Mediterranean sapropel formation; Preservation and palaeoceanography

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Precession-related deposition of eastern Mediterraneran sapropels are associated with humid climate conditions. The last of such 'humid periods' occurred from 10.4 to 5.7 kyr ^{14}C ago, simultaneous with the sustained wet period in the circum Mediterranean area. The end of this humid period coincides with a high peak of MnO_2. This peak in all 30 studied cores occurs in response to a relatively abrupt re-ventilation event at 5.7 kyr. Subsequently, oxygen continued to progressively move downward into the sapropel sediment thus removing organic C.and organic biomarkers. Such removal mechanism seriously affects the traditional interpretation based on palaeoproxies.

From a detailed study of the mechanisms of formation of sapropel S1 across the eastern Mediterranean basin as a function of time and water depth, we demonstrate that surface waters had a reduced salinity and concomitantly that the deep (> 1.8 km) eastern Mediterranean Sea was devoid of oxygen during 4,000 years of S1 formation. This has resulted in a differential basin-wide preservation of S1 determined by water depth, as a result of different ventilation/climate-related redox conditions above and below 1.8 km. Climate-induced stratification of the ocean may thus contribute to enhanced preservation of organic matter, ie to formation of sapropels (and potentially black shales)

Production flux of sea-spray aerosol

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Knowledge of the size- and composition-dependent production flux of primary sea-spray aerosol (SSA) particles and its dependence on environmental variables is required for modeling cloud microphysical properties and aerosol radiative influences, interpreting measurements of particulate matter in coastal areas and its relation to air quality, and evaluating rates of uptake and reactions of gases in sea-spray drops. The current status of the knowledge on the primary SSA production flux, mainly for particles with r_{80} (equilibrium radius at 80% relative humidity) less than 1 μm, has recently been reviewed by de Leeuw et al. (2011). These authors discussed the production of sea-spray particles and its dependence on controlling factors which have been investigated in laboratory studies that have examined the dependences on water temperature, salinity, and the presence of organics, and in field measurements with micrometeorological techniques that use newly developed fast optical particle sizers. Extensive measurements show that water-insoluble organic matter contributes substantially to the composition of SSA particles with r_{80} < 0.25 μm and in locations with high biological activity can be the dominant constituent. Order-of-magnitude variation remains in estimates of the size-dependent production flux per white area, the quantity central to formulations of the production flux based on the whitecap method. This variation indicates that the production flux may depend on quantities, such as the volume flux of air bubbles to the surface, that are not accounted for in current models. Variation in estimates of the whitecap fraction as a function of wind speed contributes additional, comparable uncertainty to production flux estimates.

de Leeuw et al. (2011) conclude that despite the many gains in understanding in recent years, the uncertainty in the SSA production flux remains sufficiently great that present knowledge of this quantity cannot usefully constrain the representation of emissions of SSA in chemical transport models or climate models that include aerosols. As a consequence it is not yet possible to improve the modeling of these emissions much beyond the current state of affairs which shows nearly two orders of magnitude spread in current estimates of global annual SSA emissions.