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PALEOSOLS, SOILS AND CLIMATE CHANGE

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Paleosols are an important source of information for documenting the changes that took place in the past, especially as regards the climate. In addition, they can be used in models that seek to predict how the earth's system will react in the future to the changing environmental conditions. A central objective of paleopedology is to reconstruct how the

climate changed during the geological eras.

A paleosol complex was found at Podere Renieri in Montalcino (Siena). About 40 m thick, it was formed during a series of continental episodes that began after marine sediments were deposited during the Pliocene starting at 4.8 My BP. The paleosol documents climate changes and soil formations that took place since the Lower Pliocene in central Italy, along the Mediterranean coast.

Podere Renieri's most characteristic soil horizons are those containing plinthite, a partially hardened soil rich in iron whose formation took place in a hot and humid climate over about 700,000 years during the Lower Pliocene. This soil formation was also greatly influenced by the geomorphological position of the paleosol, at that time located on an alluvial fan near the coast. The climate conditions during the Pliocene were much hotter and more humid than nowadays, and the time needed for plinthite formation was rather short, not more than one or two hundred thousand years. Podere Renieri's morphology of plinthite-containing horizons however shows that from the middle of the Lower Pliocene, rainfall started to give clear signs of seasonality as a result of the onset of a Mediterranean-type climate along the western coast of Italy. Later on, the soil was again covered by the sea that permanently withdrew during the middle Pliocene. The resulting clayey sediments, water erosion and different climate conditions during the Pleistocene and Holocene, on average increasingly hotter and more arid, resulted in thinner soils with salt-impregnated horizons (calcic, gypsiferous), that show clear signs of cuneiform (summit horizons) or polyhedral (cambic horizons) structurings.

The plinthite presence in some Montalcino soils has an important agronomic value for vineyards. The consistency of the plinthic horizons, in fact, limits root growth and reduces the risk of excessive heterosis, improving the quality of the grapes. The low nutrient level and the high content of iron and other metals are useful in the production of high-quality wine. Therefore, these plinthite-containing soils – very characteristic and excellent for vineyards – contribute to the typicity of the Brunello di Montalcino wine region.

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