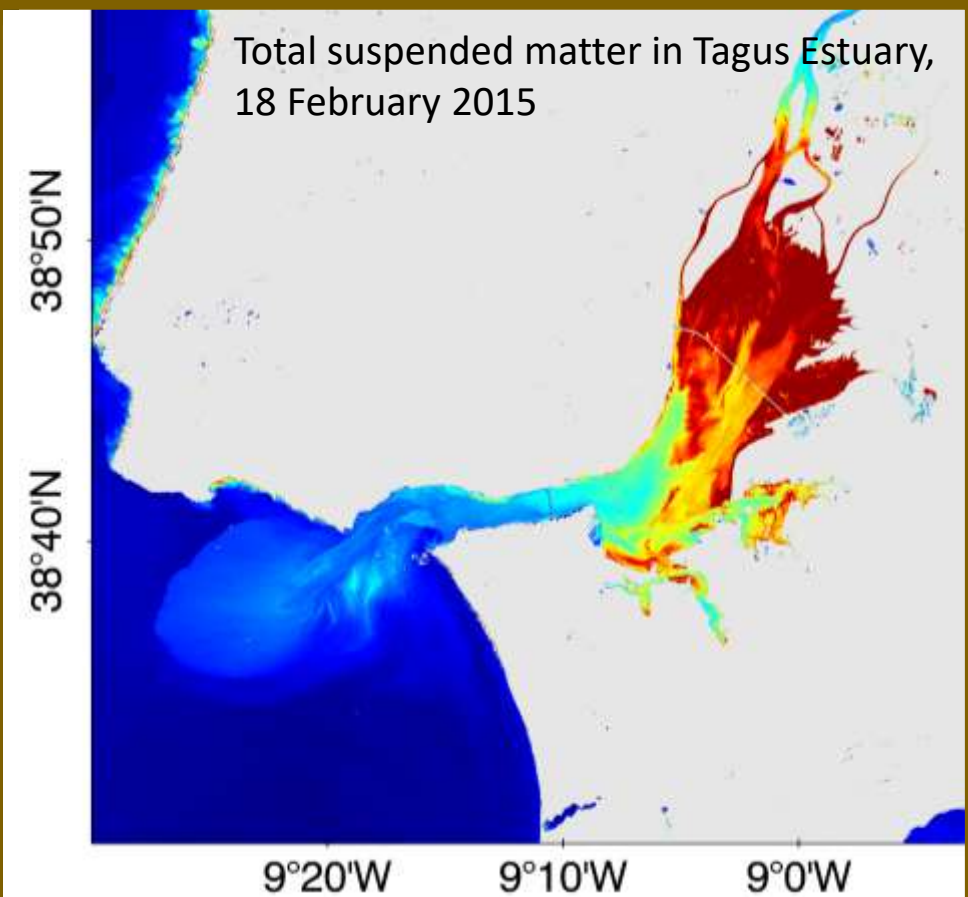
MSc thesis of Alexandre Dias da Cruz, Ciências do Mar, FCUL

Imagem de floração excessiva de algas na Baía de Guanabara, em 31 de Julho de 2015, Vanda Brotas Ciência 2019

Rio de La Plata, riverine sediment transport



In situ radiometric measurements



PLATAGUS - Transnational Cooperation – Portugal - Argentina
[FCT - MINCYT], IAFE (Argentina) CIMA e MARE (Portugal)

