Masked evidence for terra rossa type soil formation on the Kimmeridgian platform of the Swiss Jura

Richard Waite[1], Daniel Marty[2] & André Strasser[1]

[1] Département de Géologie, Université de Fribourg, Ch. du Musée 6, CH-1700 Fribourg, Switzerland Email: richard.waite@unifr.ch

[2] Paléontologie A16, Section d'archéologie et paléontologie, Office de la culture, Hôtel des Halles, 2900 Porrentruy 2, Switzerland

A new hypothesis is proposed that attempts to explain the genesis of several key phenomena such as: mass accumulations of nerineoids and oysters, hardgrounds and marls as well as signs of emersion, that are so characteristic for the Kimmeridgian succession of the Swiss Jura Mountains. Based on circumstantial evidence from two different maximum flooding surfaces, masked evidence of emersion and soil formation has been identified.

During times of regression large parts of the Late Jurassic European carbonate platform emerged. Evidence for these recurrent periods of emergence in the form of dinosaur track-bearing intervals, tidal laminites, birdseyes, and beach lamination is abundant throughout the Kimmeridgian succession. The fresh water associated with these newly emerged areas initially dissolved the aragonitic components in the carbonate sediments and precipitated cements, thus leading to an early diagenetic consolidation. Following a new line of evidence for the genesis of terra rossa recently put forward by Merino and Banerjee (2008) and Meert et al. (in press), possible candidates for sub-soil rock surfaces are identified. Terra rossa is the typical soil-cover on carbonate rocks in Mediterranean type climate zones such as have been proposed for the Late Kimmeridgian (Abbink et al., 2001). Terra rossa soils have been shown to form principally by replacement of carbonate by authigenic clay minerals at a reaction front at the soil-rock interface. This process leads to corrosion and karstification of the underlying limestone. Due to the buffering effect of the carbonate, iron oxides and hydroxides are preserved, which encrust and impregnate the reaction front. By these means soils can accumulate with a speed of 25 cm / 10'000 years. These soils potentially permit a vegetation cover to become established on the emerged part of the platform, which in turn can sustain diverse populations of dinosaurs. Fossilized remains of this ancient flora, especially large pieces of wood, have lately been recovered from the lower Virgula marls near Porrentruy (Canton of Jura). Surfaces showing iron hydroxide impregnation, microkarst formation, dissolution of aragonitic components, corrosion, and negative excursions of the $\delta^{13}C$ and $\delta^{18}O$ isotope values due to the exposure to soil gas and fresh-water influence, respectively, are proposed to resemble the metasomatic front of the bedrock underlying these ancient terra rossa covers. These sequence-boundary deposits, however, are masked during the subsequent transgression. Rising sea level erodes the soil cover and vegetation, leaving only the iron-hydroxide impregnated and microkarstified bedrock in evidence. The previously consolidated rocks are consequently intensely bored and encrusted. The organic-rich soil is flushed into the shallow waters of the platform where it forms the food basis for the suspension-feeding nerineoids in the high-energy zone. The clays are washed past the high-energy zone and finally are deposited in the deeper parts of the platform where they form the food basis for the small oysters *Nanogyra* (BEURLEN, 1958), which are abundant in the conspicuous, dark, organic-rich Virgula marls.

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