

Sedimentary condensation and authigenesis

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Most marine authigenic minerals form in sediments, which are subjected to condensation. Condensation processes lead to the formation of well individualized, extremely thin (< 1m) beds, which were accumulated during extremely long time periods (> 100ky), and which experienced authigenesis and the precipitation of glaucony, verdine, phosphate, iron and manganese oxyhydroxides, iron sulfide, carbonate and/or silica. They usually show complex internal stratigraphies, which result from an interplay of sediment accumulation, halts in sedimentation, sediment winnowing, erosion, reworking and bypass. They may include amalgamated faunas of different origin and age. Hardgrounds may be part of condensed beds and may embody strongly condensed beds by themselves. Sedimentary condensation is the result of a hydrodynamically active depositional regime, in which sediment accumulation, winnowing, erosion, reworking and bypass are processes, which alternate as a function of changes in the location and intensity of currents, and/or as the result of episodic high-energy events engendered by storms and gravity flow.

Sedimentary condensation has been and still is a widespread phenomenon in past and present-day oceans. The present-day distribution of glaucony and verdine-rich sediments on shelves and upper slopes, phosphate-rich sediments and phosphorite on outer shelves and upper slopes, ferromanganese crusts on slopes, seamounts and submarine plateaus, and ferromanganese nodules on abyssal seafloors is a good indication of the importance of condensation processes today. In the past, we may add the occurrence of oolitic ironstone, carbonate hardgrounds, and eventually also silica layers in banded iron formations as indicators of the importance of condensation processes. Besides their economic value, condensed sediments are useful both as a carrier of geochemical proxies of paleoceanographic and paleoenvironmental change, as well as the product of episodes of paleoceanographic and paleoenvironmental change themselves.