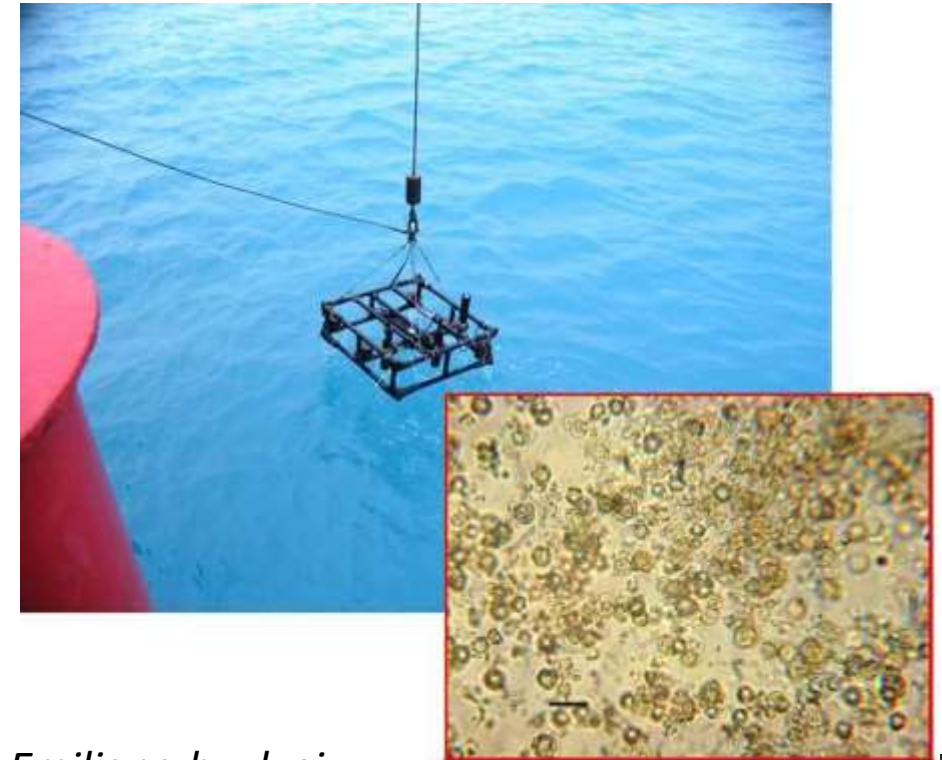
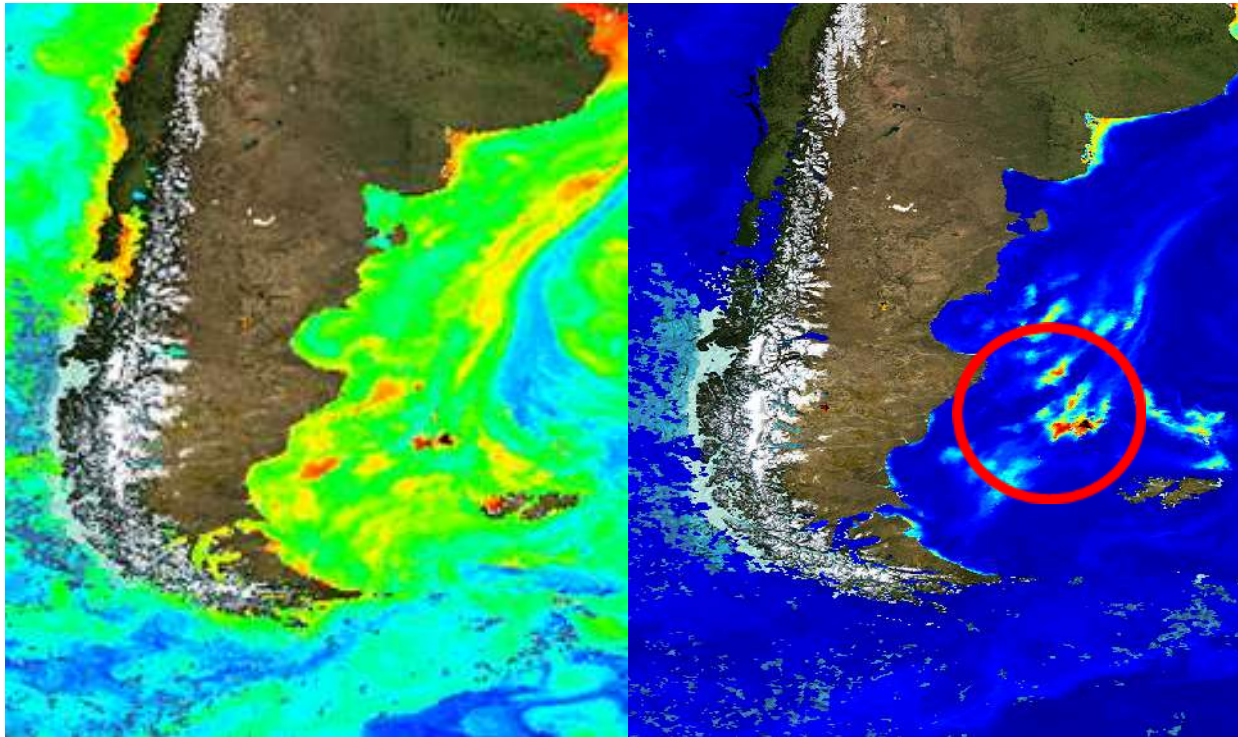
Patagonia, Coccolithophores bloom



