

Journée d'Etude

Littoral Marocain et Changement Climatique

Par

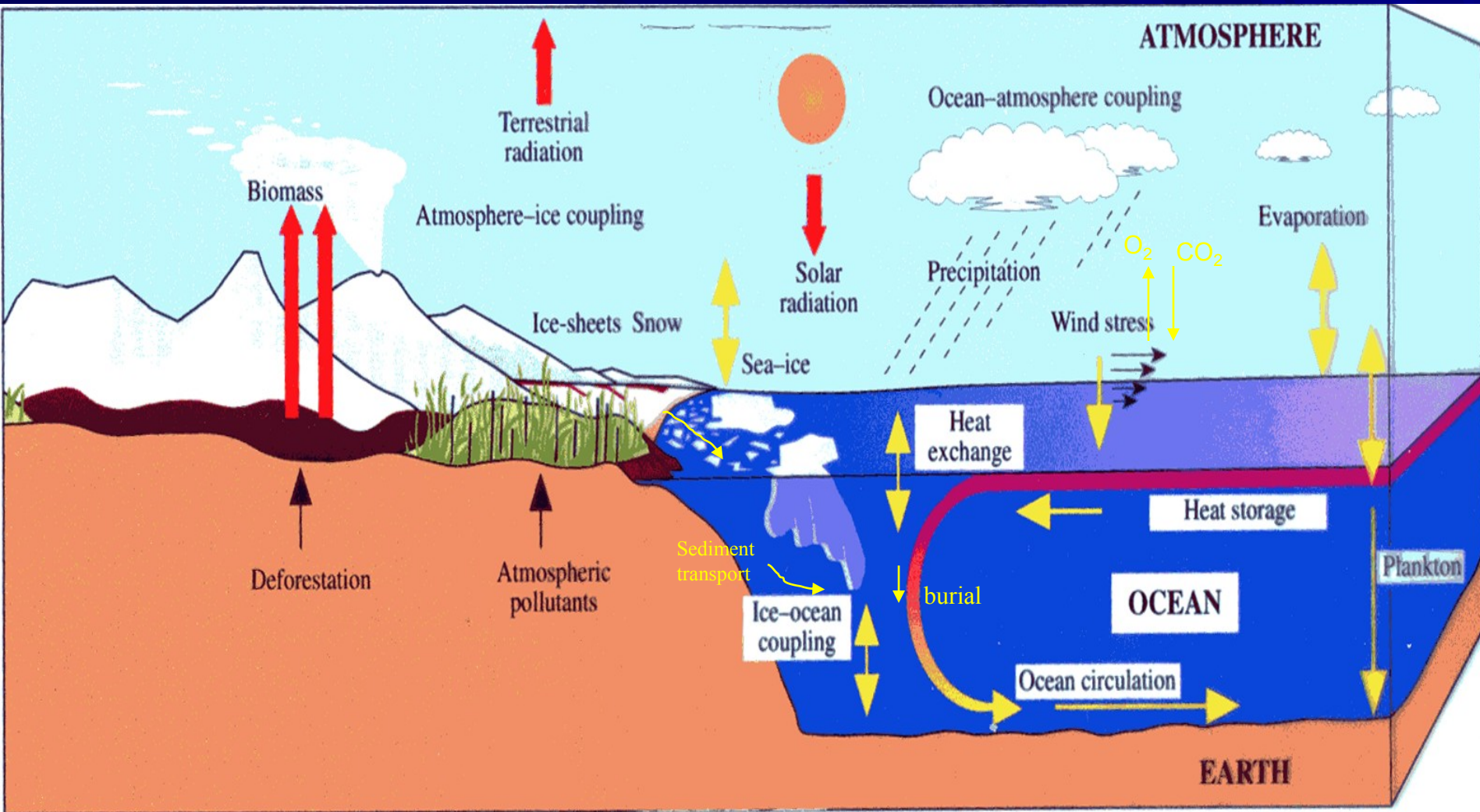
Bouchta EL MOUMN

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Doyen de la FP Larache - Professeur à l' Université A. ESSAADI
Délégué national auprès de la CIESM (www.ciesm.org)

