

Dissolved organic matter fate in coastal Mediterranean site: Toulon bay case - France

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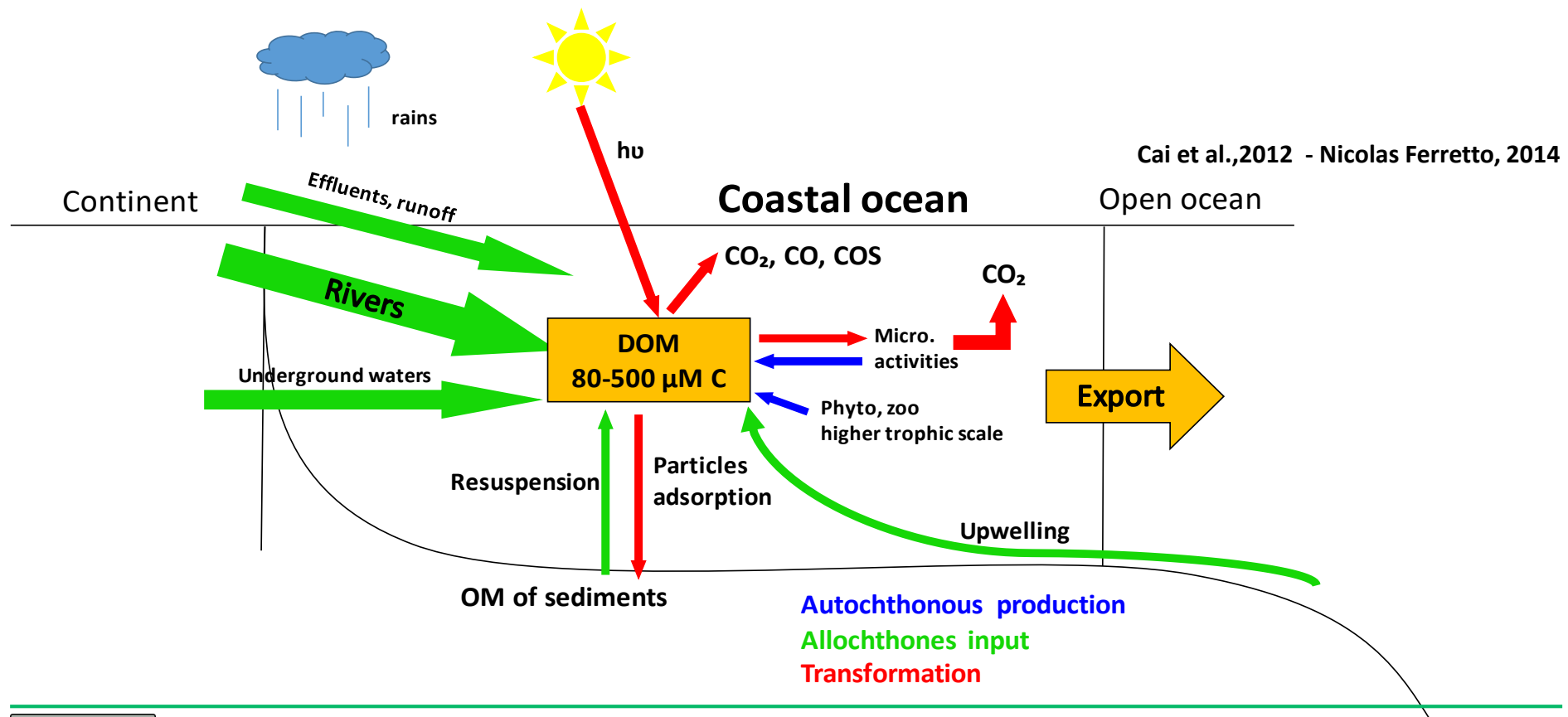
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The biogeochemical cycling of dissolved organic matter (DOM) in coastal ocean

