



Biogeoquímica dels fluxos de partícules en canyons submarins de la Mediterrània nord-occidental: Els efectes de les cascades d'aigües denses de plataforma

*Biogeochemistry of particle fluxes in submarine canyons of
the Northwestern Mediterranean Sea:
The effects of dense shelf water cascading*

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**BIOGEOQUÍMICA DELS FLUXOS DE PARTÍCULES EN
CANYONS SUBMARINS DE LA MEDITERRÀNIA NORD-OCCIDENTAL:
ELS EFECTES DE LES CASCADES D'AIGÜES DENSES DE PLATAFORMA**

*BIOGEOCHEMISTRY OF PARTICLE FLUXES IN SUBMARINE CANYONS OF
THE NORTHWESTERN MEDITERRANEAN SEA:
THE EFFECTS OF DENSE SHELF WATER CASCADING*

Memòria de Tesi Doctoral presentada per

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per a optar al grau de Doctora per la Universitat de Barcelona.

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Terminologia

Afòtic: Dit dels dominis submarins on no hi arriba la llum o n'hi ha tan poca que no hi pot haver fotosíntesi.

Biomarcador: substància derivada d'un precursor bioquímic que permet investigar l'origen de la matèria orgànica i el grau de degradació al qual ha estat sotmesa.

Bloom: proliferació ràpida d'organismes en el medi aquàtic (com la de fitoplàncton en un llac).

Bomba biològica de carboni: suma de processos biològics que indueixen el transport de carboni des de la capa fòtica fins al fons de l'oceà.

Bomba de plataforma de carboni: suma de processos que tenen lloc a la plataforma continental que indueixen el transport de carboni des de la plataforma continental cap a la capa subsuperficial de l'oceà obert com a conseqüència de l'enfonsament d'aigua densa formada a la plataforma (Tsunogai et al., 1999)

C3: Dit les plantes que converteixen el CO₂ i la ribulosa difosfat en fosfoglicerat. Les plantes C3 perden el 97% de l'aigua que absorbeixen per transpiració vegetal.

C4: Dit d'aquelles plantes que fixen carboni per la via de 4 carbonis, o també denominada Via de Hatch-Slack. L'avantatge d'aquest procés radica en el fet que al tenir a la RuBisCO tancada en les cèl·lules de la beina se li impedeix la possibilitat que reaccioni amb Oxigen en situacions en les quals la concentració de CO₂ sigui molt baixa, per la qual cosa el CO₂ perdut a través de la fotorespiració es redueix considerablement.

Canyó: Vall submarina de morfologia bastant abrupta, estreta i sinuosa, de vessants molt rostos, encaixada al marge continental, la qual neix a la vora de la plataforma continental o en ple talús continental, i mor al glacis continental o a la plana abissal; té una secció transversal en forma de V, o amb fons aplanat si té sediments; excavat pels corrents de turbiditat, sovint es desenvolupa a la prolongació dels grans rius o de les grans falles.

Capa Nefeloide: Capa d'aigua d'una conca submarina profunda prop del fons del talús o de l'ascens continental, que conté quantitats significatives de sediment en suspensió que l'enterboleix; pot atènyer gruixos de 200 a 1.000 m.

Cascada d'aigua densa: tipus de corrent marina causada exclusivament per un contrast de densitat de l'aigua de la mar. La cascada sol ser un procés estacional, induït per la formació, a la plataforma continental, d'aigua densa a causa del seu refredament i/o evaporació, i el seu posterior enfonsament talús avall cap a zones distals més profundes.

Cicle biogeoquímic: Cicle en el qual els elements químics passen del medi físic als organismes i d'aquests al medi físic.

Cloropigments: suma de la clorofil·la a i els seus productes de degradació per part del zooplàncton pheophorbide-a i macrozooplàncton pyropheophorbide-a.

CRAM: Dit les plantes que fixen el diòxid de carboni (CO₂) durant la nit, emmagatzemant-lo com a malat. El CO₂ durant el dia es concentra en l'enzim RuBisCO, incrementant l'eficiència de la fotosíntesi. El procés CAM permet que els estomes romanguin tancats durant el dia i això és especialment avantatjós en les plantes sotmeses a condicions àrides.

Cutina: Substància impermeable de naturalesa lipídica que forma part de la cutícula de les plantes.

Derivatització: procés mitjançant el qual es modifica químicament un compost per tal de produir un nou compost amb unes noves propietats. En aquest cas, per exemple, es substitueixen hidrògens actius dels compostos inicials per grups trimetilsilil, incrementant-ne la seva volatilitat i per tant, els fa aptes per ser analitzats per cromatografia de gasos.

Flux: Moviment d'energia, de partícules, expressat habitualment per unitat d'àrea i de temps. (TERMCAT)

Fòtic: Dit de l'espai submarí penetrat per la llum suficient per a generar la fotosíntesi, la fondària del qual és d'uns 80 m, aproximadament.

Isòtop estable: Isòtop que no és radioactiu, és a dir, que no pateix desintegració radioactiva a causa de la seva inestabilitat nuclear.

Lignina: Polímer aromàtic natural de molècules ramificades, derivades principalment del fenilpropà, i que forma part de la paret cel·lular de moltes cèl·lules vegetals, a les quals confereix duresa i resistència.