Interaction Terre – Mer et changement climatique

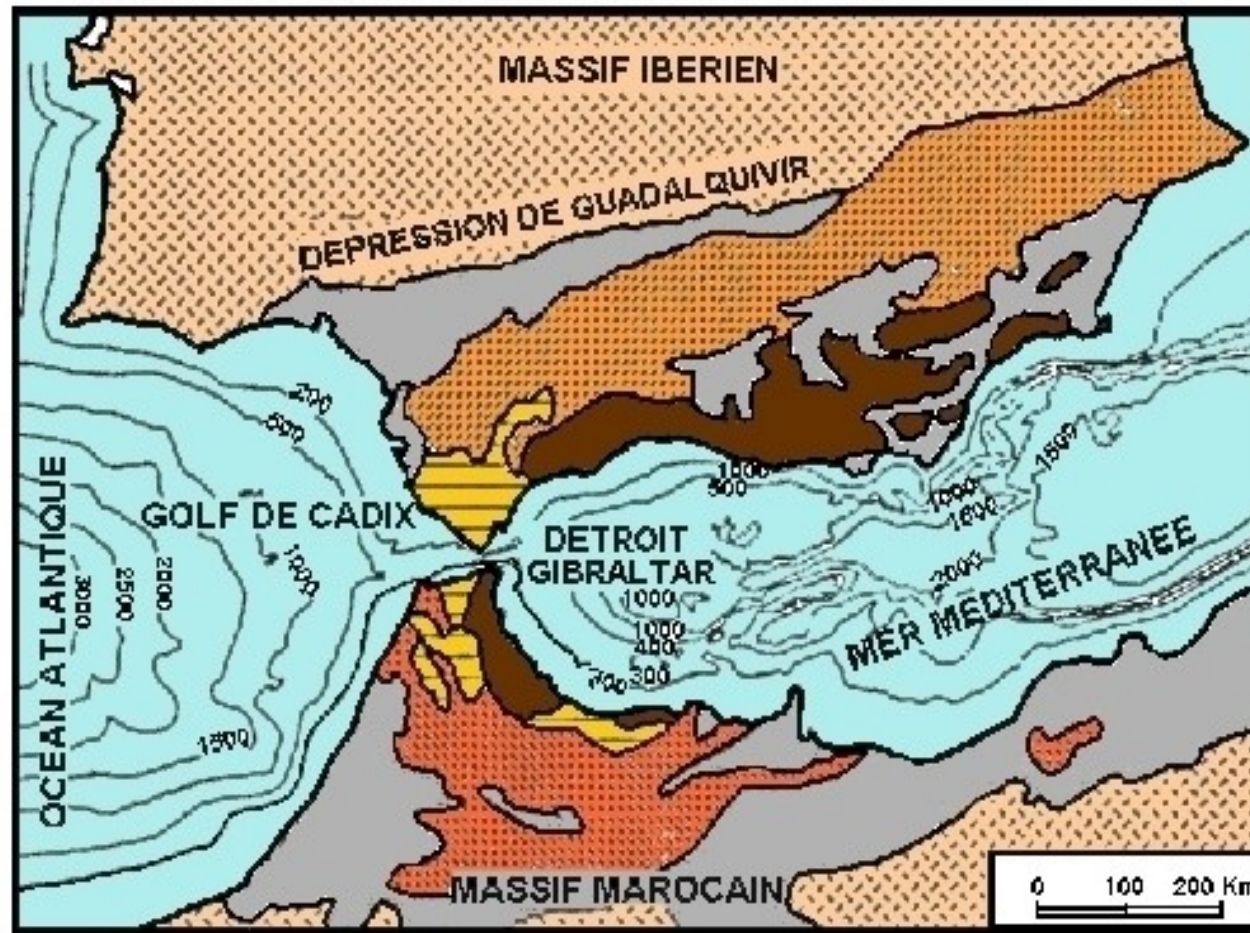
Fonctionnement global de l'écosystème marin



The Ocean as part of the Earth System

Cas du Nord du Maroc

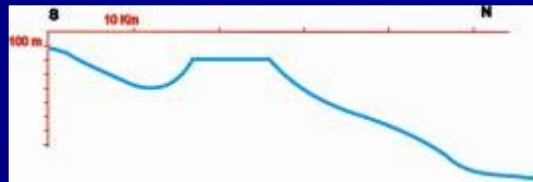
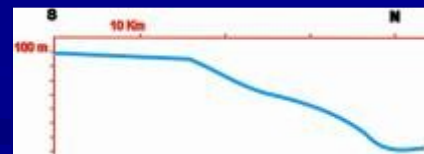
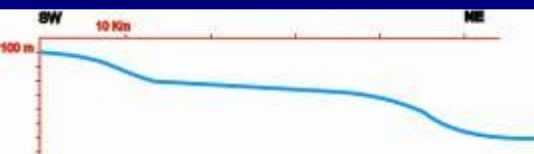
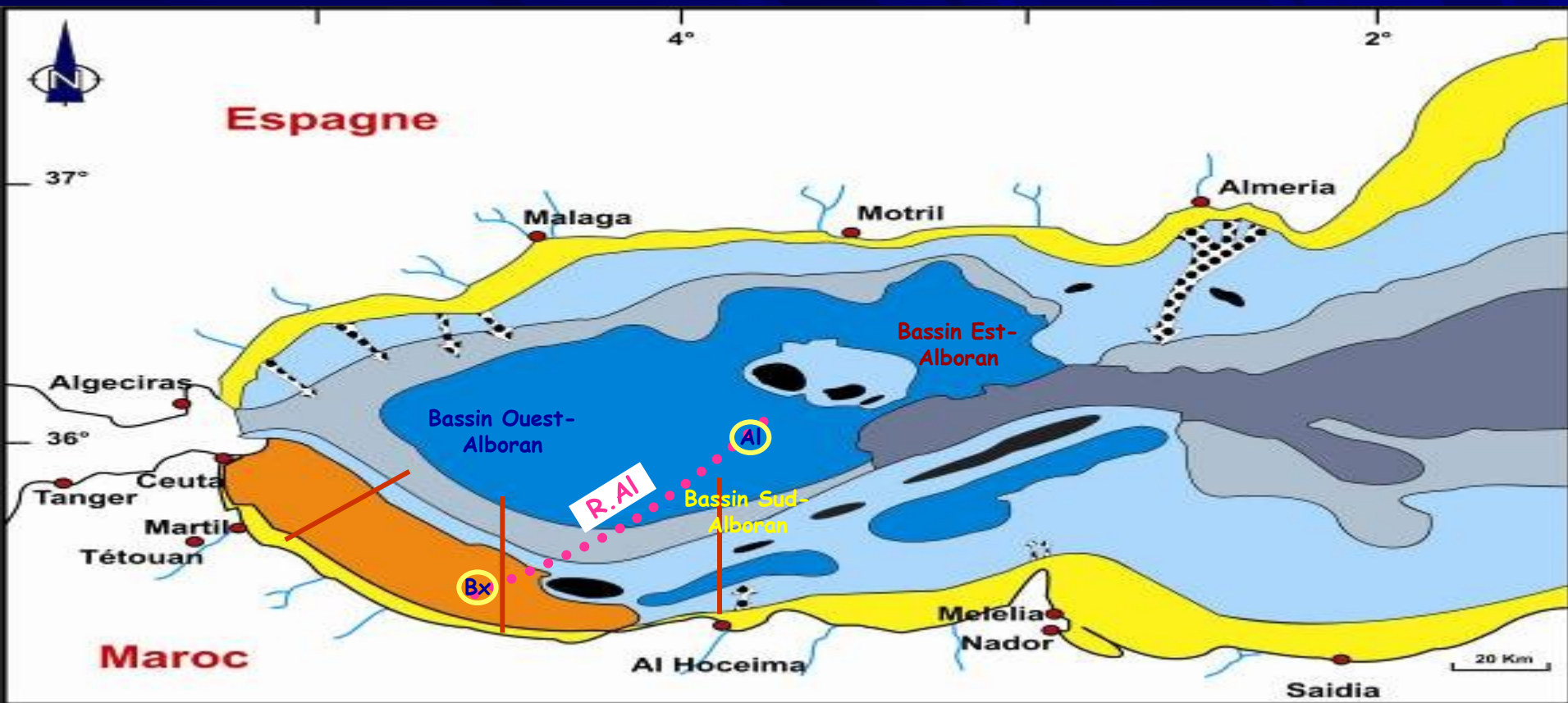
Chaîne alpine de la Méditerranée occidentale



