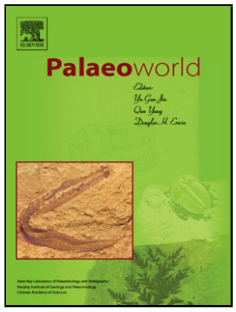

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The first megafossil record of *Goniophlebium* (Polypodiaceae) from the Middle Miocene of Asia and its paleoecological implications

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Abstract

The first megafossil record of *Goniophlebium macrosorum* Xu et Zhou n. sp., is described from the Middle Miocene Climate Optimum (MMCO) (15.2–16.5 Ma) sediments in Wenshan, southeastern Yunnan, China. The fossils are with well-preserved leaf pinnae and *in situ* spores, and are represented by pinnatifid fronds and crenate pinna margins, with oval sori almost covering 3/5 area of areolae on each side of the main costa. *In situ* spores have verrucate outer ornamentation, and are elliptical in polar view and bean-shaped in equatorial view. The venation is characterized by anastomosing veins with simple included veinlets forming 2-3 order pentagonal areolae. All these morphological characters confirm the assignment of this species to the genus *Goniophlebium* (Polypodiaceae), now is distributed in southeastern Asia to Australia. Among living species, *G. macrosorum* shows the closest morphological affinity to the extant *G. subamoenum*. The discovery of *G. macrosorum* suggests that *Goniophlebium* occurred in this region no later than the Middle Miocene. Moreover, the result of this study is consistent with the paleoenvironment of Wenshan flora as reconstructed in previous research, which concluded that modern evergreen broadleaved forests with