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Evaluation of the intended Givetian (Middle Devonian) Substages subdivision in the Spanish Central Pyrenees

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After a successful investigation in many regions globally distributed, the International Subcommittee on Devonian Stratigraphy (SDS) formally voted the definition of Givetian substages in 2007. This subdivision is based in the conodont zonal scheme that has been achieved after more than 30 years of intense research in many areas worldwide. However, data from Spain were not considered (as they were not available in enough detail at that time) in this decision. Therefore, a detailed study of key Spanish sections for testing the applicability of the intended subdivision in Spain was undertaken. The purpose of this report is, thus, to present the state-of-the-art regarding the Givetian conodont sequence from one Spanish key region (the Central Pyrenees) and to correlate this sequence with the globally established as standard.

After the SDS formal Givetian sub-stage ballot, this stage is subdivided into three sub-stages, Lower, Middle and Upper Givetian respectively. The base of the Lower Givetian coincides with the base of the Givetian, which is defined by the entry of the conodont *Polygnathus hemiansatus*. The Middle Givetian starts at the base of the *rhenanus/varcus* Zone. The base of the Upper Givetian coincides with the beginning of the *hermanni* Zone.

The Spanish sequence studied herein is compiled from five relevant sections that stretch between the Esera and Segre rivers (about 100 km along W-E strike) and comprises two of the main sub-facies areas of the Pyrenean southern facies.

The entry of *P. hemiansatus* in section Renanué (LIAO *et al.* 2008) permits precise location of the Eifelian/Givetian boundary and, consequently, of the Lower Givetian base. The second Givetian zone, the *timorensis* zone, is identified in several Pyrenean sections.

The entry of *P. rhenanus* allows identification of the Middle Givetian base. The taxon is recorded in the Renanué, Compte, La Guardia d'Ares and Villech sections (LIAO *et al.* 2008, LIAO & VALENZUELA-RÍOS 2008, GOUWY 2010), although the record in the latter section is delayed as its first occurrence is within the overlying *ansatus* Zone. The *ansatus* Zone is recorded in all sections. In the upper half of this zone a radiation of *Tortodus* is documented. The upper zone of the Middle Givetian, the *semialternans/latifossatus* zone is identified by the entry of the nominal taxa in Villech and Compte sections; in the other sections the conodont association and its stratigraphical position permits its recognition.

The appearance of *Schmidtnognathus hermanni* defines the Upper Givetian; the record of *P. cristatus ectypus* permits recognition of its two-fold subdivision (LIAO & VALENZUELA-RÍOS 2008). The sequential entries of *Klapperina disparilis* and *P. dengleri* warrants identification of the *disparilis* zone and of its further subdivision into two parts in most of the Pyrenean sections. The entry of *Skelethognathus norrisi* in all sections identifies the latest Givetian LIAO *et al.* 2008, LIAO & VALENZUELA-RÍOS 2008, GOUWY 2010).

The compiled Pyrenean conodont sequence is comparable with the standard succession document in other parts of the world. The successive entry of key index taxa permits identification of the intended three-fold subdivision of the Givetian Stage and supports this proposal.

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