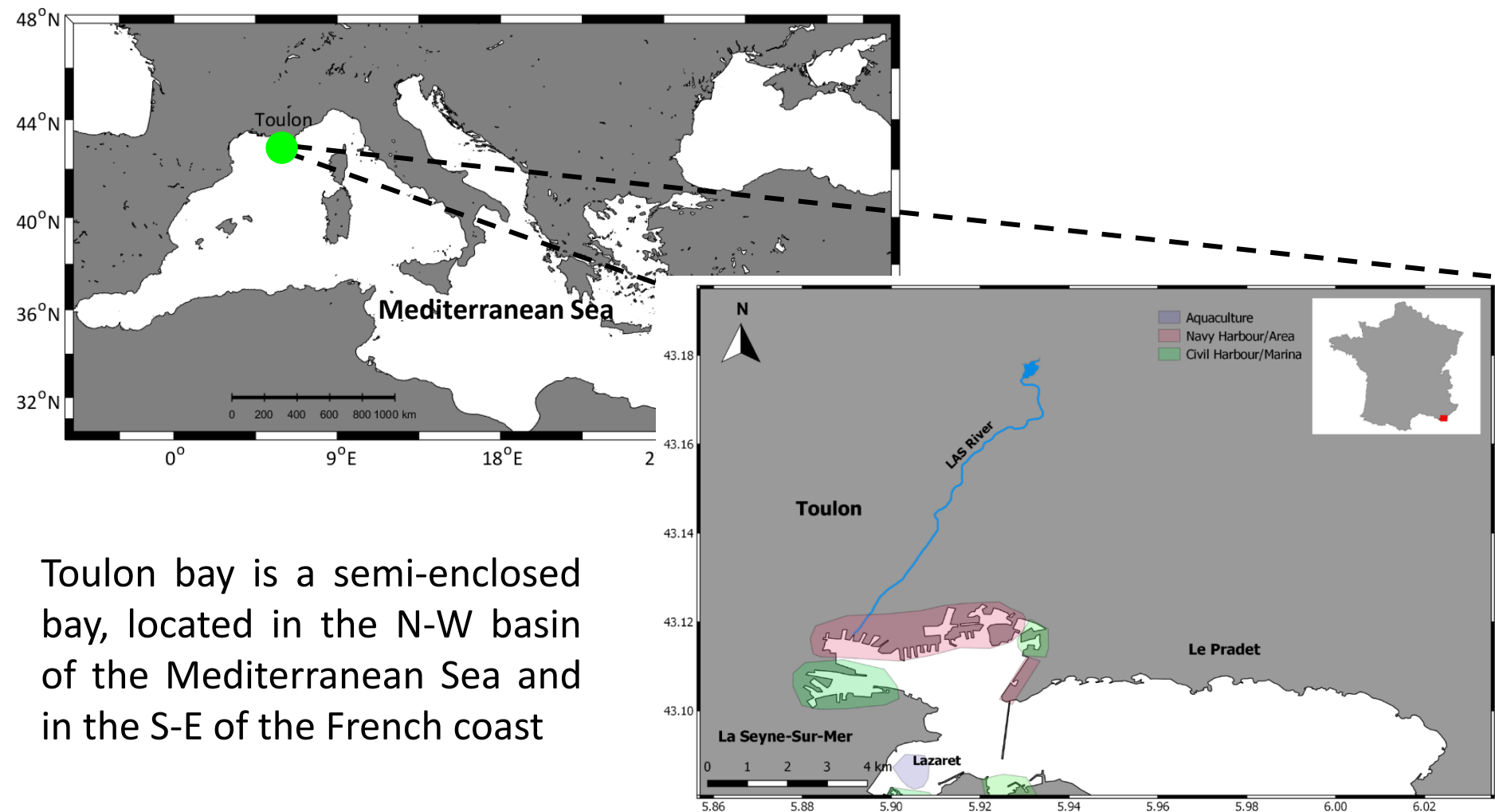
Rivers transport terrestrial organic matter to the coastal marine environment

Small fraction of terrestrial organic matter reaches the open ocean

Degradation, transformation, and burial of terrestrial organic matter through physicochemical, microbial, and photochemical processes in estuaries are important

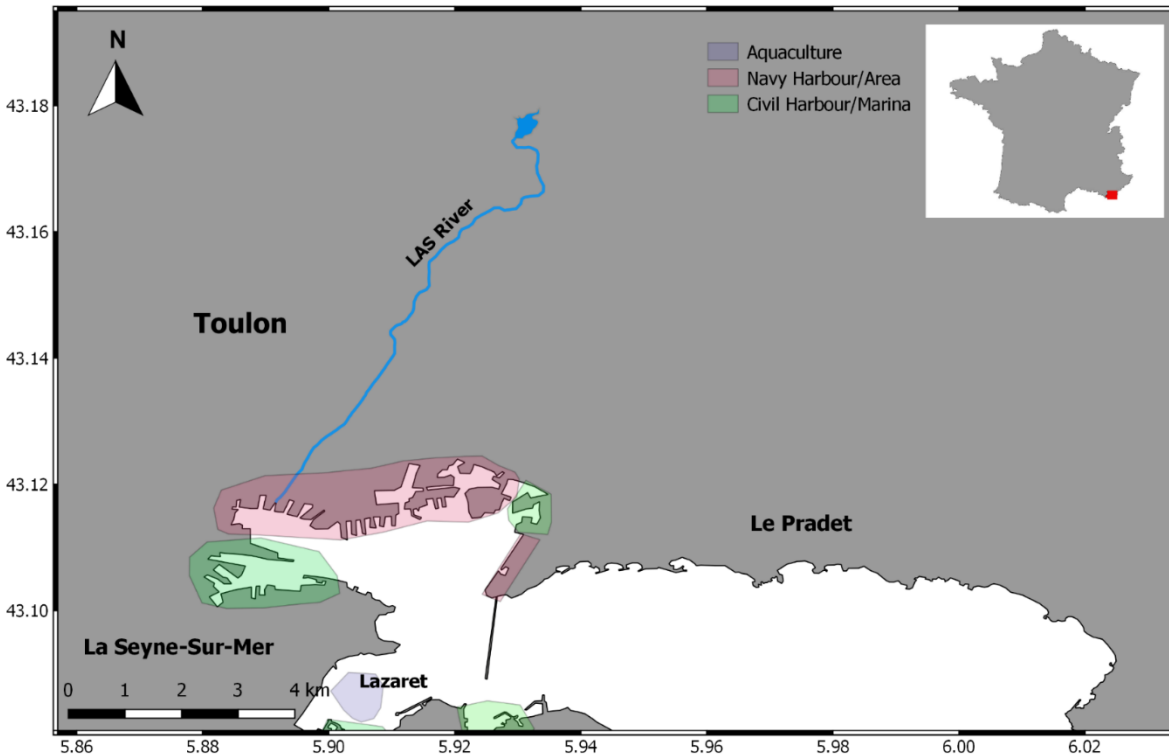


Toulon Bay - France



Toulon bay is a semi-enclosed bay, located in the N-W basin of the Mediterranean Sea and in the S-E of the French coast

Toulon Bay – France/ pollution sources



- This bay hosts the 2nd French Navy base
- It is exposed to numerous pollution sources:

