



A.D. 1308
unipg
DIPARTIMENTO
DI FISICA E GEOLOGIA

PhD in Earth System and Global Changes

*Seminar
Cycle 2022*

Giorgio Basilici, Luca Colombera, Marcus Vinícius Theodoro Soares, Oscar Javier Arévalo, Nigel Philip Mountney, Paolo Lorenzoni, Carlos Roberto de Souza Filho, Áquila Ferreira Mesquita, Juraj Janočko

Variations from dry to aquatic conditions in vertisols: a late Paleocene climate change (Esplugafreda Formation, eastern Pyrenees, Spain)

Sedimentological studies of ancient fluvial systems commonly do not consider in detail palaeopedogenised flood plain deposits. This is the case of the upper Paleocene Esplugafreda Formation (Pyrenees, Spain), a 100-340 m thick alluvial succession, in which palaeosols represent more than 80% of its thickness. This unit closely predates the climate crisis of the Paleocene/Eocene transition, the PETM (Paleocene/Eocene thermal maximum). The purpose of this paper is to define the palaeoenvironmental conditions of formation of these palaeosols, and to establish possible changes during the late Paleocene directly prior to the onset of the PETM. This paper analyses the palaeosols in terms of variations in so-called 'aquic conditions', concerning to water saturation, reduction and formation of redoximorphic features in soils.

The uppermost part of the Esplugafreda Formation consists of cumulative sandy mudstone palaeosols, laterally associated with sparse channel deposits. Two pedotypes were recognised: Pont d'Orrit and Areny. A mud content >60% (mainly montmorillonite), slickensides, wedge-shaped aggregates, mukkaras and blow structures indicate that both pedotypes belong to the Vertisol order. They reveal a climate characterised by strong seasonal moisture variations. The Pont d'Orrit pedotype, which dominates the lower portion of the succession, shows reddish brown horizons (Bss), calcareous nodules concentration (Bssk horizon) and scarce redoximorphic features, which indicate a semi-arid climate. The Areny pedotype, which prevails in the upper part, shows a yellow horizon (Bssg) containing goethite and abundant redoximorphic features, which reveal aquatic conditions. There is no clear sedimentological evidence that river flooding became relatively more frequent in the upper part of the succession, suggesting that the aquatic conditions were caused by an increase in precipitation. This study demonstrates that (i) changes in some pedogenic features within the Vertisols enable interpretation of palaeoenvironmental variations and (ii) this region experienced a changing climate in the late Paleocene, before the onset of the PETM.

What's a flipped conference?

It is an 'inverted conference' where, on the basis of a plot, **a discussion develops between the participants and the lecturer**. In practice, the development of the conference is **driven by curiosity, interest, questions and discussions** between the participants and the lecturer and among the participants, to the point that the lecturer can listen for a long time.

Although this English terminology is commonly used, this system is not invented by the Anglo-Saxon community but is much older. It was, for example, used by Pitagora in his School in Metaponto.

This system avoids the boredom of conferences, generates interest and knowledge in the participating audience.