Bloom 1-8 January 2008

Chla concentration

Rrs 555nm



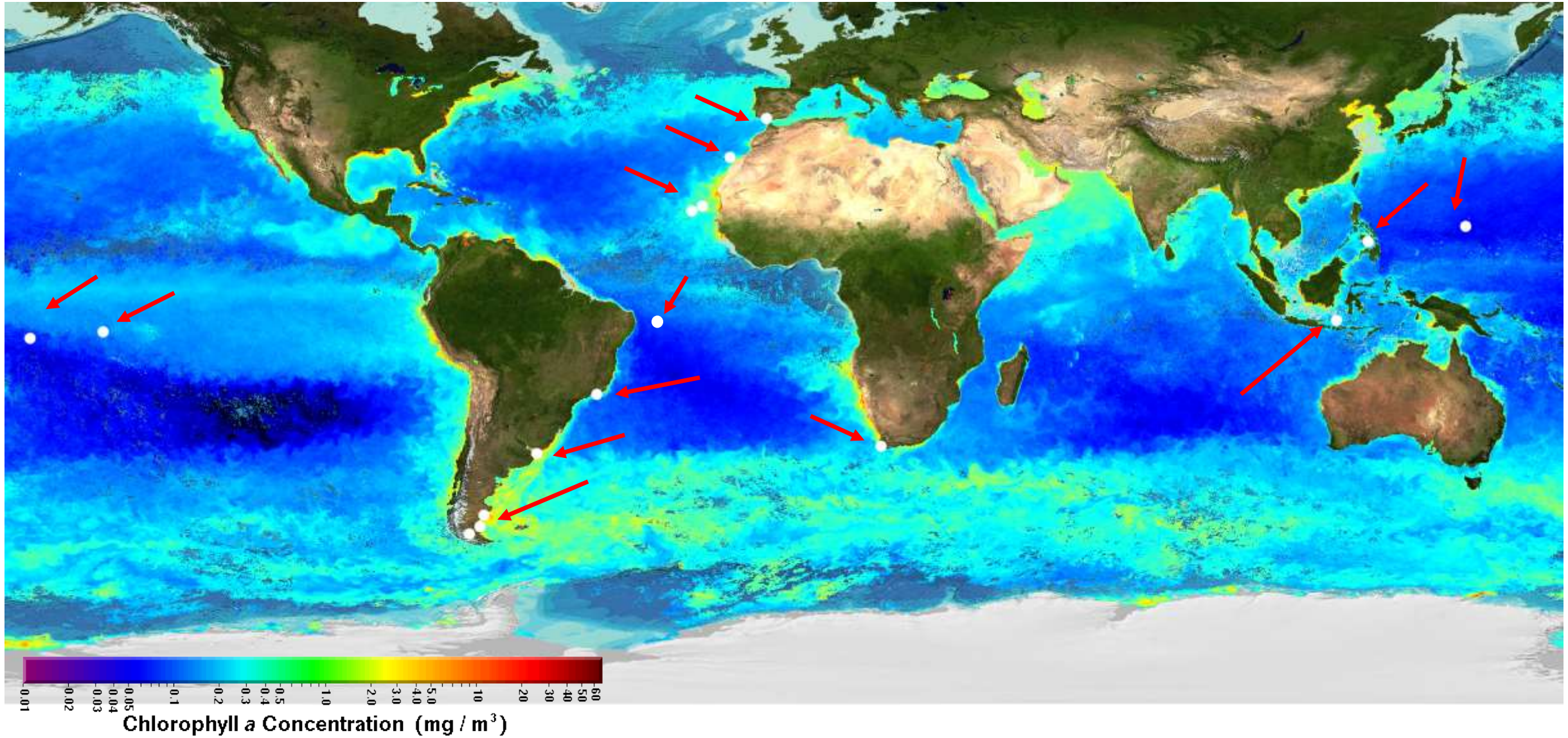
Emiliana huxleyi
contribution to total
Chla pool up to 83%



Souza, M., Mendes, C.R., Garcia, V., Pollery, R. & Brotas, V., 2011. Phytoplankton community during a coccolithophorid bloom in the Patagonian Shelf. *Journal of Marine Biological Associations*, 92(1): 13-27.

Phytoplankton, the green component of the ocean, produces ½ of the oxygen we breathe

By taking CO₂ and absorbing heat, the ocean plays a huge role in regulating our climate and weather patterns



Thank You



Climate Change Initiative



O mostrengo que está no fim do mar
Na noite de breu ergueu-se a voar;
À roda da nau voou três vezes,
Voou três vezes a chiar,
E disse: «Quem é que ousou entrar
Nas minhas cavernas que não desvendo,
Meus tectos negros do fim do mundo?

*The monster that lives at the end of the sea
Rose up in the night to fly;
Three times around the ship he swirled
And thrice was heard his screaming cry:
"Who is that dares to come and brave
The dreadful vaults of my secret cave?*