RED-EASTERN MEDITERRANEAN-MARMARA-BLACK SEAS STAGNATION LAYERS : SEQUENCE DEVELOPMENT AND TIME SUCCESSION.

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Abstract:The sapropel sequence development of the Red and Eastern Mediterranean Seas display both the same lithofacies associations, recording similar paleoceanographic conditions.In contrast the B-lack and Marmara Seas sapropel sequence differs marketly recording the stagnation induced by the transition from a fresh water into a marine basin.

Résumé :Le developpement de la séquence sapropelle de la mer Rouge de la Mediteranné de l'Est, donne les mêmes associations lithophasiques, enregistrant les mêmes conditions paléoceanographiques. Inversement, la sêquence sapropelle de la Mer Noire de la Marmara diffère sensiblement,en enregistrant la stagnation provoquée par une transition depuis l' eau douce jusqu 'au bassin marin.

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Over the past 15000 years anoxic sea floor environment occured successively in the four adjacent landlocked marine basins of the Red, Eastern Mediterranean and Black Seas.As a result extensive organic rich layers,the so called sapropels,were deposited below the stratified waters.Detailed examination of 50 piston and gravity cores from the forementioned Seas revealed the remarkable petrologic variations of Late Quaternary organic rich layers.The sapropel sequence development(sensu stricto) in the Eastern Mediterranean and Red Seas should be reserved for the following succession(from base up) of marine lithofacies:grey hemipelagic mud,organic ooze,sapropel,organic ooze and oxidised layer.The sapropel lithofacies is characterised by a high (over 2%) organic carbon content and low carbonate carbon/organic carbon ratio;the other three types (organic ooze,oxidised layer and grey hemipelagic mud) have lower organic carbon content(0.5%) and show progressively higher carbonate carbon/organic carbon ratios.Some organic rich sequences,also emplaced by essentially suspension settling mechanisms have a lower(o.5 to 2%) organic carbon content.These termed sapropelic,can be correlative with true sapropels,and record

oxygen variations within the oxygen depleted water mass.
The sapropel sequence development in the Black Sea consists of a lacustrian sapropelic layer with organic carbon around 1%,a brackish sapropel layer which is divided into two units:a)A lower unit II, which is a sapropel lithofacies with organic carbon averaging over 10% and b)An upper unit I,which is also a sapropel lithofacies with around 5% organic carbon and carbonate rich.
An interesting sapropelic sequence exists in the sea of Marmara which connects the Eastern Mediterranean and the Black Seas.It consistsof: a)A lower sapropelic lithofacies deposited in a possible saline lacustrian environment with organic carbon batween 0.5-1%. b)A middle sapropelic unit deposited in lacustrian conditions with organic carbon around 1.5% and c)An upper gytja lithofacies with organic carbon between 0.5 and 1%,deposited in a non euxinic marine regime.
The succession of lithofacies types forming each sapropel sequence records the progressive oceanographic changes that influenced each basin:diminuation of oxygen in the deeper water masses;further detioration of oxygenation; complete anoxia throughout the basin; restoration of some oxygen in the water column; and rapid return of fully oxygenated conditions above the sea floor.Marked oxygen variations occurred laterally and with time during a single stagnation event. This is recorded by pronounced organic carbon variations within a sapropel lithofacies at any one location, and the concurrent deposition of both sapropel and sapropelic sequences in different parts of the basin.This latter is demonstrated by good stratigraphic control using numerous radiocarbon-dated sequences.These indicate that stagnation in the Red Sea ended around 12000BP and by that time the easternmost sector of the Eastern Mediterranean had become already stagnant.However it took over 2000 yrs for the stagnation to spread in the west Eastern Mediterranean and Aegean Seas.
All the discussed sapropel sequences were basically controlled by the influence of the fluctuating sea level on sea water; by the position and depth of each basin sills relative to sea level;and by the effect of the climate both on the hydrography of the basins and their catchment areas on the land.