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FLUSHING OF TERRIGENOUS ORGANIC MOLECULES THROUGH SUBMARINE CANYONS

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In open marine environments, far from the influence of riverine waters, terrigenous organic molecules are currently incorporated into sediments after transport through the atmosphere and water column sedimentation. Recently, the role of submarine canyons has been outlined (Canals et al., 2006). These canyons are formed by erosion of the continental shelf during low sea-level stands. In these conditions they may funnel large volumes of sediment and organic matter from shallow regions to the deep ocean (Posamentier et al., 1988). During high sea level stands, such as at present, these canyons still experience occasional sediment gravity flows which may be triggered by sediment failure, river flooding or dense shelf water cascading (DSWC)—a type of current that is driven solely by seawater density contrast. These processes may also result into the incorporation of large amounts of terrigenous organic molecules, both natural and anthropogenic, into the open marine sediments. This aspect must be considered in models assuming that sedimentary deposition of these compounds in open marine environments can be ultimately attributed to atmospheric processes. This is particularly relevant for calculations of budgets of anthropogenic compounds (Lipiatou et al., 1997)

In the present study, the efficiency of the submarine canyons located in the northwester Mediterranean Sea for the transport of organic molecules of continental origin is evaluated. For this purpose, sediment cores have been collected in three canyons, Cap de Creus (CC), Lacaze-Duthiers (LD) and Sete at different water depths (400, 1000 and 1500 m below sea level; Fig. 1). For reference, sediment cores in nearby areas without direct influence from canyons (open slope) have also been collected at the same depths. The cores have been analyzed for anthropogenic and natural terrigenous compounds. The former encompass organochlorine pesticides and industrial products and polycyclic aromatic hydrocarbons and the second higher plant n-alkanes, n-alkan-1-ols and sterols. For reference, lipid molecules representing algal inputs from the water column have also been analyzed. The cores have been dated by ^{210}Pb and ^{137}Cs providing historical records of the sedimentation of these compounds in each site.

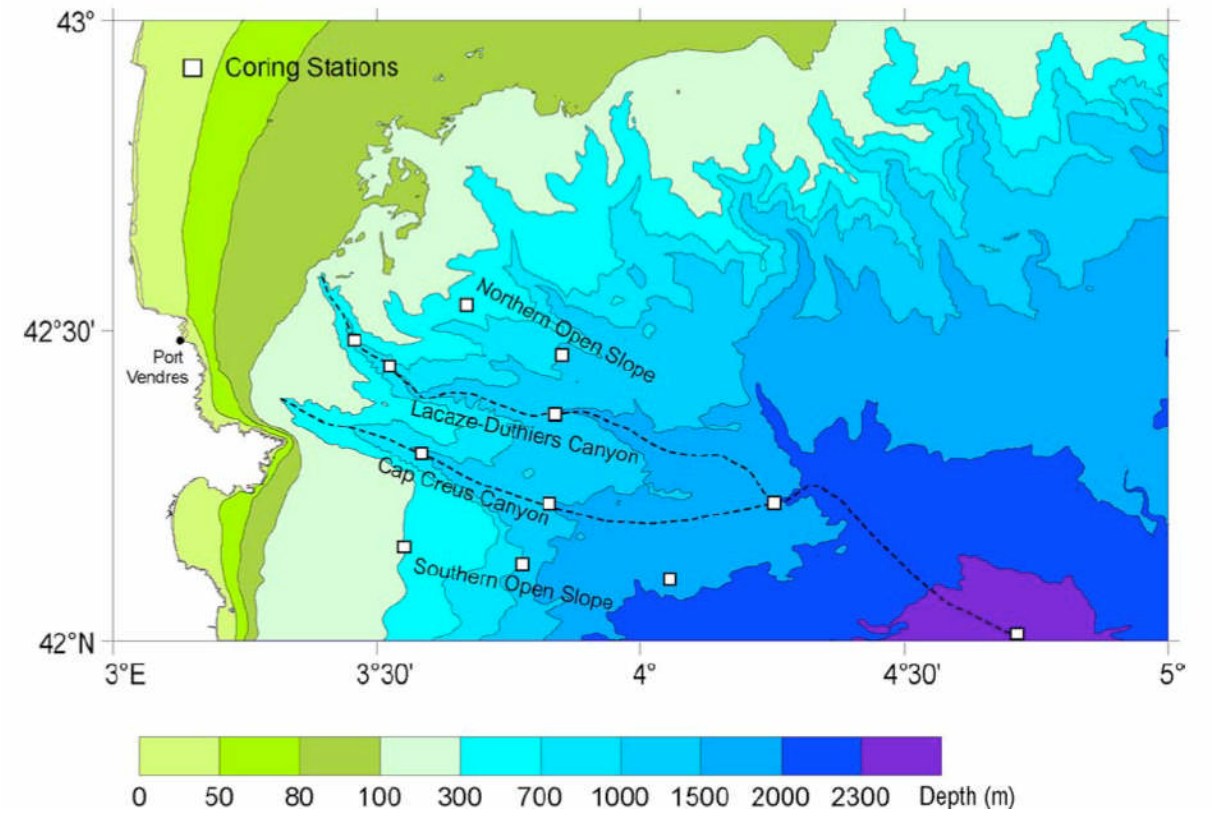

Figure 1. Location of the coring sites. They encompass area within canyons and open slope sites.

The results show that some of these canyons, namely CC, may have an important role in the transport of some pollutants such as organochlorine compounds towards deep sea areas. Thus the concentrations of PCBs (seven ICES congeners) at 400 m, 36 ng/g, are about 7 times higher than those generally encountered in the other canyons or in the open slope areas. Other pollutants such as 4,4'-DDE also exhibit the same differences between concentrations in CC and open slope. In relation to natural products, both CC canyon and LD exhibit higher concentrations of higher plant n-alkanes and n-alkan1-ols, but in these cases the concentration differences with respect to the regular sedimentation is only in the order of two times.

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