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Characterization of conodont biostratigraphy in the basal Moscovian boundary interval at the Naqing section, Loudian, Guizhou, South China

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A major criterion for selecting a Global Stratotype Section and Point (GSSP) is to demonstrate depositional continuity. Depositional continuity is most often accepted where there is a transitional morphocline from an ancestral species to its descendent. The GSSP is then selected to correspond with the phylogenetic first occurrence of the descendent species. Ideally, strata elsewhere are subsequently correlated with the GSSP using the local first appearance of the descendent species, or by other taxa associated with the GSSP providing supplementary biostratigraphic data. Any other stratigraphic methods can be used for correlation once the GSSP has been ratified by the International Union of Geological Sciences Commission on Stratigraphy.

Multiple conodont lineages with complete transitional morphologies characterize the Bashkirian-Moscovian boundary interval in the Naqing section. The presence of all these chronoclines through the section demonstrates depositional continuity at Naqing, and provides numerous possible conodont-based levels available for selecting a basal Moscovian GSSP. The one that best matches the basal Moscovian in its type region, and with the greatest potential for intercontinental correlation, is the phylogenetic first occurrence of *Diplognathodus ellesmerensis*. *Declinognathodus* and *Idiognathoides* are very abundant in the Naqing section, species of which are used for Bashkirian and Moscovian biostratigraphy in Europe. Additional chronoclines occur at Naqing between species of “*Streptognathodus*,” *Neognathodus*, *Idiognathodus*, *Gondolella*, and *Mesogondolella*. The section has complete bed-by-bed exposure of strata that represent open marine depositional environments. Conodont diversity is high, and every bed in the boundary interval has been productive.

Another criterion considered when selecting a GSSP is minimized disruption of current concepts. Recent suggestions to shift the base of the Moscovian Stage up by a substage, to the first occurrence of *N. bothrops*, would be fraught with complications. Not only would it be an unnecessary major change in concept, but the taxonomy and paleobiogeography of *Neognathodus* species are poorly understood. *Neognathodus* evolved through heterochrony, producing two significant identification problems for international correlation. One is erroneous comparison of specimens at different ontogenetic stages. The other is many homeomorphic species that occur throughout its range. Both have caused numerous misidentifications in past research. Only now are we beginning to understand that *Neognathodus* species often appear in a different succession in different localities.

Diplognathodus ellesmerensis is easily recognized and has been recovered from Asia, Europe, boreal Canada, and North and South America—making it one of the most widely recovered conodonts in the Upper Carboniferous. Notably, it is found in the basal marine units of the type Moscovian. An ancestral form with many of the characters of *D. ellesmerensis* occurs at Naqing. The continuous, diverse conodont faunas at Naqing would enhance correlation of any GSSP definition. And because *D. ellesmerensis* is found worldwide, its evolutionary first occurrence would provide an almost ideal GSSP to define the base of the international Moscovian Stage.