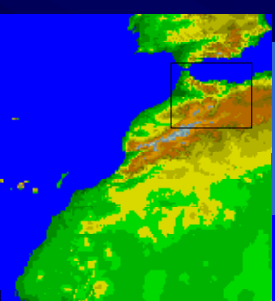
LEGENDE

-  Massif Hercinien
-  Zones Externes Bétiques
-  Zones Externes Rifaines
-  Zones internes
-  Flysch des unités de l'arc de Gibraltar
-  Remplissage des Bassins Néogènes et Quaternaires

Morphologie de la marge méditerranéenne marocaine (Ammar et El Moumni, 1987).



Bilan moyen des flux annuels en MES



8.15 Mt/an

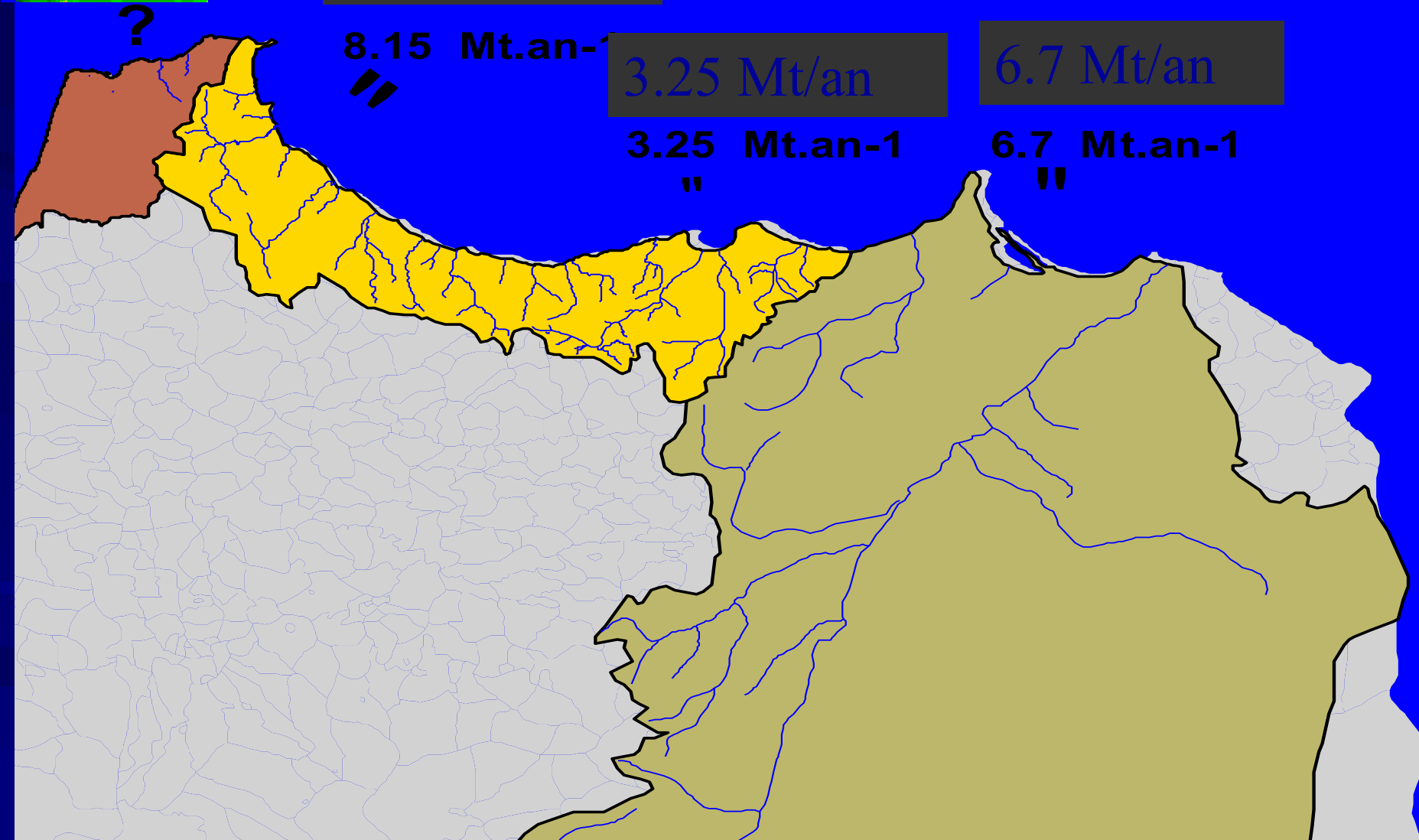
8.15 Mt.an-1

3.25 Mt/an

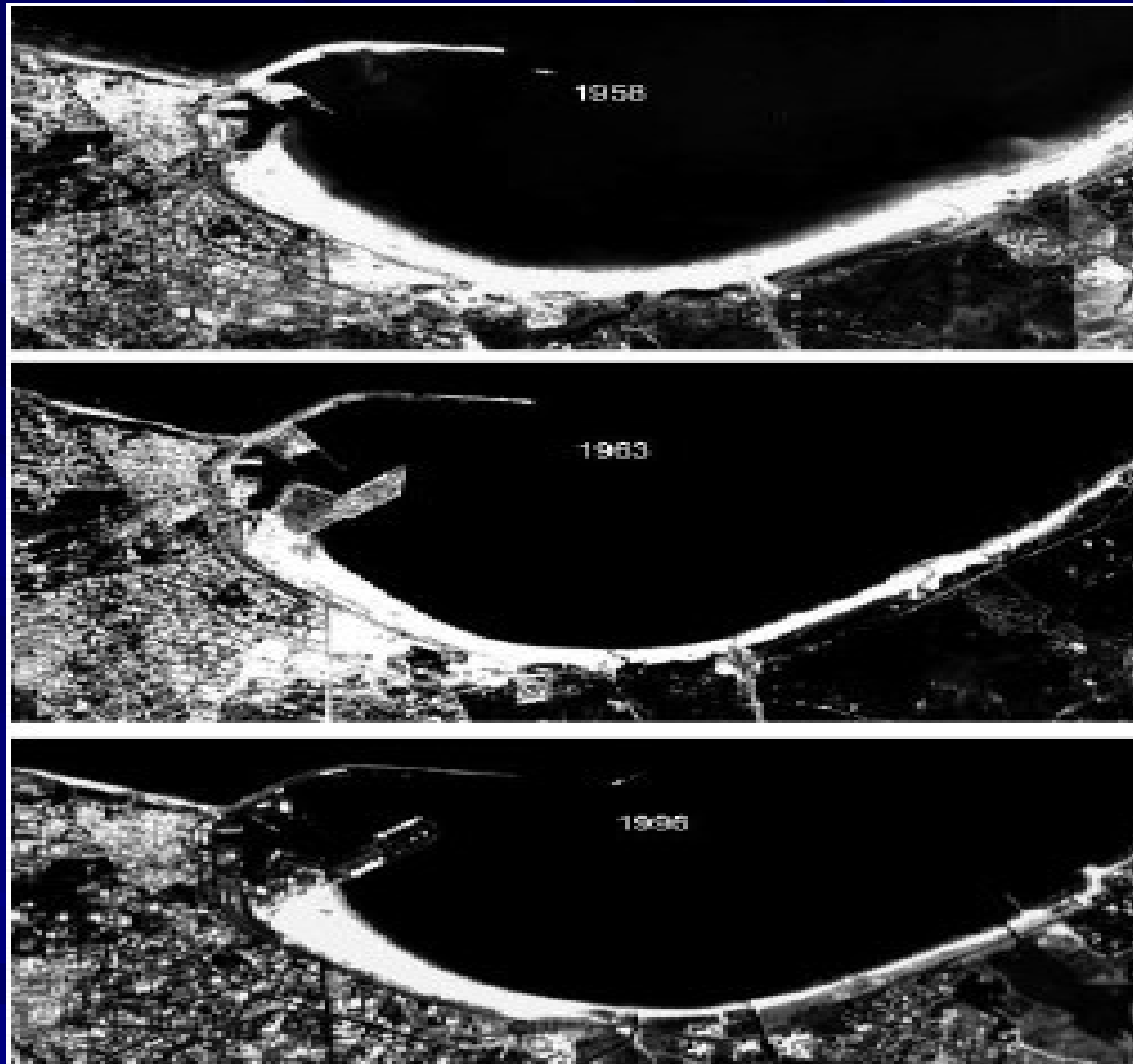
3.25 Mt.an-1

6.7 Mt/an

6.7 Mt.an-1



Exemple de la baie de Tanger (1958-1996)



1958

1963

1996

EL Moumni et al. 2002

Evolution de la ligne de rivage (baie de Tanger)

