Graptolite-rich Ordovician-Silurian boundary and Rhuddanian reference section in the south-central Pyrenees, Spain: stratigraphy and correlation

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Abstract

An Ordovician–Silurian boundary section described from the south-central Pyrenees of Spain, comprises the uppermost part of the quartzite-dominated Bar Formation and overlying black shales of late Hirnantian and Rhuddanian age which have been dated by graptolites to the *Metabolograptus parvulus* (upper *Metabolograptus persculptus*), *Akidograptus ascensus–Parakidograptus acuminatus* and *Cystograptus vesiculosus* biozones. The structurally simple Estana section is remarkable by an uninterrupted, relatively high rate black-shale sedimentation and abundant, diverse graptolites. The succession of graptolite assemblages and occurrence of several cosmopolitan taxa in its *parvulus* and lower *ascensus–acuminatus* biozones that are unknown elsewhere in peri-Gondwanan Europe suggest that strata immediately surrounding the O–S boundary are either absent, highly condensed, or oxic and barren of graptolites in many other sections of north-western peri-Gondwana. The whole succession of uni-biserial dimorphograptids (*Dimorphograptus elongatus*, *Dim. extenuatus*, *Bulmanograptus swanstoni/confertus*, *Bul. decussatus*, *Bul.? compactus*), associated with successive appearances of early monograptids (*Coronograptus praematurus*, *Atavograptus atavus*, *Huttagraptus acinaces*) is preserved in the *vesiculosus* Biozone. *Atavograptus atavus* and *Huttagraptus acinaces* subzones of the *vesiculosus* Biozone are recognized in the Estana section. Present succession is well correlatable with that described from Scotland and elsewhere in the UK. Absence of the former subzone in Bohemian sections, however, accounts for another, although less widespread gap in Rhuddanian black-shale sedimentation.

Keywords: Ordovician, Silurian boundary, graptolites, stratigraphy, Spain

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