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Sea level fall and rise controlling cyclic fluid expulsion: comparison between pockmarks in the Congo Basin and mud volcanoes in the Gulf of Mexico.

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Fluid migration in marine sediments is a widespread phenomenon, which is increasingly gaining attention due to the environmental impact of the fluid expelled, mainly methane and other greenhouse gases. However, neither the timing of fluid expulsion (episodic, cyclic, catastrophic) nor the processes that trigger it (overpressure induced by overlying sediments loading or by additional underlying fluid supply from reservoirs) have been clearly defined yet.

On 3D seismic data in the Congo Basin we have determined the depths of the palaeo-fluid seeps (buried pockmarks) within the Miocene-Present stratigraphic interval, given the potential levels at which the fluid expulsion has started and ceased. Using the high resolution stratigraphic model from ODP Leg 175, we are able to define that fluid seepage events are clearly correlated with sea-level falls. A sea-level fall induces higher erosion in the onshore drainage basin and on the exhumed platform, leading to an increase in the sediment supply to the sedimentary basin. The ultimate mechanism responsible for fluid escape is the sudden loading of overlying sediments.

In the Gulf of Mexico, the 3D seismic data coupled to IODP exp 308 core data have shown that the mud volcanoes have been periodically active. The periods of activity are clearly correlated from one mud volcano to the others all over the basin and corre-

spond to significant sea level changes in the late Quaternary. The ultimate mechanism responsible for mud volcano reactivation and fluid escape in the case of the Gulf of Mexico is a sudden sea level rise.

This work conducted in the Congo Basin and in the Gulf of Mexico is an important breakthrough in the understanding of seepage processes, and shows that fluid seepage may be induced by external forcing factors such as sea level fall and rise. Further studies are now necessary to incorporate these results into models of carbon and methane cycles, taking into account focused and cyclic fluid flow at continental margins.