Avant 2005



Après 2005





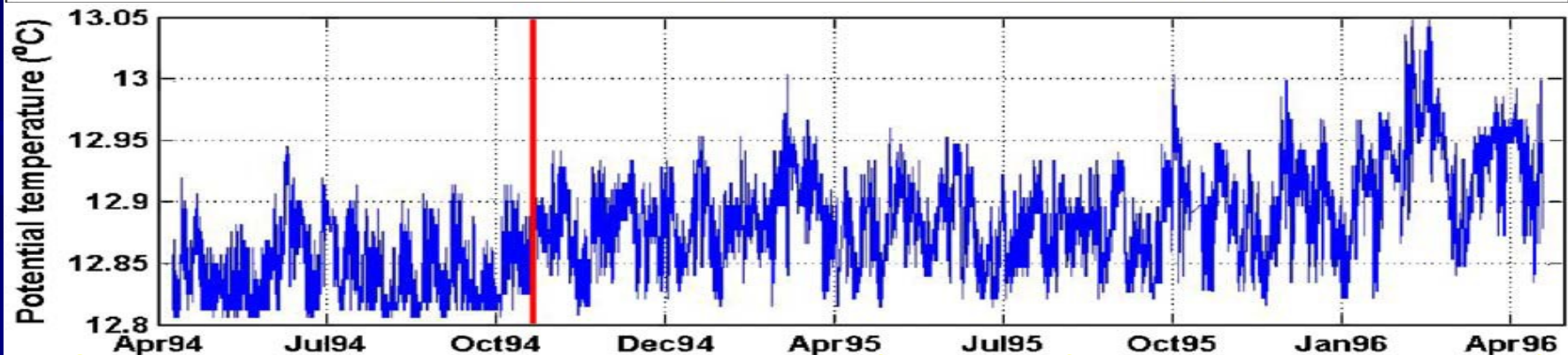
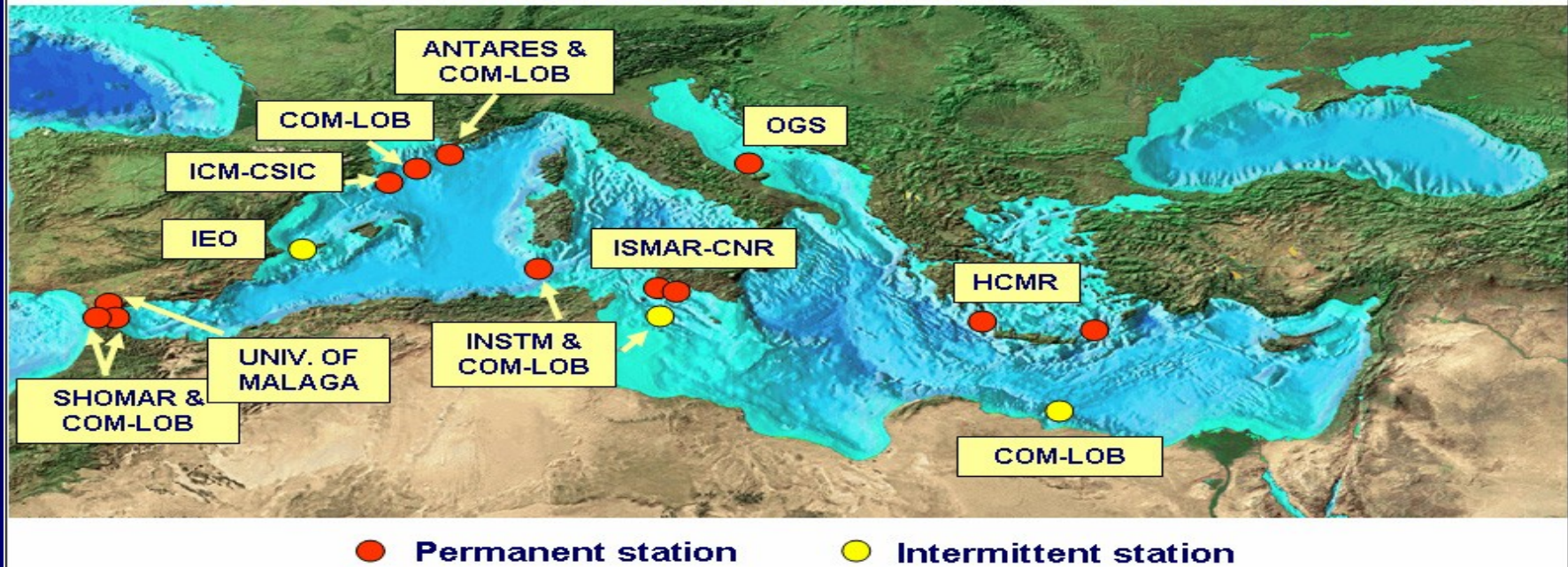
Avant 2005



Après 2005

Réchauffement touchant aussi l'eau méditerranéenne sortante en profondeur

CIESM HYDROCHANGES NETWORK – ASSOCIATED INSTITUTES



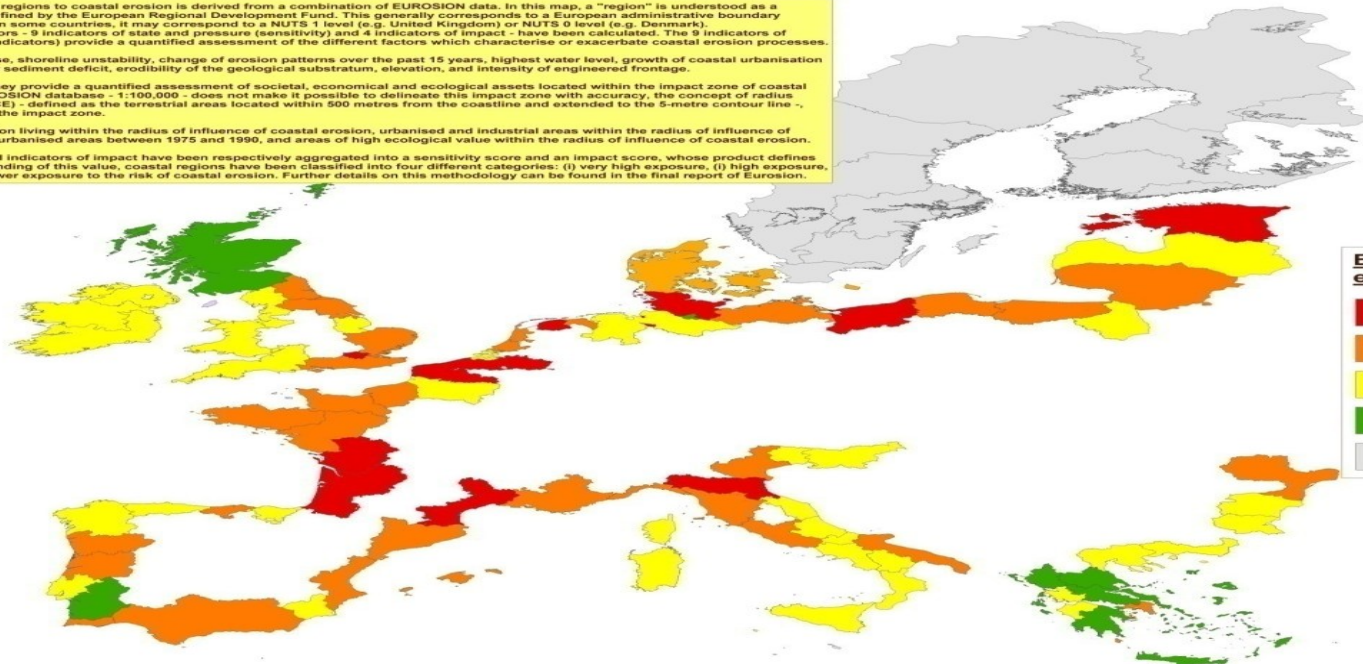
C. Millot et al., Large warming and salinification of the Mediterranean outflow due to changes in its composition. *Deep-Sea Research I* 53 (2006) 656–666

