

LETTER TO THE EDITOR

Sir,

Having had an opportunity to read the interesting paper on "Molasse and Clastic-Wedge sediments of the southern Cantabrian Mountains (NW Spain) as geomorphological and environmental indicators" by J.D. de Jong (*Geologie en Mijnbouw*, 50 (3), pp. 399-416), I have regretfully noticed a number of inaccuracies in the stratigraphic account on the Carboniferous, which should be pointed out before they have a chance to become established in the literature on an area which is currently receiving a good deal of attention.

In describing the Carboniferous molasse sediments reference is made to "the main or Asturian orogenic phase, which occurred at the beginning or during the Westphalian D" (*op. cit.*, p. 400). This statement is misleading on two counts. First of all the Asturian phase has been dated as intra-Stephanian, and post-Asturian deposits range in age from late Stephanian A to early Stephanian C. Secondly, the earlier Leonian phase took place in late Westphalian D times, and nowhere in the Cantabrian Chain have orogenic movements been recorded of early Westphalian D age. The dating of the orogenic events in the Cantabrian Mountains is well substantiated and there is no factual reason for de Jong's incorrect statement as quoted above. De Jong further refers to "sediments of the Cea Group, representing the molasse phase in the history of the Cantabrian Mountains" which "were deposited during the Westphalian D and the Stephanian, mainly in intramontane basins" (*loc. cit.*). Reasons have been given (Wagner 1970, p. 451) for regarding the Cea Group as an unsatisfactory concept, since it combines two completely unrelated post-orogenic successions of strata which are post-Leonian (late Westphalian D to Stephanian A) and post-Asturian (late Stephanian A to Stephanian C), respectively. Each of these successions may be up to 5,000 metres thick (and not the combined sequence as de Jong states on his page 400). Detailed stratigraphic studies exist to provide evidence of marine

and paralic facies for the post-Leonian succession and an almost exclusively non-marine, fluvial, lacustrine, swamp and river overbank facies with extremely rare brackish indications for the post-Asturian succession. Reading the account published by J.D. de Jong, one obtains the impression that his description of the Cea Group refers almost entirely to the post-Leonian succession.

De Jong (*op. cit.*, p. 401) states that these rocks were deposited in intramontane basins. The use of the plural (basins) is contrary to the factual information on both the post-Leonian and the post-Asturian successions in the Cantabrian Chain. Although rather spectacular valley fill deposits are found at the base of both sequences (Wagner 1966, 1970; Corrales & Pelaez 1968), which thus show sediments of local origin, the subsequent development of these successions indicates the presence of a single basin at any one time. For both post-orogenic successions the basin was situated at the foot of rising mountains, but it cannot be described as intramontane. The post-Leonian basin was primarily marine and only coincided in part with the non-marine coastal plain. The post-Asturian basin fully coincided with the coastal plain.

Depending on the area studied within the general region covered by the basin, the post-Leonian strata are almost entirely marine, with rare continental intercalations, or may show a more evenly mixed character with a predominance of continental strata only in the first thousand metres approximately (e.g. the Tejerina area studied by Wagner, Villegas & Fonollá 1969). There is no justification for de Jong's statement (*op. cit.*, p. 400) that "marine intercalations never take an important share of the total thickness of the sediments".

It is perhaps of no great moment that de Jong (*op. cit.*, p. 401) refers to Oele & Mabeoone's work (1963) as dealing with Stephanian B+C strata, whereas, in fact, late Westphalian D strata were the subject of their investigation.

Finally, the present writer's introduction of a Cantabrian Stage is referred to by de Jong (op. cit., p. 401) as a stage "to be distinguished from the Stephanian". Since this stage has been introduced (and recently accepted by the I.U.G.S. Subcommittee on Carboniferous Stratigraphy) as the basal stage of the Stephanian Series, it appears that de Jong has misread the title of a paper called "Proposal for the recognition of a new "Cantabrian" Stage at the base of the Stephanian Series" (Wagner 1969). In this paper (p. 149), it is clearly stated that "the Cantabrian could be the first (lowest) stage of the Stephanian Series".

It is regrettable that the summary provided by de Jong on the late Carboniferous sediments in Northwest Spain is so inaccurate as to be misleading, particularly since the stratigraphic history of these rocks in combination with their sedimentological characteristics add up to a fascinating story of post-orogenic basin development which is repeated with significant variants after the two different tectonic phases, Leonian and Asturian. The stated inaccuracies detract from a paper which is welcomed for the new information it provides on Permian, Triassic and Cretaceous sediments in the Cantabrian Chain.

Yours, etc.
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