

LOESS IN NORTHERN ITALY. NEW INSIGHTS ON DATING, ENVIRONMENT, AND ARCHAEOLOGY

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ABSTRACT: Cremaschi M. *et al.*, *Loess in Northern Italy. New insights on dating, environment, and archaeology.* (IT ISSN 0349-3356, 2011)

Age, sedimentation, soil forming processes, and geoarchaeological implication of the loess in Northern Italy are discussed on the basis of new OSL dating obtained at several key-sequences in the Apennine margin of the Po Plain and on the base of recent literature. The comparison of field data, soil properties, and luminescence ages offers a new perspective in studying the loess of the Po Plain during the MIS 4 to MIS 2.

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In questo contributo si discutono l'età, i processi sedimentari, di alterazione e le implicazioni geoarcheologiche del loess in Italia settentrionale, principalmente sulla base di nuove datazioni OSL su alcune sequenze chiave posizionate lungo il margine Appenninico della pianura del Po e di dati editi. Dal confronto tra evidenze di terreno, proprietà dei suoli e datazioni radiometriche emerge una nuova prospettiva di studio per i loess del bacino padano tra il MIS 4 e il MIS 2.

Key words: loess, Northern Italy, OSL dating, glacial phase, Mousterian culture.

Parole chiave: loess, Italia settentrionale, datazioni OSL, fase glaciale, cultura Mousteriana.

Loess deposits in Northern Italy are widespread, as in most of the circum-Mediterranean regions; they are typical of the Glacial Pleistocene ages (COUDÉ-GAUSSIN, 1990; CREMASCHI, 1990) and are related to poorly vegetated soil surfaces and dry climate (CREMASCHI, 1990). In Northern Italy loess occurs as thin sheets at the top of polygenetic paleosols, with the exception of few stratigraphic sequences (BUSACCA & CREMASCHI, 1998; RELLINI *et al.*, 2009). Furthermore, loess deposits are systematically associated with Middle Palaeolithic archaeological evidence, indicating that the loess belt surrounding the Po plain was densely occupied at that time, representing an ecosystem suitable for human life.

Recently, an effort has been made to explore different sources for radiometric dating (CREMASCHI *et al.*, 1987, 1990; FERRARO *et al.*, 2004; MARTINI *et al.*, 2001), which appears essential to face the wide range of questions involved in loess research (sedimentation, weathering, climate change, human behaviour). Radiocarbon dating (Fig. 1) was applied on chernozem-type horizons buried in loess (Val Sorda and Gajum) and in the anthropogenic fill of caves with a windblown silt component (Riparo Tagliente and Grotta di Fumane). Moreover, TL ages were obtained on fire-damaged flint artefacts buried into loess sequences (Ghiardo and Bagaggera sites). All the available ages indicate that the loess

sedimentation in Northern Italy begun during the MIS 4 and continued until the late MIS 2. Recent research in the Val Sorda sequence (Fig. 2) proved the suitability of loess for OSL and IRSL dating and provided results consistent with other chronometric indicators (FERRARO, 2009).

This paper presents some recent OSL dates performed on three soil profiles (Fig. 2) developed on loess and placed along the pede-Apennine, at Ghiardo Cave and Cavriago (RE) and at Borgetto (PR). Sampling sites are c. 40 km apart, although they belong to the same geomorphological position, represented by Pleistocene terraces. All profiles show the same sedimentological, pedological and geoarchaeological characteristics: a shallow layer of loess, up to 1 m thick which lies upon fluvial clay. In the loess a *Soil Lessive a pseudogley* (Haplic Udalf) is developed, displaying the horizons sequum: Ap, E, 2Bt, 2Bc. The underlying fluvial clay (3Bw, 3Ck horizons) has outstanding vertic properties and a mukkar-type microrelief. Mousterian artifacts (of Levallois technique) were found at the investigated sites, mostly buried in the 3 Bw and 2Bc horizons; the latter represents the buried topographic surface and the lithological discontinuity where later pedological processes precipitated Fe and Mn hydroxides as nodules and concretions.

Eight preliminary OSL dates were obtained, ranging from 47000 to 18000 years and covering

Site	Unit/Sample name	Age (years BP)	Lab-code	Method
Val Sorda	VS130-165	27.880 ± 600	R.1854	¹⁴ C
Val Sorda	VS 210-280	36.000 ± 5000	Oxford Labs	OSL
Gajum	Unit 3	40.830 +7820 -3890	Gx 14 028	¹⁴ C
Ghiardo	II B23 cn	61.000 ± 9000	Mi96-Gh1	TL
Ghiardello	II B22t	73.000 ± 11.000	Mi96-Gh2	TL
Bagaggera	III B23t	60.500 ± 7500	OXTL - 750 f	TL
Fumane cave	A4II	33.150 ± 600	Ox-6462 AMS	¹⁴ C
Fumane cave	A5	33.700 ± 600	Ox-6463 AMS	¹⁴ C
Fumane cave	A5+A6	38.250 ± 700	Ox-8023 AMS	¹⁴ C
Fumane cave	A6	34.950 ± 700	Ox-6464 AMS	¹⁴ C
Fumane cave	A6	50.000 ± 8.000	Mi97-Fu1	TL
Fumane cave	BR11	55.000 ± 7.000	Mi97-Fu2	TL
Tagliente shelter	t.12a	17.000 ± 3000	GL	TL
Tagliente shelter	t.39	54.000 ± 3000	GL	TL
Tagliente shelter	t.8-10	12.040 ± 170	R.371	¹⁴ C
Tagliente shelter	t.15-16	13.430 ± 180	R.605α	¹⁴ C

Fig. 1, Published radiocarbon, TL, and OSL dating results from several loess sequences located in Northern Italy (references in the text).