Exemples régionaux

Exemples régionaux

Exposure of European regions to coastal erosion

This map of exposure of European regions to coastal erosion is derived from a combination of EUROSION data. In this map, a "region" is understood as a regional administrative entity as defined by the European Regional Development Fund. This generally corresponds to a European administrative boundary of level 2 (NUTS2 level). However, in some countries, it may correspond to a NUTS 1 level (e.g. United Kingdom) or NUTS 0 level (e.g. Denmark). For each region, a set of 13 indicators - 9 indicators of state and pressure (sensitivity) and 4 indicators of impact - have been calculated. The 9 indicators of state and pressure provide a quantified assessment of the different factors which characterise or exacerbate coastal erosion processes. These factors include: sea level rise, shoreline instability, change of erosion patterns over the past 15 years, highest water level, growth of coastal urbanisation areas between 1975 and 1990, river sediment deficit, erodibility of the geological substratum, elevation, and intensity of engineered frontage. As for the 4 indicators of impact, they provide a quantified assessment of societal, economical and ecological assets located within the impact zone of coastal erosion. Because the scale of EUROSION database - 1:100,000 - does not make it possible to delineate this impact zone with accuracy, the concept of radius of influence of coastal erosion (RICE) - defined as the terrestrial areas located within 500 metres from the coastline and extended to the 5-metre contour line -, has been introduced as a proxy of the impact zone. Impact indicators include: population living within the radius of influence of coastal erosion, urbanised and industrial areas within the radius of influence of coastal erosion, growth of coastal urbanised areas between 1975 and 1990, and areas of high ecological value within the radius of influence of coastal erosion. In turn, indicators of sensitivity and indicators of impact have been respectively aggregated into a sensitivity score and an impact score, whose product defines the "risk of coastal erosion". Depending of this value, coastal regions have been classified into four different categories: (i) very high exposure, (ii) high exposure, (iii) moderate exposure, and (iv) lower exposure to the risk of coastal erosion. Further details on this methodology can be found in the final report of EuroSION.



Data source - Sources des données : EUROSION

Scale - Echelle : 1:20 000 000



Au niveau du delta du Nil

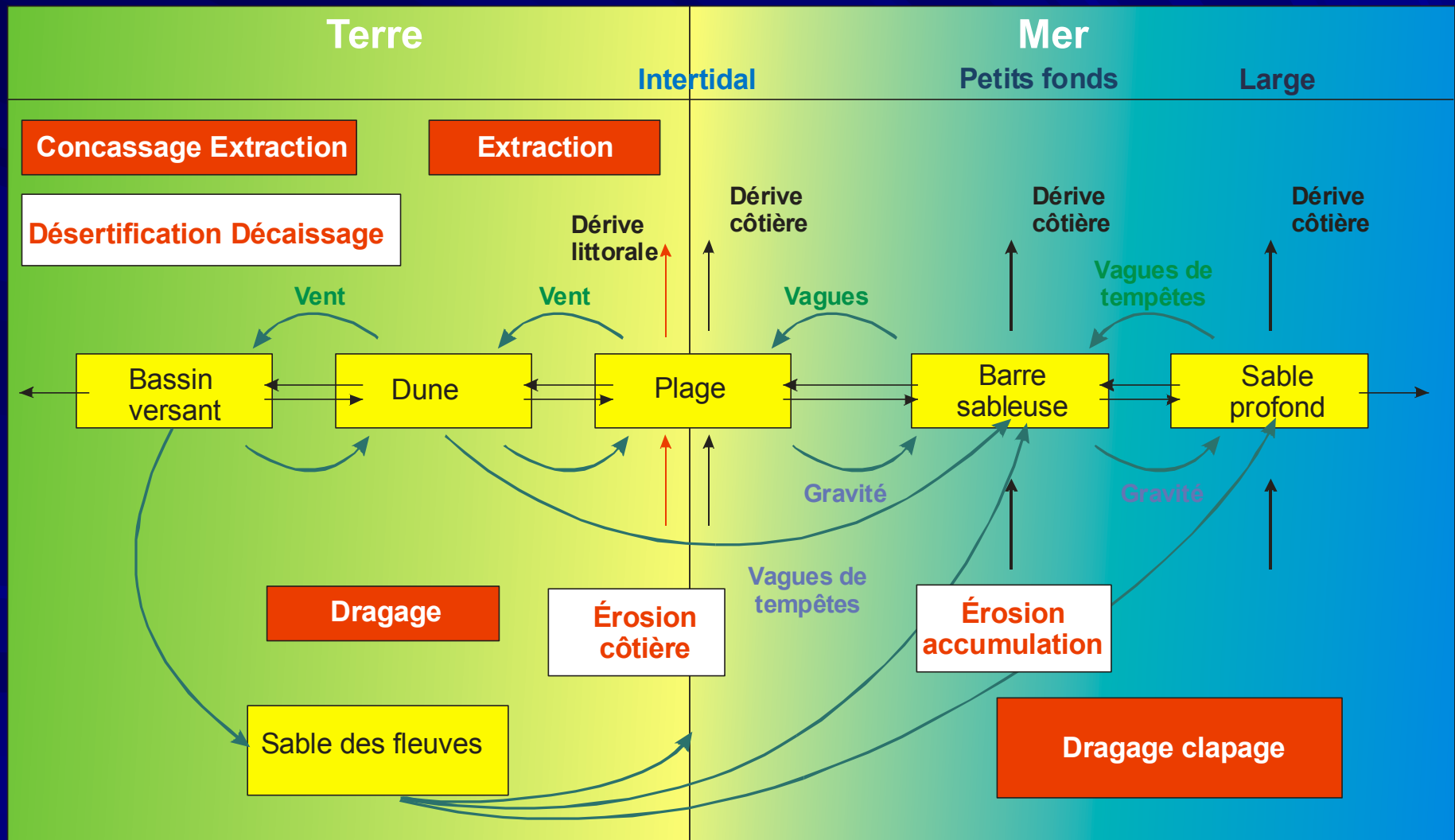
Nile Delta
Potential impact
of sea level rise



