

THE POLLEN FINGERPRINT OF THE LAST INTERGLACIAL IN THE SOUTH-EASTERN PO PLAIN

Fabio Fusco

LIPPIA, Pescara

Dip. di Scienze della Terra, Università di Firenze, Firenze

Corresponding author: F. Fusco <fabiomfusco@libero.it>

ABSTRACT: Fusco F., *The pollen fingerprint of the Last Interglacial in the south-eastern Po Plain*. (IT ISSN 0394-3356, 2011)

The Last Interglacial in the SE Po Plain can be recognized by: i) a forest dynamics of four distinct phases, *Corylus*->*Quercus*->*Carpinus*->*Fagus*; ii) continuous presence and maxima of *Zelkova* and evergreen *Quercus*; iii) *Quercus* at 75%. These features are not recorded during the preceding and the subsequent warm-temperate intervals, and can be considered as distinctive of the Last Interglacial in the SE Po Plain.

RIASSUNTO: Fusco F., L'impronta pollinica dell'Ultimo Interglaciale nell'area padana sud-orientale. (IT ISSN 0394-3356, 2011)

L'Ultimo Glaciale nel settore SE della Pianura Padana può essere riconosciuto da: i) una dinamica forestale suddivisa in quattro distinte fasi, *Corylus*->*Quercus*->*Carpinus*->*Fagus*; ii) dalla presenza continua e dai valori massimi di *Zelkova* e delle querce sempreverdi; *Quercus* al 75%. Tali tratti principali, non registrati negli intervalli caldo-temperati precedenti né in quelli successivi, possono essere considerati distintivi dell'Ultimo Interglaciale nella pianura romagnola.

Key words: pollen, Last Interglacial, Eemian, vegetation dynamics, *Fagus*.

Parole chiave: polline, Ultimo Interglaciale, Eemiano, dinamica vegetazionale, *Fagus*.

1. INTRODUCTION

The Po River Plain is one of the major alluvial plain of Europe and it was densely drilled in the last years for the geological mapping project of Italy to scale 1:50.000 (CARG Project).

As part of this huge project, the Geological Survey of Regione Emilia-Romagna extensively drilled the Late Quaternary deposits of the SE Po Plain.

In the last years, a number of works concerning pollen (e.g., Fusco, 1999), foraminifers, ostracods, radiocronologic and sedimentological data and their integration in a reliable chronostratigraphic framework (e.g., AMOROSI *et al.*, 2004; AMOROSI & COLALONGO, 2005; Notes to F° 222, 223, 240, 256 of CARG project, and references therein) documents the depositional history, the stratigraphic architecture and the palaeoclimatic evolution of the Romagna plain over the last 150 ky, suggesting that Late Quaternary sedimentation in the eastern Po Plain developed under a predominantly glacio-eustatic control. A cyclic sedimentation pattern (including continental, coastal and shallow-marine deposits) defines two transgressive-regressive sequences, deposited over the last two climatic cycles.

The vegetation dynamics within the Last Interglacial (~MIS 5e), a time interval poorly investigated in the Po Plain, and the subsequent substages (MIS 5d-5a) is here reconstructed on the base of the detailed pollen diagrams from three

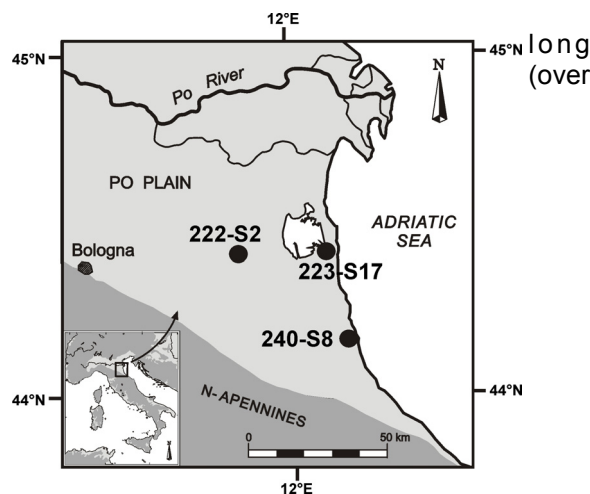


Fig. 1, Location map of the boreholes.
Ubicazione dei sondaggi.

150m) and continuously cored boreholes, labelled 223-S17, 240-S8 and 222-S2. (Fig.1). In this extended abstract, only the pollen diagram from core 223-S17 is shown. Pollen diagrams from cores S2 and S8 are not figured because they are similar to that of S17.