Datazioni al radiocarbonio, TL e OSL note in letteratura e ottenute in alcune sequenze di loess distribuite in Italia settentrionale (referenze bibliografiche riportate nel testo).

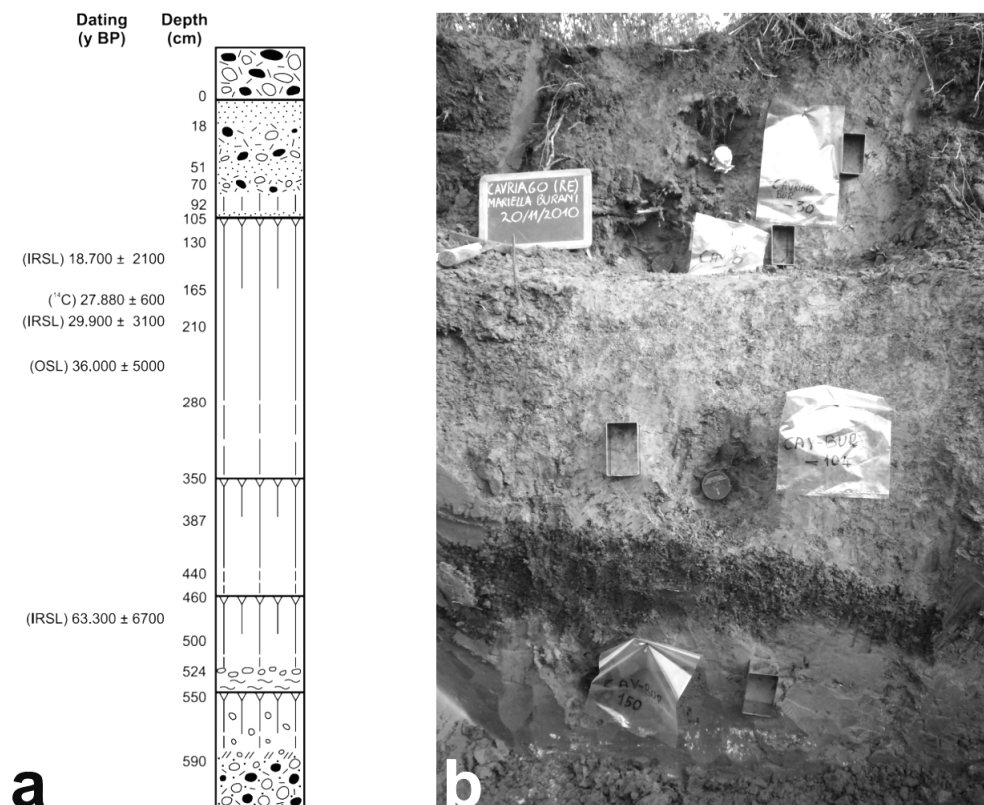


Fig. 2, (a) Stratigraphic section of Val Sorda site, indicating radiocarbon and luminescence dating results (modified, FERRARO, 2009). (b) Stratigraphic section at Cavriago, indicating the sampling points for OSL analyses.

(a) La sezione stratigrafica esposta presso la Val Sorda; i risultati di datazioni al radiocarbonio, OSL e IRSL sono indicati (modificata da FERRARO, 2009). (b) La sezione stratigrafica esposta presso Cavriago, con indicati i punti di campionamento per le datazioni OSL.

the whole chronologic interval between MIS 4 and MIS 2. These results have several consequences: i) they confirm an Upper Pleistocene age for the loess sheets covering the pede-Apennine terraces of the Po valley and allowing a correlation with the loess spread at the southern margin of the Alps (isolated terraces in the northern Po Plain, pede-Alpine terraces, sequences of the Garda moraine system, loess in the Lessini caves); ii) each profile shows a regular, progressive decrease in loess age toward its surface. This is indicative of a persistent accumulation of dust (decanting from the atmosphere). Evidence of syndepositional loess weathering – the development of a slow-rate aggrading cumulic soil – was detected in thin sections by microcharcoals and bioturbation and indicates a steppe environment affected by recurrent fire episodes. The syndepositional pedological features are obscured and partly erased by subsequent Holocene soil forming processes (clay illuviation, shrinking and swelling, hydromorphism; CREMASCHI, 1987, 2008). iii) The chronological difference between the burned flint tools (around 70000-60000 years) and on loess sediments (47000-18000 years) may indicate that Mousterian hunters settled the margin of the Apennine at the beginning of the MIS 4 in suitable environmental conditions, and later left the region, when a severe dry climate prevailed, leading to a stronger loess sedimentation .

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