Sources: Otto Simonett, UNEP/GRID Geneva; Prof. G. Sestin, Florence; Remote Sensing Center, Cairo; DIERCKE Weltwirtschaftsatlas.

Impact sur le bilan sédimentaire et la biodiversité

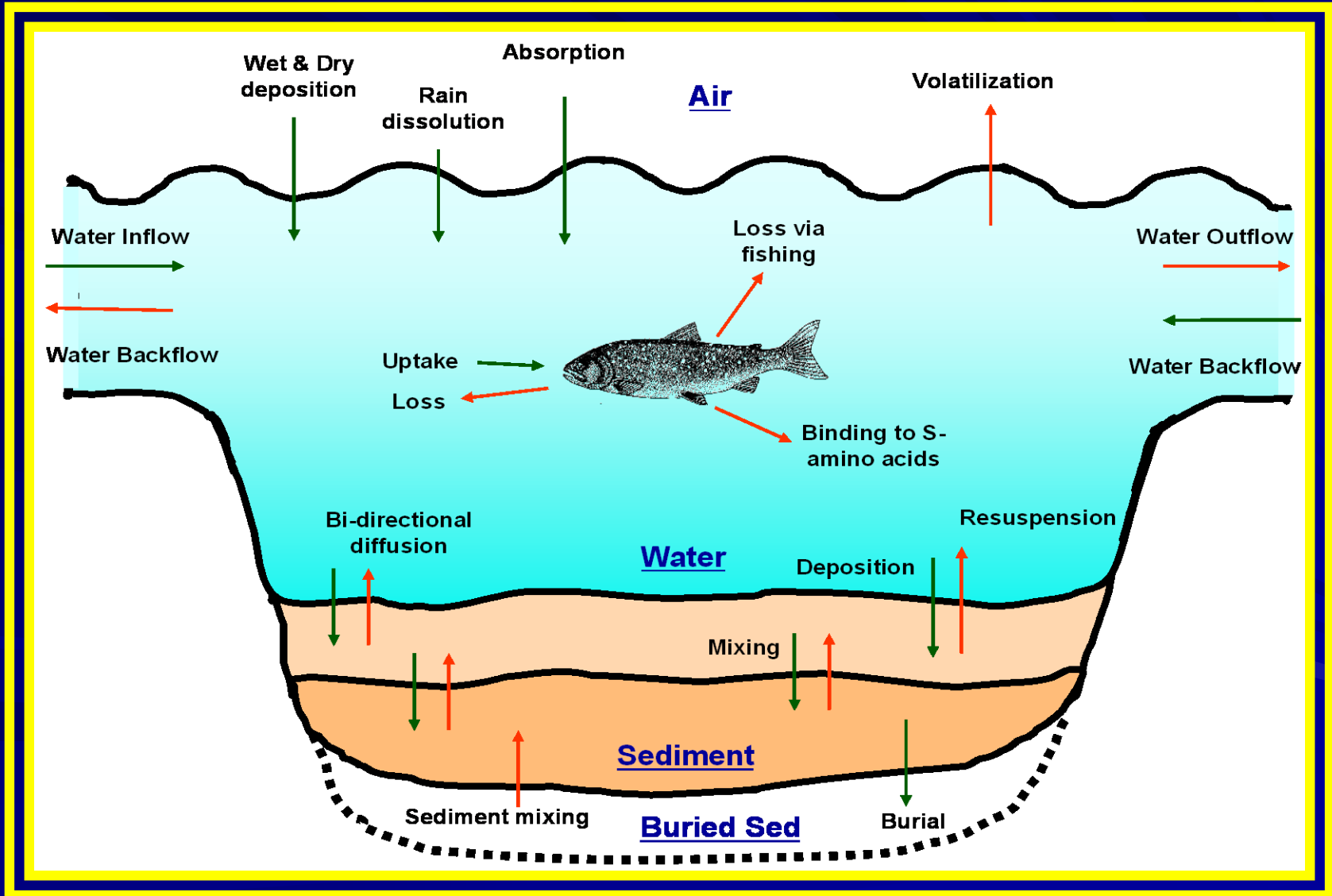
Granulat : une ressource mobile au cœur d'un géosystème complexe



Inondation 2009 (Tétouan)



