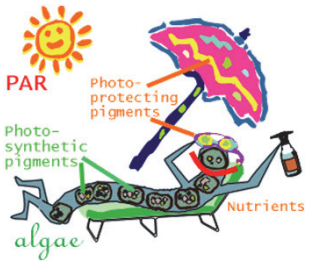
Marine Monitoring Innovative Techniques

DEVOTES
DEVelopment Of innovative Tools for understanding marine biodiversity and assessing good Environmental Status

CHEMTAX Software: The use of pigments to monitor phytoplankton biodiversity

Aim of : Increase the knowledge of phytoplankton community (i.e. estimating the main groups contributing to total Chlorophyll *a* (CHl*a*) concentration)

Basis: Knowledge of the concentrations of **pigments** found in **phytoplankton cells**, factor analysis and a steepest descent algorithm



Source: http://www.iopan.gda.pl/

Phytoplankton pigments

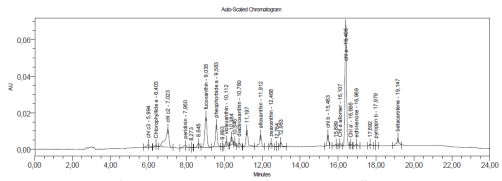
Chlorophylls
Chl*a*, *b*, *c*1, *c*2, *c*3, phaeophytin, phaeophorbide

Carotenoids and biliproteins
Accessory pigments such as peridinin, alloxanthin, diatoxanthin, diadinoxanthin, etc.

Some carotenoids or chlorophylls are **typical for a specific group** or species, and can be used as biomarkers – diagnostic pigments.

How to know the phytoplankton pigments concentration?

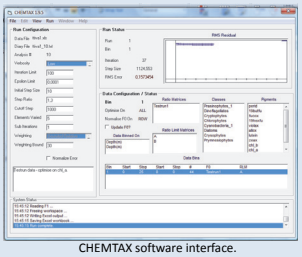
1) **Collection of phytoplankton cells through filtration**
2) **Extraction of the pigments from the cells (usually in acetone or ethanol)**
3) **Analysis by cromatography (HPLC)**



Example of a chromatogram: each peak represents a different pigment.

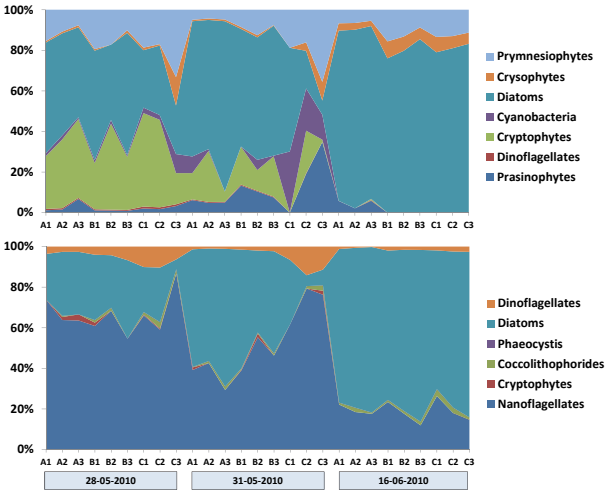
CHEMTAX Software:

Input:
- Diagnostic pigments concentration
- Main groups which might be found
- Approximate initial pigment to Chl*a* ratios.
- Configure the software:

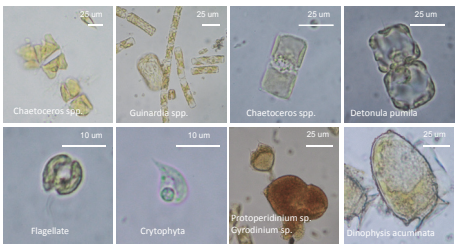


CHEMTAX software interface.

CHEMTAX *vs* Microscopy



Comparison between CHEMTAX (upper graph) and microscopy results (lower graph) in samples from Sagres. A, B and C are three different sampling stations at 2, 10 and 18 km from coast, respectively; the indices 1, 2 and 3 represent 3 different depths of sampling: 1-Surface, 2-Mid-Secchi and 3-Secchi Depths.



Examples of phytplankton from Sagres. (*In* Icely et al., 2012)

Advantages

- Good approximation of the major phytoplankton groups present in one sample, including the smaller sized cells.
- Practical and rapid

Limitations

- Some diagnostic pigments might be shared by various phytoplankton groups;
- It is assumed that all members of a given algal class have the same 'typical' set of pigment ratios.
- An *a priori* knowledge of the phytoplankton community is essential to avoid misclassifications.

Source: P. Costa Goela, 2014 CHEMTAX: The use of pigments to monitor phytoplankton biodiversity

www.devotes-project.eu