2. RESULTS AND DISCUSSION

The pollen diagram of core 223-S17 (Fig. 2) shows two opposite pollen associations which testify two extreme vegetation landscapes:

- a non-forested (steppic) panorama, as the

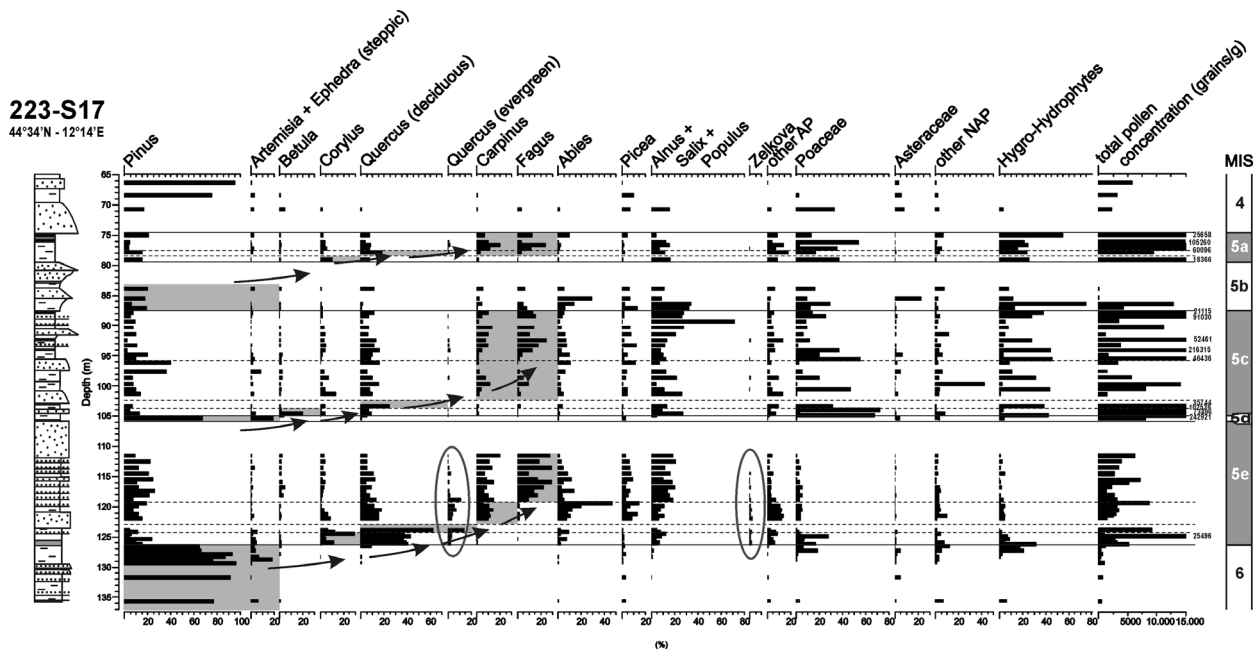


Fig. 2, Core 223-S17: pollen diagram of selected taxa for the Last Interglacial (Eemian, MIS 5e) and subsequent stadials and interstadials. The pollen "fingerprint" of the Last Interglacial is given by: a clear forest dynamics in four phases (*Corylus*->*Quercus*->*Carpinus*->*Fagus*); *Quercus* culmination at ~70%; the spread of *Fagus* (~25%); the continuous presence and the relative abundance of *Zelkova* and evergreen *Quercus* (in circles)

Sondaggio 223-S17: diagramma pollinico dei principali taxa per l'Ultimo Interglaciare (Eemiano, MIS 5e) e i successivi stadiali ed interstadiali. L'impronta pollinica dell'Ultimo Interglaciare è data da: una chiara dinamica forestale in quattro fasi (*Corylus*->*Quercus*->*Carpinus*->*Fagus*); la culminazione di *Quercus* a ~70%; la diffusione di *Fagus* (~25%); la presenza continua e la relativa abbondanza di *Zelkova* e delle querce sempreverdi (nei cerchi)

response of the vegetation to glacial (or stadial) climate, characterized by dominance of *Pinus*, with bushes (*Artemisia* and *Ephedra*), non-arboreal elements, scarcity of trees, low floristic diversity, and low total pollen concentrations;

- a forested landscape (dominance of AP) due to warm-temperate (interglacial or interstadial) climate, characterized by high number of arboreal taxa, high floristic diversity, strong reduction of *Pinus* and NAP.

