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Human impact and Holocene climatic change in the archaeological site "Piani della Corona" (southwest Calabria, southern Italy)

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A pedoarchaeological study was carried out in the archaeological site "Piani della Corona", located on a wide terrace at 500 m a.s.l. along the southwestern coast of Calabria, in southern Italy. The archaeological excavations exhumed an extensive settlement related to old to medium Bronze Age phases and traces of late Neolithic human colonization. On the basis of archaeological finds the pedostratigraphic succession can be partly dated. It consists of soils with variable features and andic properties, which include yellowish-brown (in places more reddish), deep argillic (Bt) horizons with variable amounts of clay coatings in pores and dark brown infillings of soil material rich in organic matter, in places overlaid by thin, severely truncated, brown to dark brown, organic-mineral (A) horizons. These layers include late Neolithic ceramic artefacts (Diana style facies) and typical incineration burials found in biconical vases, that can be referred to 6500-5000 years BP. The prehistoric layers are widely overlaid and strongly superimposed by a paleosurface of the early to medium Bronze age. This surface is affected by many pole holes left by large rectangular, apsidal wooden huts (not preserved), ploughed furrows, excavated cisterns, ditches and trenches, often filled by organic-rich dark brown material. Also hearths with charcoal remains, burials, vases and other diagnostic ceramic fragments occur. The upper portion of the pedostratigraphic succession consists of thicker brown A horizons, that appear cyclically ploughed during historical times (archaeologically not well dated as a consequence of their reworking for agricultural practices), with abrupt irregular boundaries often entering the underlying horizons.

Micromorphological observations confirmed the presence of clay coatings within pores of Bt horizons, showing that they represent relict features (i.e. related to inactive illuvial processes, at present), as often fragmented and with smooth-banded to grainy extinction patterns between crossed polars. In A horizons, characterized by granular to dominant isotropic matrix some reddish-yellow, subrounded pedorelicts exhibiting fragments of clay coatings, occur, probably derived from the underlying Bt horizons. The occurrence of clay coatings suggests (pedo)climatic conditions characterized by high moisture availability and some seasonal contrast, enhanced by a warm and humid climate corresponding to the Neolithic climatic optimum pro parte. This period of geomorphic stability promoted important soil development. These conditions are supported by: (i) less developed andic properties, estimated with the ICOMAND index (based on oxalate-extracted Al and Fe content) and FT-IR spectroscopy in argillic horizons, indicative of low amounts of short-range order minerals (SROM); (ii) more abundant phyllosilicate clays (mainly halloysite and at a minor extent chlorite, smectite and illite) detected by X-ray diffractometry. Andic properties appear more developed in A horizons, where abundant SROM are associated with minor phyllosilicates. This feature suggests the occurrence of a regime with prolonged and seasonally poorly-contrasted moisture availability, promoting SROM formation rather than phyllosilicate clays. The variability of andic properties, phyllosilicate formation and illuvial pedofeatures with depth suggests climatic changes probably occurred at the transition from the Neolithic climatic optimum to the upper Holocene, after a period characterized by severe land degradation during the Bronze age, testified by soil erosion and human impact. This phase was presumably coupled with deforestation and agricultural practices, highlighted by truncation of late prehistoric fertile A horizons, once developed at surface under particularly suited climatic conditions and vegetation cover, but nowadays not completely preserved in situ. The eroded material likely represents the organic-rich filling of soil macropores in the argillic horizons and more extensively of ploughing furrows and artificial excavations. Also some micromorphological features such as occasional broken, subhorizontal, fine-silty coatings and the above pedorelicts can be interpreted as possible traces of irrigation and subsequent ploughing practices, in agreement with field evidence.