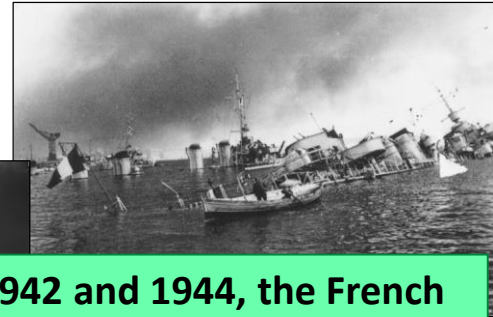
Aquaculture

Navy harbor

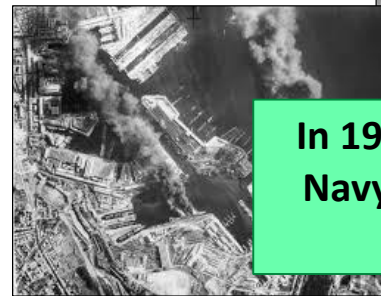
Tourism activities



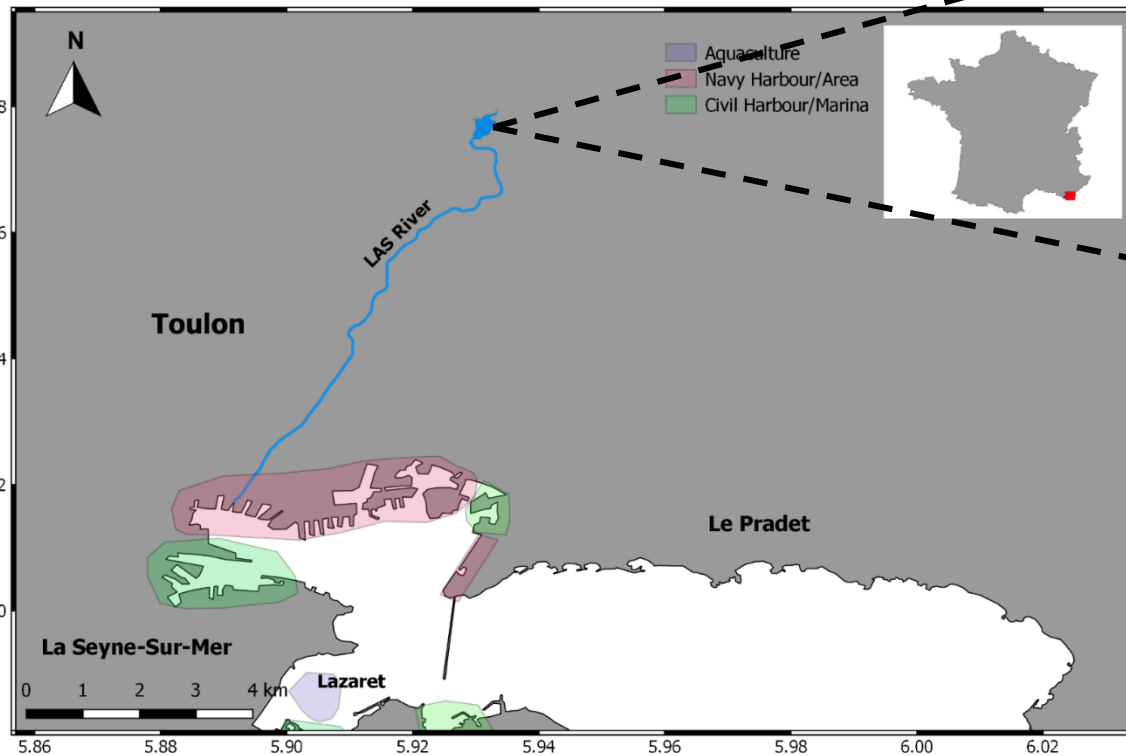
French Navy



In 1942 and 1944, the French Navy base was destroyed by bombing

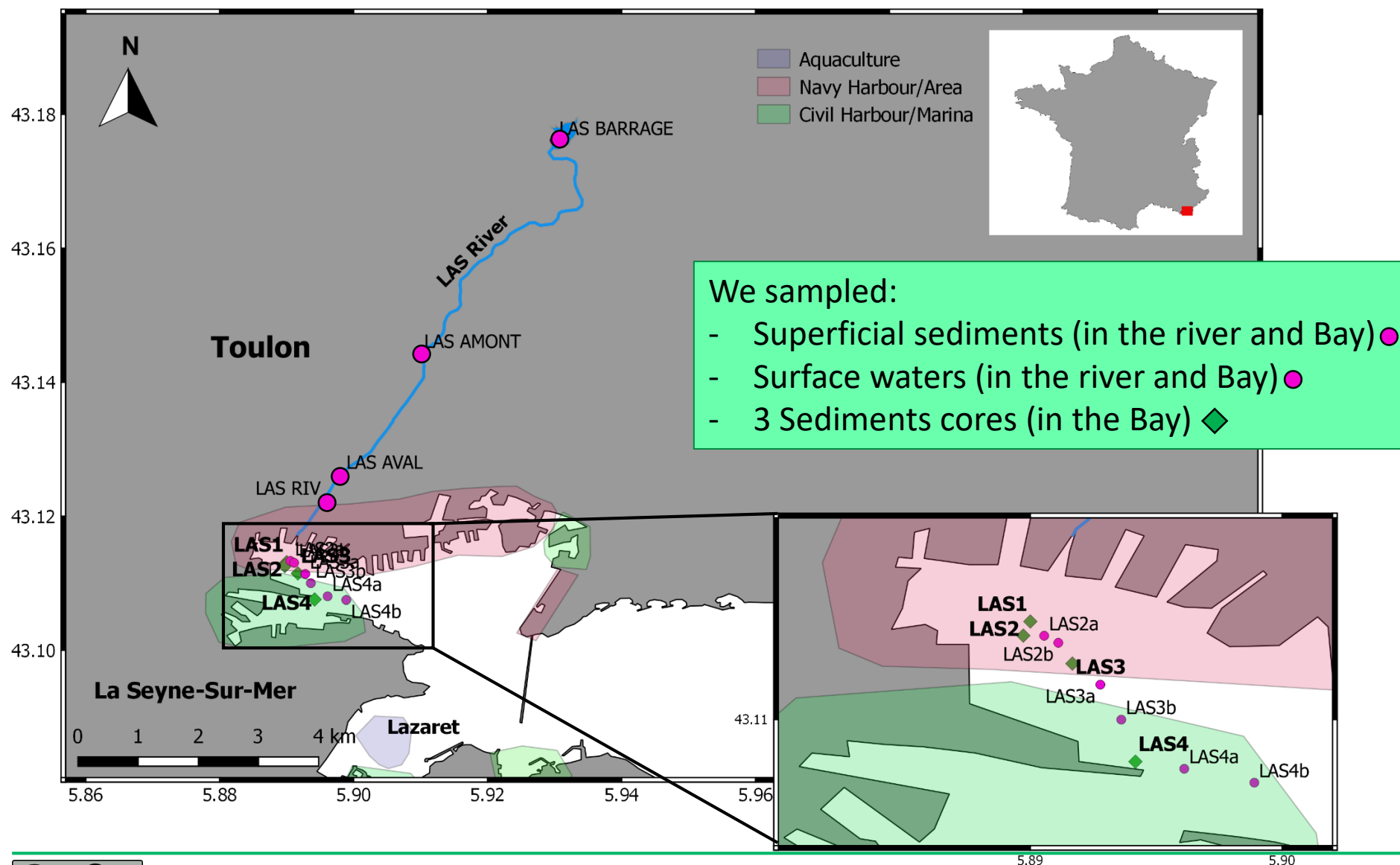


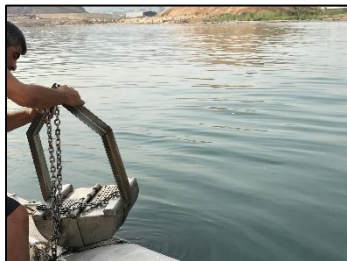
Las River



- The Las River take its source at the Dardenne dam
- At the last km, the river is channeled and underground to its mouth
- Length = 9 km
- Watershed $\sim 60 \text{ Km}^2$, karstic
- Average flow = $1.64 \text{ m}^3/\text{s}$ (min = $0.14 \text{ m}^3/\text{s}$, max = $29.14 \text{ m}^3/\text{s}$; correlated with rainy episodes)


Toulon Bay and Las River - France





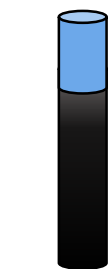

Superficial sediments
(river and sea)




Surface waters
(river and sea)