Marge continental: Regió immersida de la vora dels continents, que comprèn la plataforma continental i el talús continental i que constitueix la transició de l'escorça continental a l'oceànica.

Matèria orgànica: Matèria formada per estructures i teixits procedents d'organismes animals o vegetals, vius o morts, que requereixen la intervenció de microorganismes per a la seva descomposició.

Material caracteritzable: Material que pot ser identificat cromatogràficament com són els amino àcids hidrolitzables, els sucres neutrals, els lípids extractables amb dissolvents així com la clorofil·la i els seus productes de degradació (Wakeman et al., 1997).

Material particulat: aquell que és retingut per un filtre de 0.45 µm.

No-redfieldià: dit de la matèria orgànica que no té l'estequiometria de Redfield, és a dir, que la ràtio molecular de carboni, nitrogen i fòsfor (C:N:P) no és de 106:16:1.

Oceà Obert: aigües situades més enllà de la plataforma, apareixen al TERMCAT amb el terme pelàgic, que ve del grec *pélagos*, "mar oberta". Per contra, la zona nerítica és el medi marí pelàgic que correspon a la plataforma continental.

Oligotròfia: Qualitat d'oligotròfic, és a dir, pobre en elements essencials per a la vida.

Òpal: L'òpal és el nom que rep el silici biogènic de fórmula química: $\text{SiO}_2 \cdot 0,4 \text{H}_2\text{O}$, format per la polimerització de molècules d'àcid silícic. Aquest element és produït per les diatomees, els radiolaris, els silico-flagel·lats i les esponges silíciques a partir del silici que es troba dissolt a la capa més superficial de la mar.

Pèl·let fecal: Excrement orgànic, de forma normalment ovoide, de < 1 mm de llargària. Produït sobretot per invertebrats marins.

Plataforma continental: Part del marge continental submergida, compresa entre la línia de costa (o línia de baixamars) i el cantó (o ruptura de pendent), a uns -200 m de profunditat, que mena al talús continental; es caracteritza per ésser una superfície força plana i llisa, amb pendents inferiors a 0,1 i recoberta de sediments molt diversos: graves, sorres, llots i llims orgànics, bancs de mol·luscs, alguers (o prats d'algues), esculls coral·lins, etc.

Talús continental: Part externa del marge continental que uneix, mitjançant un pendent (d'uns 5°), la zona nerítica de plataforma amb els grans fons oceànics, és a dir, des de la ruptura de pendent (aproximadament als -200 m, el cantó dels pescadors) fins a enllaçar amb el glacis, de pendent més feble, i fins a les planes abissals. El talús sol ésser solcat pels canyons o recs, i és una zona d'esllavissaments i de corrents turbidífics.

Acrònims i sigles

ADIOS, de l'anglès: Atmospheric Deposition and Impact of pollutants, key elements and nutrients in the Open Mediterranean Sea, Deposició Atmosfèrica i Impacte dels contaminants, els elements claus i nutrients a la Mar Mediterrània Oberta.

Chl, de l'anglès: Chlorofil a, Clorofil·la a.

DIC, de l'anglès: Dissolved Inorganic Carbon, Carboni Inorgànic Dissolt.

DOC, de l'anglès: Dissolved Organic Carbon, Carboni Orgànic Dissolt.

DSWC, de l'anglès: Dense Shelf Water Cascading, en català: Cascada, Cascada Submarina o Enfonsament d'Aigües Denses.

DYFAMED, del francès: Dynamique des Flux Atmosphériques en Méditerranée; Dinàmica dels Fluxos Atmosfèrics a la Mediterrània.

ECOMARGE, del francès: Ecosystème de Marge Continentale; Ecosistemes del Marge Continental.

EUROMARGE, de l'anglès: Transfer of Matter and Energy on European Continental Margin, Transferència de Matèria i Energia en els Marges Continentals Europeus.

GoL, de l'anglès: Gulf of Lion, Golf de Lleó.

HERMES, de l'anglès: Hot Spot Ecosystem Research on the Margins of European Seas, Recerca en els Punts Calents dels Ecosistemes dels Marges de les Mars Europees.

HPLC, de l'anglès: High Performance Liquid Chromatography, Cromatografia Líquida d'Alta Resolució.

JGOFS, de l'anglès: Joint Global Ocean Flux Study, Estudi Conjunt sobre el Flux Oceànic Global.

MATTER, de l'anglès: Mass Transfer and Ecosystem Response, Transferència de Massa i Resposta de l'Ecosistema.

MAW de l'anglès: Modified Atlantic Water, Aigua Atlàntica Modificada.

NC, de l'anglès Northern Current, Corrent del Nord.

OC, de l'anglès: Organic Carbon, Carboni Orgànic.

OM, de l'anglès: Organic Matter, Matèria Orgànica.

PIC, de l'anglès: Particulate Inorganic Carbon, Carboni Inorgànic Particulat.

POC, de l'anglès: Particulate Organic Carbon, Carboni Orgànic Particulat.

TC: de l'anglès, Total Carbon, Carboni Total.

Acrònims i sigles

THAA, de l'anglès: Total Hidrolizable Amino Acids, Total d'Aminoàcids Hidrolitzables.

TN, de l'anglès: Total Nitrogen, Nitrogen Total.

WMDW, de l'anglès: Western Mediterranean Deep Waters, Aigües Profundes de la Mediterrània Occidental.