The marked expansion of forests during the last Interglacial is followed by two minor forest development referred to interstadials 5c and 5a. Analogue vegetation dynamics occurs in core 240-S8 and 222-S2.

During these interstadials, in S17 Poaceae and hygro-hydrophytes (mainly Cyperaceae) spread markedly, when humid environments, to which they are linked, progressively reached the SE Po Plain in their migration northwards as a result of marine transgression.

2.1 The pollen fingerprint of the Last Interglacial (Eemian) in the SE Po Plain

A very interesting forest dynamics, composed of four phases, characterizes the Last Interglacial:

- a) *Corylus* (hazel) phase, at the beginnings of the interglacial, with deciduous *Quercus* (oak) at high

values (not maxima), with appearance of other (not all) warm-temperate trees;

- b) *Quercus* (oak) phase, during which both deciduous and evergreen oaks attain their maxima (~75%).

- c) *Carpinus t. betulus* (hornbeam) phase, during which *Carpinus* appears and spreads. *Quercus* decreases. *Picea* (spruce) and *Abies* (fir) are at high percentages. The most marked peak of *Abies* occurs at the end of this phase.

- d) *Fagus* (beech) phase, with *Fagus* at ~25% on average, indicating its local spread over the plain from the back relieves. *Carpinus* does not vary its values. *Quercus* decreases.

It is furthermore noteworthy the continuous and relative maxima of evergreen *Quercus* and *Zelkova*, taxa never abundant in Late Quaternary pollen profiles from N-Italy.

These peculiar pollen features are also recorded in S8 and S2 cores and they will never repeat in the subsequent warm-temperate intervals, making the Last Interglacial distinguishable from the succeeding interstadials.

2.3 The presence of *Fagus* in the Last Interglacial

It is well known that *Fagus* is virtually absent in pollen profiles of Central and Mediterranean

Europe during the Last Interglacial. When recorded in some sites, pollen of *Fagus* occurs discontinuously and limited to very low percentages, as at Azzano Decimo (NE-Italy, PINI *et al.*, 2009). At Valle di Castiglione (Central Italy) *Fagus* is continuously present, but its values are again very low (FOLLIERI *et al.*, 1988). *Fagus* becomes abundant later on.

By contrast, *Fagus* spread over the SE Po Plain during the final phase of the Last Interglacial with high values (~25% on average), which testify its presence *in situ*. This occurrence is surprising even if it is not isolated in Italy: at Venice (MULLENDERS *et al.*, 1996), *Fagus* is recorded in the pollen zone referred to Eemian (zone 14) at ~10% on average with peak of ~25%, consistently with core S17 and S8. At Mt. Amiata *Fagus* is abundant (over 30%) in a warm interval referred to the Riss/Würm Interglacial (=Eemian) by U/Th datings (BERTOLANI MARCHETTI & SOLETTI, 1972). In core S2 the *Fagus*-phase is absent because the pollen registration is truncated by a sand interval. High percentages and local occurrence of a beech forest could indicate the presence of a refuge area for the beech in the SE Po Plain.

3.3 The post-Interglacial

At S17, a thick deposit of regressive sands abruptly concludes the *Fagus*-phase and, consequently, the Last Interglacial.

Successively, the spread of shrubby-herbaceous communities with *Pinus* and steppic elements signs the return to cold climatic conditions (MIS 5d). All warm-temperate trees disappear.

A development of temperate forests is again exhibited during 5c and 5a interstadials. Forest dynamics is here characterized by the spread of warm-temperate trees, weaker than the preceding interglacial, and parallel profiles of *Fagus* and *Carpinus* which are joined in a common phase. *Quercus* does not display marked peaks whereas *Zelkova* and evergreen *Quercus* are discontinuous and scarce.

In core S17 an unexpected re-diffusion of *Pinus* with *Artemisia* is recorded within the 5c Interstadial

suggesting the onset of a brief cooling episode possibly reportable to the Montaignu event.

3. CONCLUSIONS

The development of the Last Interglacial in the SE Po Plain is characterized by a series of peculiar pollen aspects which make this warm period distinguishable from a palynological viewpoint. The unexpected presence of *Fagus* in the Last Interglacial is a very interesting occurrence which makes this area a possible refuge area.

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