Sur la biodiversité



Migration vers le large

Espèce commerciale à forte profondeur



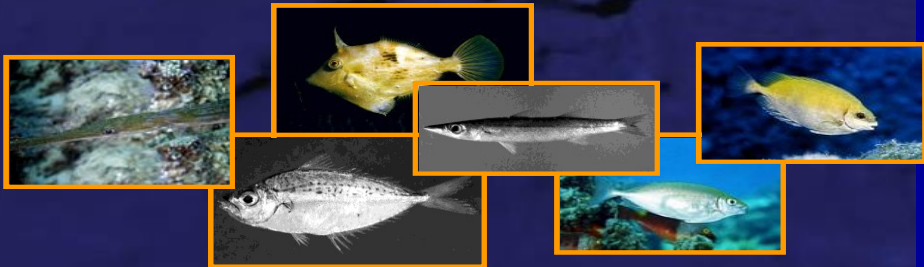
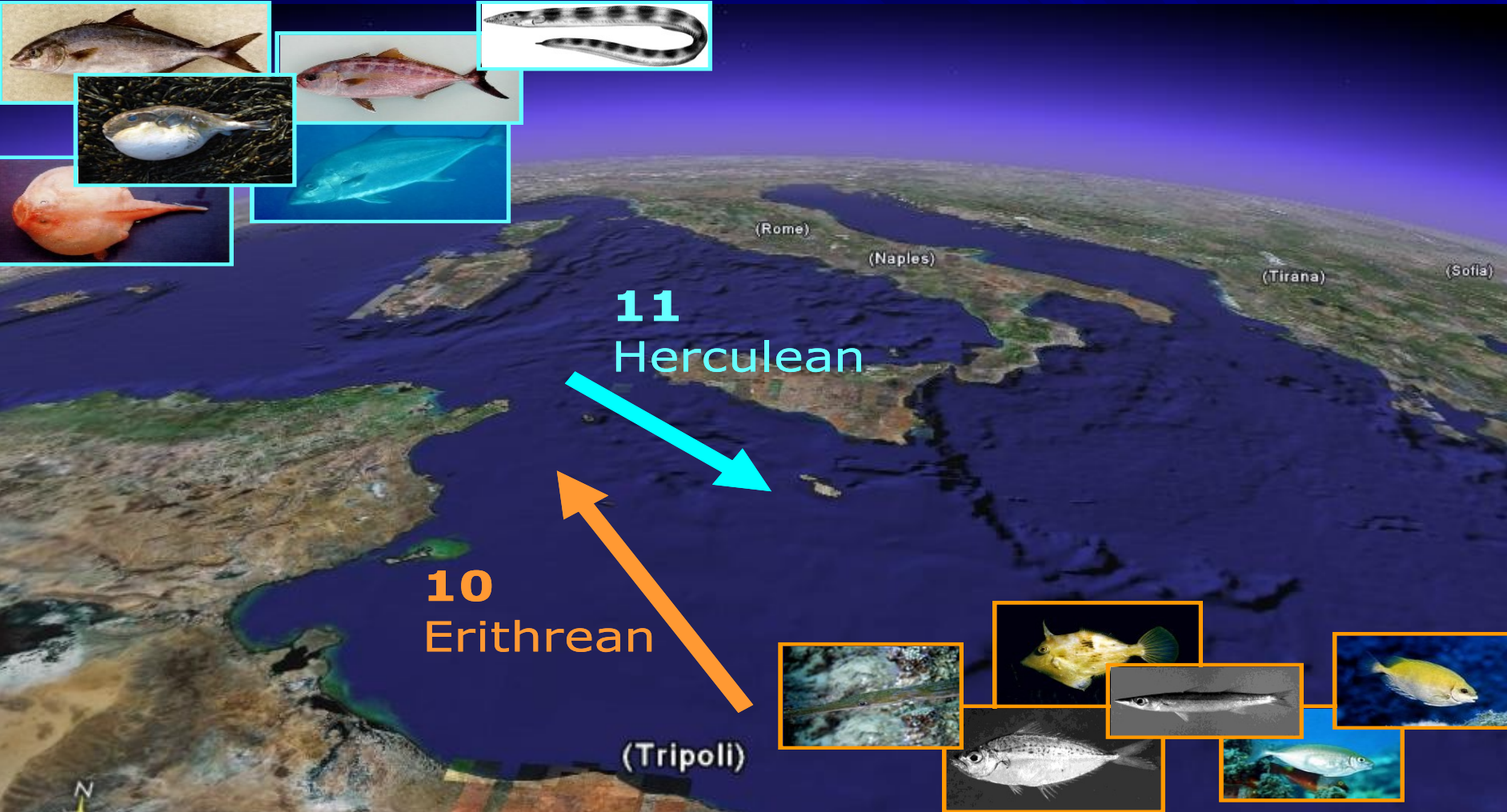
Hoplostète orange – *Hoplostethus atlanticus*
jusqu'à-1800m

**Accumulation de coquilles en relation possible
avec les modifications climatiques et
physicochimiques**

Little known on drivers for variability



Introduction d'espèces exotiques



A crossroad between atlantic and indopacific fauna

**CONCLUSIONS ET
PERSPECTIVES POUR
L'ENSEMBLE
DES PAYS MEDITERRANEENS**

Forte littoralisation d'ici 2025

avec :

+ 20 millions d'urbains (côtes)

+ 136 millions de touristes

densité en période de pointe 2025: 3300 personnes/km de côte

+ 160 Centrales électriques

+ 175 Usines de dessalement

- Doublement aquaculture

- Doublement Transports routiers

Impacts et Conséquences

- Bétonnage des côtes + 4000 km, 50% artificialisés en 2025

- Risques accrus de pollutions accidentelles avec le quasi quadruplement des trafics fret maritime (+ 270%)

- Croissance des pollutions telluriques au Sud et à l'Est

- Pertes accrues de biodiversité, dégradation des paysages littoraux, congestion

De nouvelles orientations s'imposent pour la préservation et la sauvegarde de l'environnement :

- Economie des eaux et réorientation vers la désalinisation des eaux de mer et la réutilisation des eaux usées traitées pour l'irrigation;**
- Utilisation des énergies renouvelables : Hydrique, solaire, éolienne;**
- Contrôle des rejets en mer, des dégazage de bateaux, de la pollution côtière;**
- Contrôle de l'aménagement du territoire et du respect des règles de l'environnement.**

Merci pour votre attention