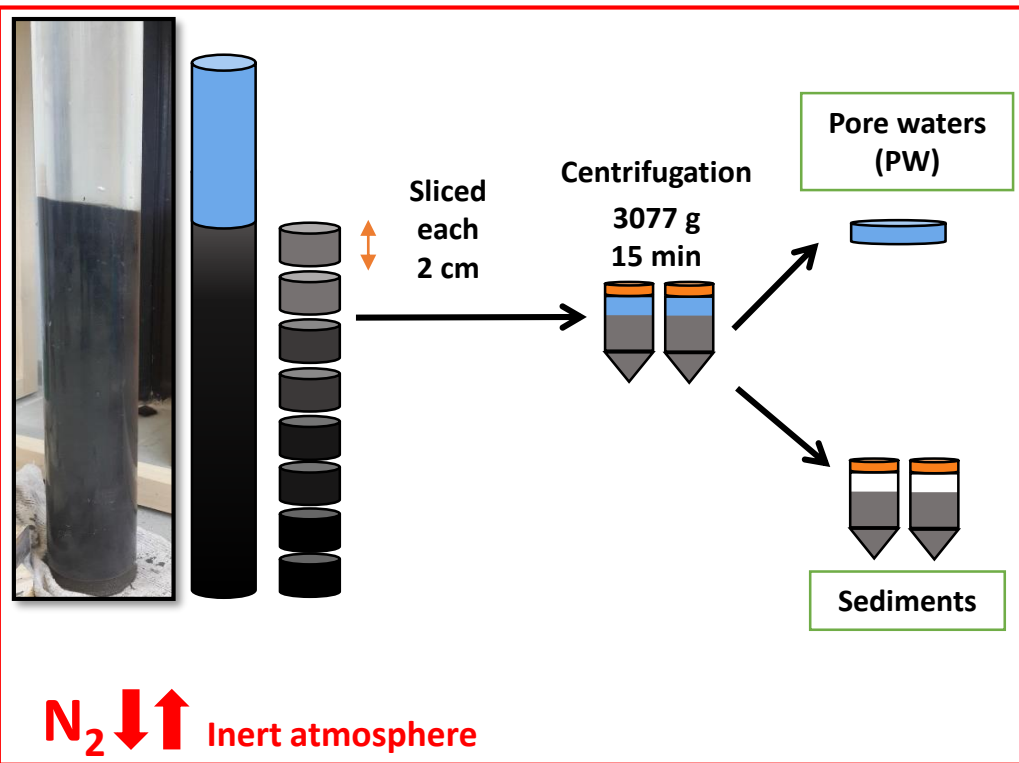


After 24 h

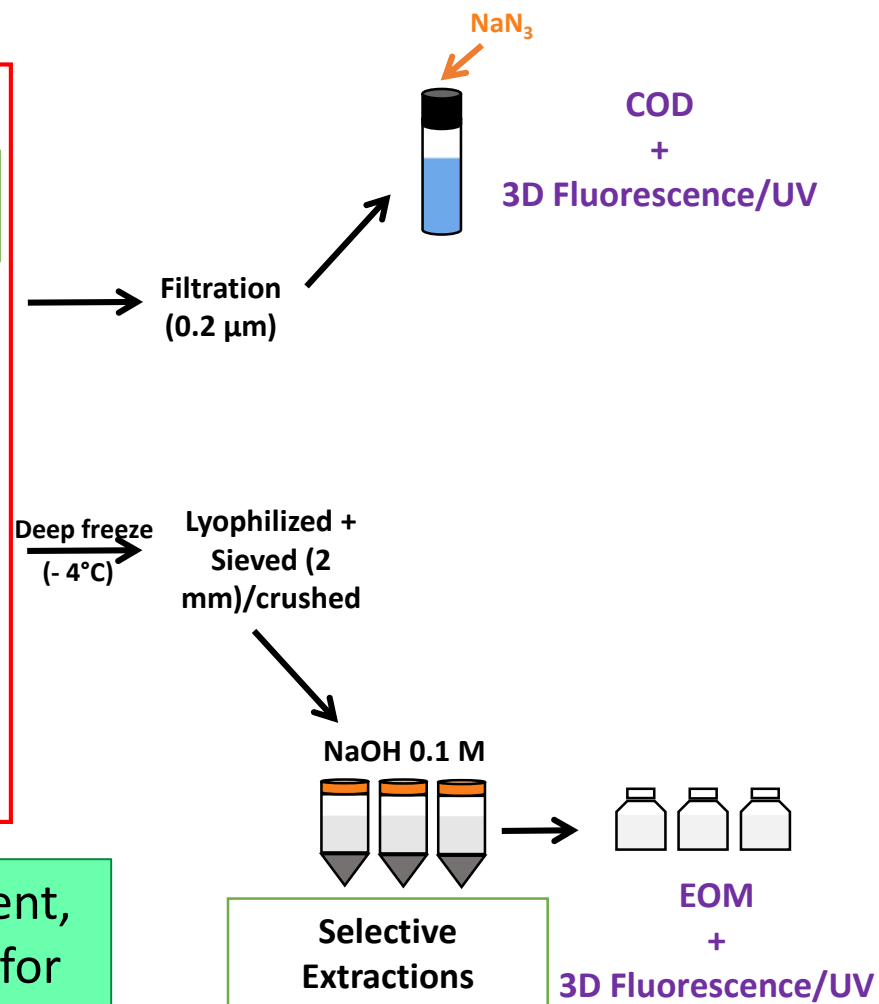
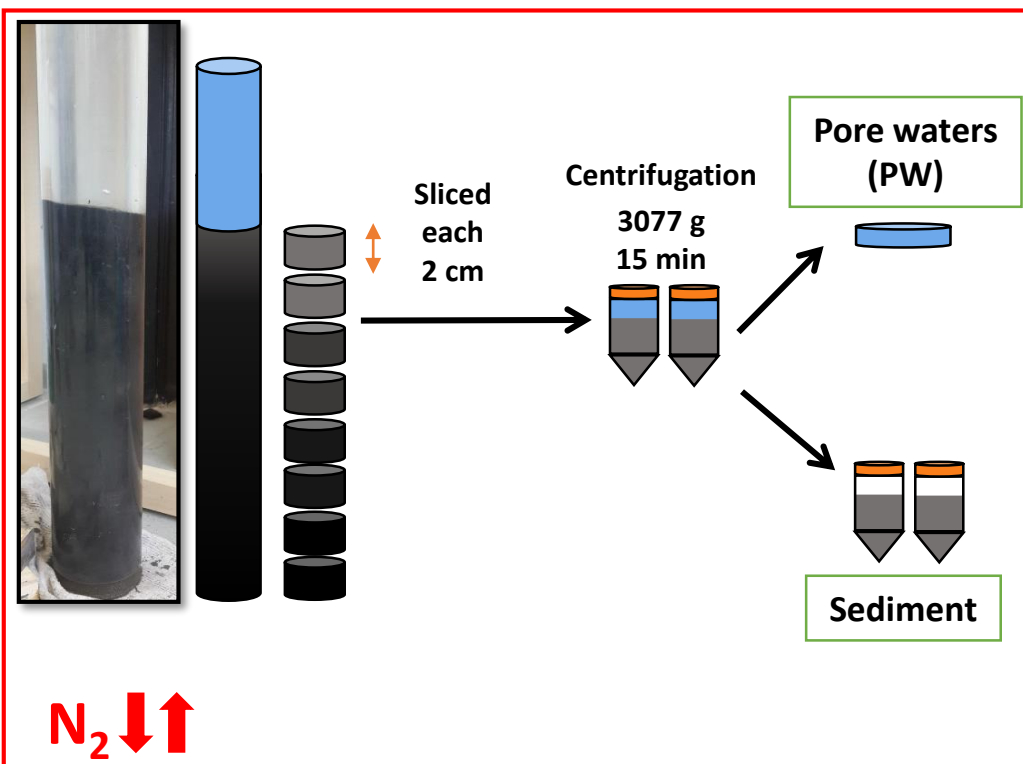


Supernatant
waters

pH/Eh



Fluorescence measurement



After 3D fluorescence measurement,
data were treated with PARAFAC for
CORCONDIA > 60%

