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Soils on a sequence of eleven marine terraces in the Metaponto area, Gulf of Taranto, S Italy

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A staircase of Pleistocene marine terraces stretches with a width of about 25 km along the Gulf of Taranto, southern Italy. Different geomorphologists distinguished varying numbers of terraces in the area; this study refers to Brückner (1980) who mapped one Holocene and 11 Pleistocene terraces. Several chronologically relevant observations and some datings provide a rough chronological frame for the formation of the terrace sequence. The Brunhes/Matuyama boundary is located between the formation of the terraces T10 and T11, and a tephra layer in terrace T8 is attributed to an eruption of the Phlegraean Fields that took place 500-600 ka BP. Identification of Senegalese fauna in some places, e.g. Ponte del Re, provided evidence for the sea level during MIS 5.5. Several U series datings (Brückner, 1980) and OSL datings of Zander et al. (2003) provide age estimates for the lowermost terraces. Thus, the area offers a good opportunity to study soil development on Middle Pleistocene to Holocene marine terraces. Field observation suggests a general trend of progressive soil development with terrace elevation: Soils on the lower terraces T0 and T1 are weakly to moderately developed and have greyish- or yellowish-brown colours. Soils on the terraces T2 and T3 are more reddish, and some of the soils on the higher terraces, especially on T7, are deeply developed and red. More than 20 soil profiles have been analyzed in order to quantify clay formation and illuviation, and changes of soil chemical properties over time. Maximum Fed/Fet ratios of the soils have been plotted vs. assumed terrace age (based on the existing time pegs and interpolation). They show a strong increase in the first 100 ka slowing down afterwards. The ratio (Ca+Mg+K+Na)/Al, reflecting progressive mineral weathering and leaching of base cations, exhibits a rapid decrease in the younger soils which then slows down. However, soils on several terraces have Fed/Fet ratios below the curve that is based on the Fed/Fet maxima only. This can be explained (i) by erosion of the upper - most intensively developed - parts of these soils, (ii) by deposition of colluvial material on top of the soils at an early stage of soil formation, or (iii) by rejuvenation of the soils through dust input.

This study of soil development over a time-span of several hundred thousands of years thus shows on one hand changes of soil properties indicating progressive soil development; on the other hand, over this long time also other processes such as erosion, colluviation, in some places also loess accumulation need to be considered. It is obvious that soil development was not uniform over this time-span but underwent a number of glacial-interglacial cycles so that all soils (except for the two youngest ones) are polygenetic soils. In addition to the polygenetic nature of the soils, it has to be emphasized that the soils did not only experience different kinds of progressive soil development, but also "regressive" processes. The latter must be regarded as a part of soil development over such long time-spans.