

The continental Cretaceous-Paleogene transition from the southern Pyrenees: magnetostratigraphy and vertebrate succession correlations

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The successions spanning the Cretaceous-Paleogene (K/Pg) boundary in the southcentral Pyrenees record a general regressive trend evidenced by the succession of marine (Arén Formation), transitional (Grey unit of the Tremp Formation) and terrestrial facies (Lower Red unit, Vallcebre Limestone and Upper Red unit of the Tremp Formation). Therefore, this area allows to explore the Late Cretaceous extinction patterns in the terrestrial environments. The aim here is to correlate the Isona section from the Tremp basin (south-central Pyrenees) with the previously studied Vallcebre section (Oms et al, 2004) located further to the east. In addition, correlations can also be proposed to other extra regional sections (Provence, northern Pyrenees etc.).

The charophyte succession and magnetostratigraphy indicates that the K/Pg boundary is located at the base of the Vallcebre Limestones, as also indicated by stable isotope data from Fontllonga section in the Ager valley (López-Martínez et al, 1998). Sedimentology indicates a progressive regression from marine through lagoonal to entirely continental environment along the entire Maastrichtian. The Vallcebre section is dominated by mudstones deposited under low energy conditions, while the Isona section incorporates more sandstone and conglomerate levels. In both cases, a basin-wide regression maximum is recorded close to the K/Pg boundary as it happens in the Provence sections. This regression maximum is marked by the input of coarse-grained (alluvial) sediments that record a dramatic change in the landscape (mud plains evolved to sandy floodplains deposited by high-energy currents). This coarse grained rapid input suggests that an abrupt paleoenvironmental change took place in the continental basins of southwestern Europe just predating the K/Pg event.

Although the presence-absence of dinosaur remains may not be considered a robust evidence, it becomes useful when constraining the location of the K/Pg boundary (particularly ichnites, which are an evidence that rules out reworking). Hundreds of levels with dinosaur fossils are found in the studied sections (footprints, bones and particularly eggshells). An accurate vertical location of these sites along the studied stratigraphy reveals that no dinosaur fossil is found above the coarse-grained levels (as it happens in the French sections). The stratigraphically highest dinosaur remains are the ornithomimid footprints and bones found in these coarse levels close the K/Pg boundary. Thus, a constraint in the location of the K/Pg boundary can be addressed by the last occurrence of dinosaurs.

In order to correlate the Isona section with the Vallcebre and Fontllonga sections, we have undertaken a magnetostratigraphic study and a vertebrate fauna prospection. Several dinosaur sites (i.e., Costa Roia and Barranc de Guixers localities) have been found in the upper part of the Lower Red unit. Although the paleomagnetic signal from sediments in the Tremp basin is not yet fully understood some magnetostratigraphic constraints along the Isona section can be made and a tentative correlation to Vallcebre can be made. The general polarity pattern from the Tremp basin matches the correlation with the Vallcebre and Fontllonga magnetostratigraphy and stratigraphy.

The general integration of the southpyrenean record is leading to the understanding of terrestrial environmental changes in SW Europe around the K/Pg boundary event.

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