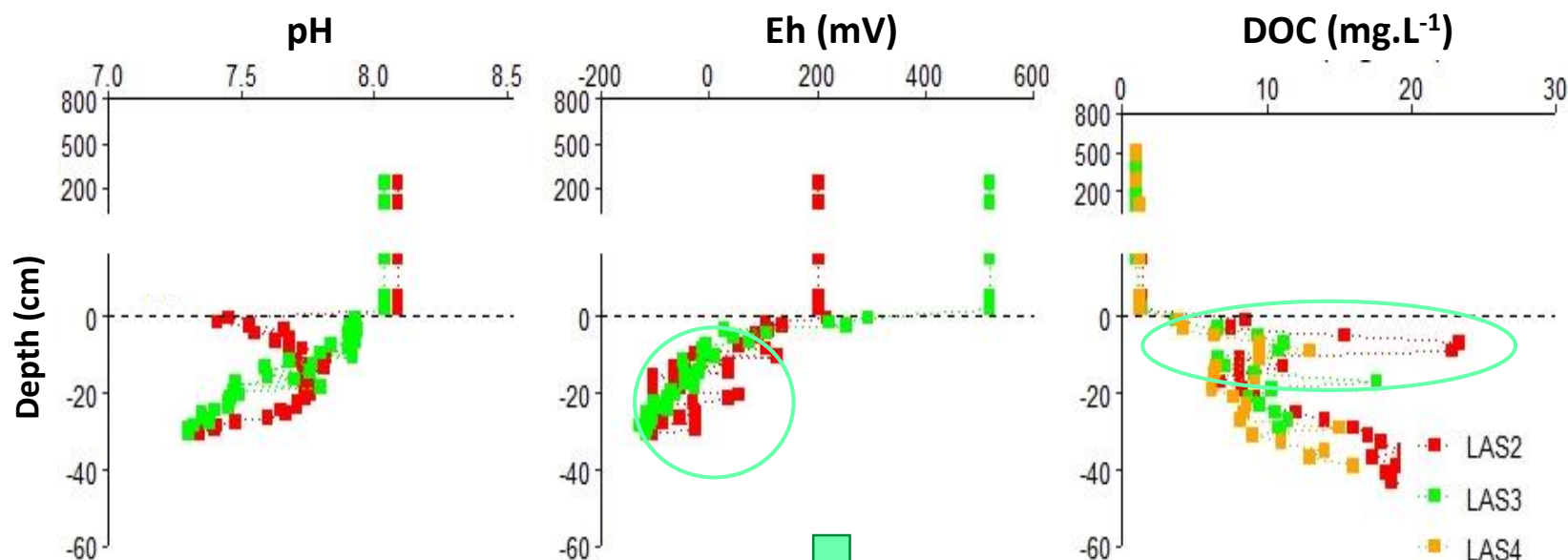
Color code:

- Sampling (black)

- Analysis (purple)

EOM: extracted dissolved organic carbon

pH, Eh and DOC in column waters and pore waters

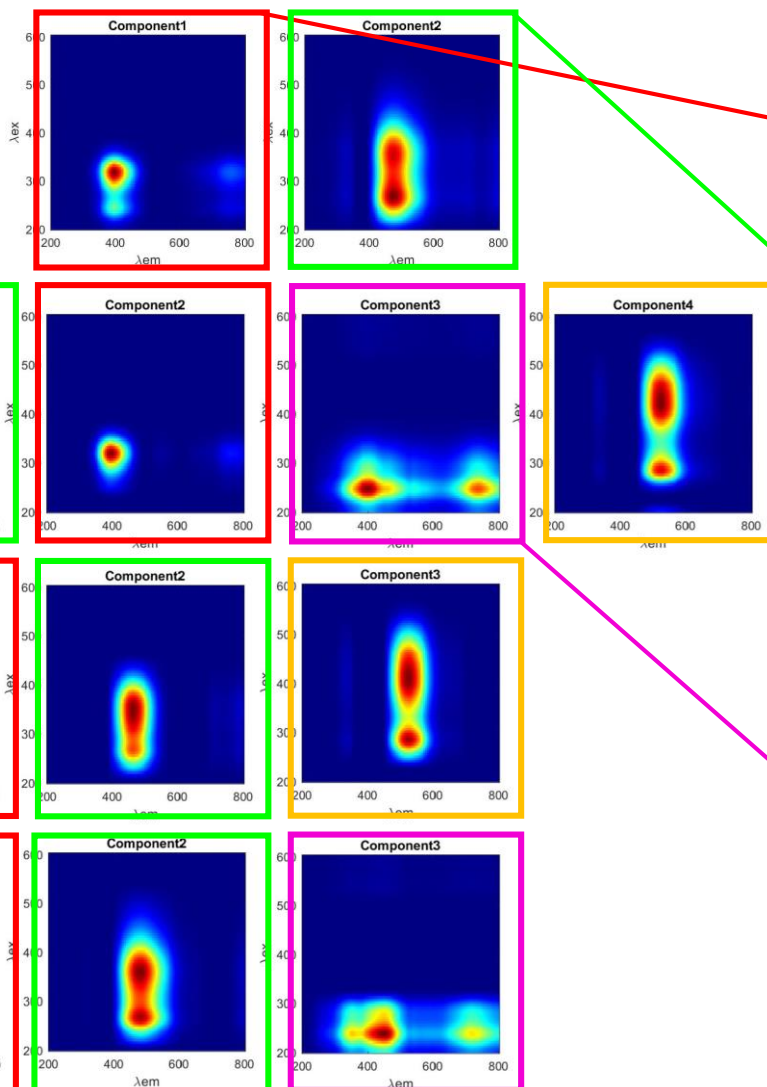


Beyond the 10 cm depth, the sediments are in suboxic / anoxic conditions.

The production of DOM was more intense in front of Las River (LAS 2) than outside of the bay (LAS 4) at 10 cm core depth.

