Geophysical Research Abstracts
Vol. 18, EGU2016-3995, 2016
EGU General Assembly 2016

Dynamics of the transfer of terrestrial organic matter in the late Quaternary turbiditic system of the Ogooué River (Gabon)

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In many cases (Hedges et al., 1995, Xing et al., 2011) the supply of terrestrial organic matter (OM) in the oceanic environment is confined to the continental and upper slope of continental margins. However, some recent studies (Huc et al., 2001, Baudin et al., 2010, Biscara et al., 2011, Stetten et al., 2015) demonstrated that significant amounts of continental OM can be transported and deposited in deep sea sediments. This transfer is more efficient in turbiditic systems which are linked to important river deltas. In such systems, the terrigenous influx are important and the downslope sediment-laden currents can indeed transport and rapidly bury important quantities of TOM transferred from the river mouth and the shelf to the abyssal plain.
The turbiditic system associated with the Ogooué River offshore Gabon has been selected to study more precisely the modalities of transfer of continental OM from the shelf to the deep offshore. The works focuses on the concentration of OM in both hemipelagites and turbidites as well as the different parameters influencing the spatial distribution and concentration. For this study 10 cores located along the system from the continental shelf to the distal lobes have been selected. The quantity of OM in the sediments as well as its origin (continental vs marine) have been measured using bulk geochemical analyses (% OC, δ13Corg). The stratigraphy of the cores was determined using a combination of planktonic foraminiferal assemblages, δ18O on benthic foraminifers and 14C dates on planktonic foraminifers, and calcium carbonate content calibrated with XRF measurements.
The studied cores contain various amounts of organic carbon ranging from 0.7wt% to more than 9wt%. The highest contents are found in turbidite beds where woody detritus and well preserved fragmentary leaf debris are concentrated. In the hemipelagic facies, organic matter is composed of a mixture of marine and land derived organic matter associated with clay-size sediments. This organic sedimentation is highly sensitive to the variations of the sea level due to the alternation between glacial and interglacial times. Glacial periods are characterized by higher amounts of organic matter in hemipelagic deposits, with a higher contribution of continental material, and by the presence of frequent organic rich turbiditic beds. On the contrary, during interglacial periods very few turbiditic events are recorded and the OM in hemipelagic sediments is mainly of marine origin and in lesser quantity. When the sea-level is high, the Ogooué delta is disconnected from the canyon heads and the sediments delivered by the river are deposited on the shelf and mobilized by the strong South-North coastal drift currents. During low sea-level periods, the river discharges its sediments rich in terrestrial OM directly in the canyons heads bypassing the shelf. The low sea level also generates increased erosion of the shelf sediments containing globally high rate of reworked continental OM.