ISOTOPIC DATING OF GLAUCONITES FROM THE UPPER CRETACEOUS IN NETHERLANDS AND BELGIAN LIMBURG, 1: REPLY TO THE COMMENTS BY G.S. ODIN.

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When using glauconites for isotopic dating, Odin emphasises the necessity of sedimentological investigation of the glauconitiferous deposits, while he also recommends the use of X-ray diffractometry for the selection of glauconites suitable for dating. The main purpose of the sedimentological study is to decide whether the glauconite is really authigenic and not reworked material. The X-ray analyses enables the selection of "true" glauconites containing a sufficient amount (at least 7% according to Odin) of K_2O, coupled with a low percentage of smectitic layers.

We do not reject such a sedimentological approach, but one also can work the other way round. The biostratigraphy of the Cretaceous sediments in southern Limburg is very well known, and it was primarily the purpose of our reconnaissance investigation to find out how the glauconite K-Ar ages of different horizons fit into this biostratigraphic column. Regarding our comparison of the glauconite dates in their relation to the Limburgian biostratigraphical column with Obradovich & Cobban's time-scale based on sedimentary sequences in the U.S.A., it is a simple statement of facts that our K-Ar dates appear to fit remarkably well into that time-scale. It is certainly true that the Cretaceous strata in northern America cannot be correlated precisely on the basis of fossils with the European sequence, but this makes a comparison of many stratigraphically well defined isotopic age data the more desirable.

No specialistic sedimentological investigations relevant to the problem of the authigenic versus reworked origin of the glauconites in the Cretaceous of southern Limburg have been made so far. However, this should not discourage a reconnaissance investigation of the K-Ar dates of the glauconites. If the investigation would have included glauconites reworked from significantly older deposits, this would surely have shown up in the results in relation to their position in the biostratigraphic column. This does not appear to be the case.

Regarding the procedure to select suitable glauconites by means of X-ray diffractometry, the same criterion is obtained by potassium determinations. If potassium analyses are easily made (as is the case in our laboratory), X-ray investigations are not an imperative necessity, although, of course, they can be most helpful in the interpretation of possible deviating K-Ar dates. Besides, none of our glauconites has a suspiciously low potassium content.

Processes of argon loss and/or potassium adsorption have been invoked by several investigators in order to explain anomalously low ages. We agree with Odin that in the Cretaceous deposits of southern Limburg the temperature apparently never became high enough to induce diffusive losses of argon from the glauconites. But we feel that adsorption of potassium is not an improbable process. All glauconite pellets, even of the best quality following Odin's criteria, contain some smectitic material, and smectite, like all clay minerals, easily can adsorb potassium by processes of ion exchange.

Finally, regarding Odin's recommendation to calibrate our flame photometry and mass spectrometric system with the inter-laboratory glauconite standard GL-O, even the most superior glauconite is definitely not the best material to calibrate mass-spectrometer or flame photometer systems!

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