PARAFAC components from pore waters and extracted sediments

Fluvial and marine
transect



Marine humic - like (peak M)

Ex/Em = 315-320/390-395 nm
(Coble, 1996)

Terrestrial humic - like (peak C)

Ex/Em = 350-360/460-480 nm
(Stedmon et al., 2003)

**Terrestrial fulvic - like
(peak D)/atypical**

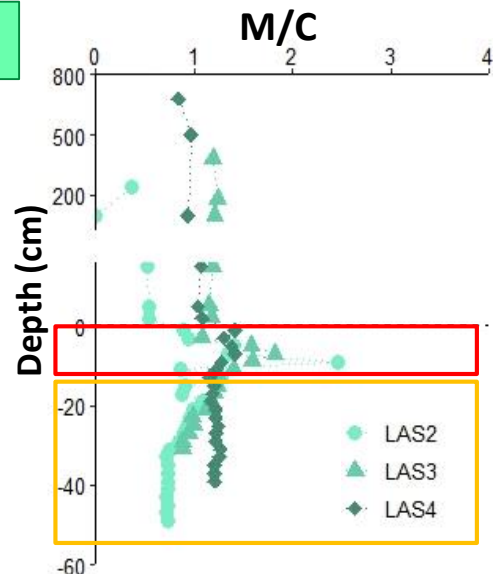
Ex/Em = (285)410-420/525 nm
(Stedmon et al., 2003)

Microbial - like (peak G)

Ex/Em = 235-255/(400)765 nm
(Murphy et al., 2011)

M/C ratio evolution in pore waters (A) and extracted organic matter (B)

A

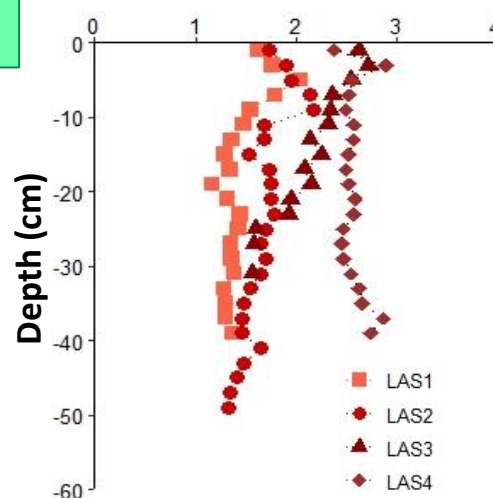


M/C ratio has a maximum in the **superficial layers** confirming a **decrease** in the contribution of **component C** - terrestrial OM.

M/C is constant and stable in **deep layers**.
The contribution of the marine type **component (M)** decreases with depth and **peak C (terrestrial)** increases in the deep layers.

 Superficial layers
 Deep layers

B

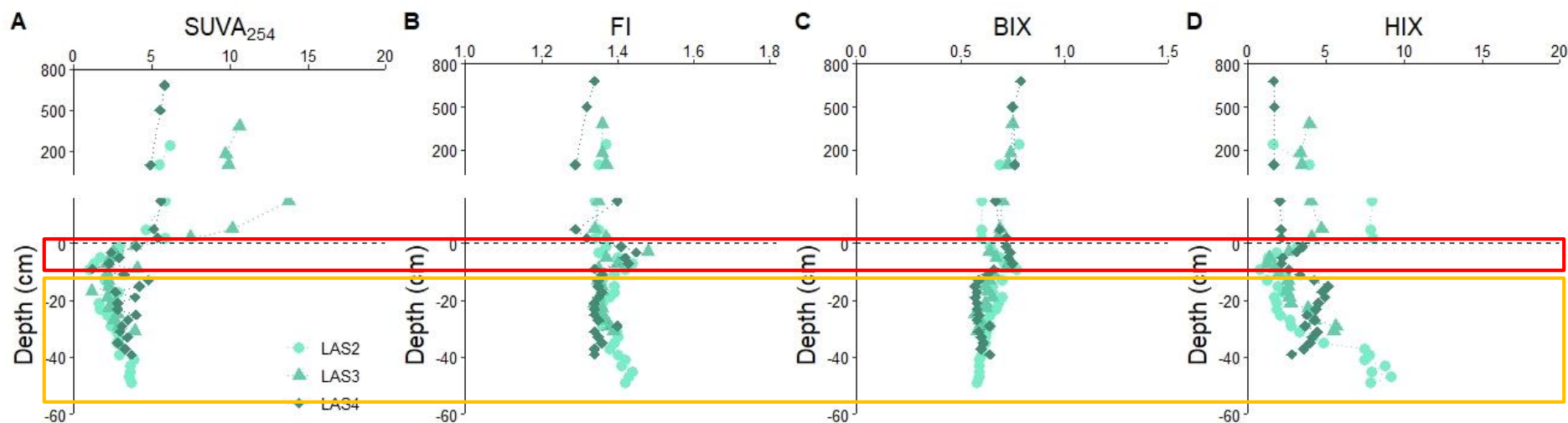


M/C ratio shows that the component **M predominates** in the superficial layers in the four sediment cores.

The contribution of the component **C increases in depth** in LAS2 and LAS3.

LAS4 presents a different behavior with an M/C clearly higher and constant with the depth
→ the transformation **processes are slowed down**.

Organic matter indexes



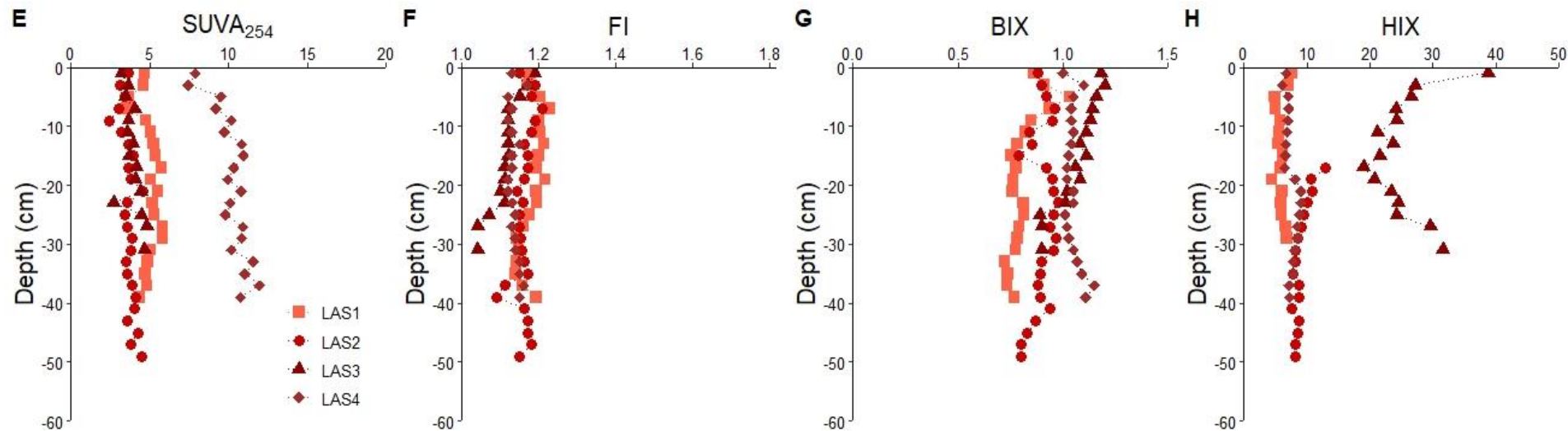
Pore water OM (PW-OM) in the superficial layers of sediments comes from *autochthonous* origin (BIX) and *less humified* (HIX) with a *weak aromaticity* (SUVA₂₅₄).

In *deep layers*, pore water OM shows a *terrestrial origin* (FI), a regain of aromaticity (SUVA₂₅₄) and an important humic character based on HIX index.

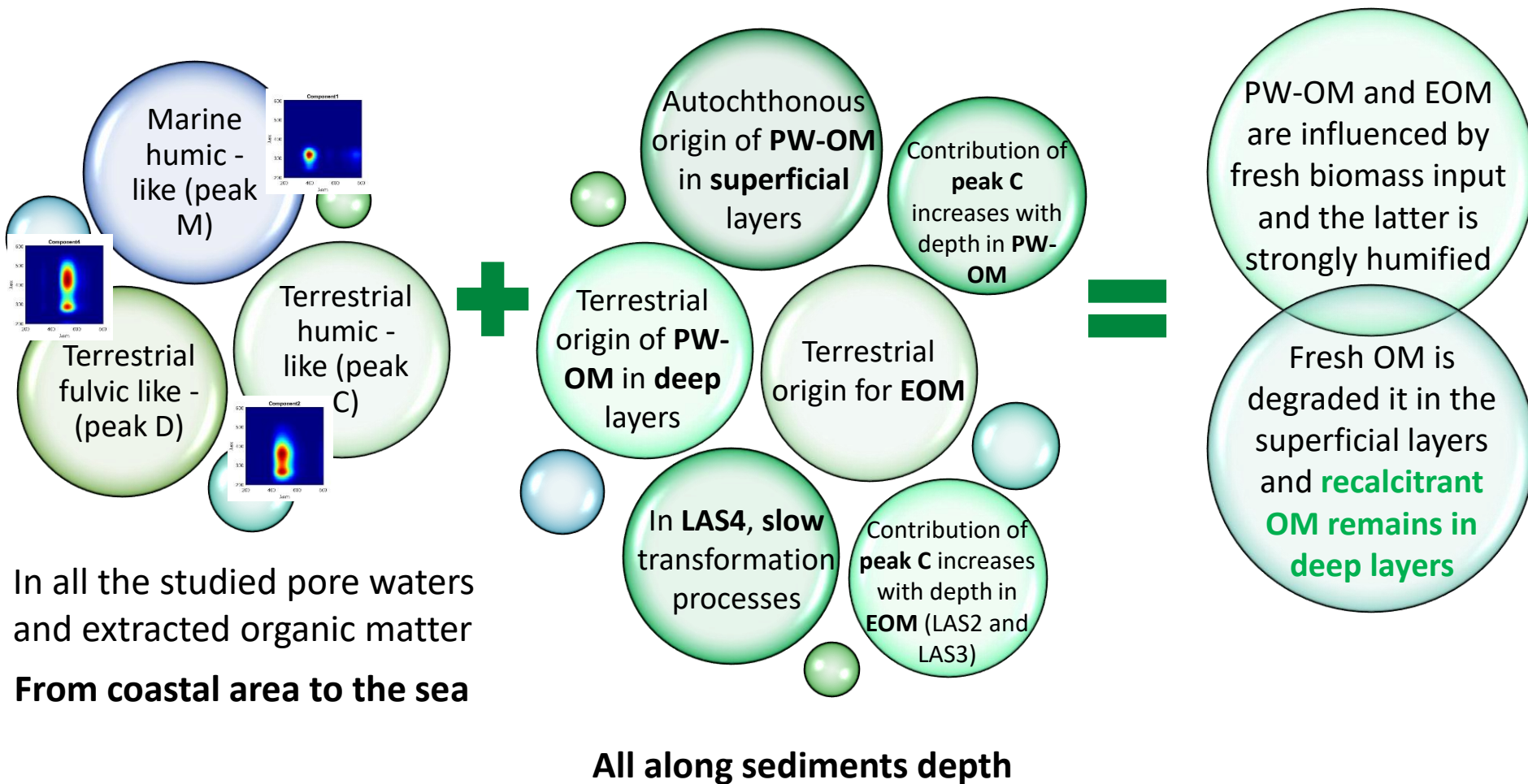
Superficial layers

Deep layers

Extracted organic matter indexes



Extracted OM (EOM) derives from **terrestrial origin (FI) and is **strongly humified** based on HIX index.**





Thank you



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