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Miocene Oaks from Eastern Zhejiang, China and their Paleoenvironmental Significance

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The intertrappean fluvial-lacustrine beds belonging to the Upper Miocene Shengxian Formation in eastern China contain many exquisitely preserved plant fossils, e.g., leaves, fruits and seeds as well as plentiful pollen. The Fagaceae is the dominant taxon represented by 5 genera and 15 species, four of which belong to Quercus subgenus Cyclobalanopsis.

Quercus species (oaks) are highly sensitive to environmental changes. The correlation between climate and trichome base density of Quercus glauca and Quercus delavayi of subg. Cyclobalanopsis, which are the NLRs of two fossil species, Quercus paraglauca and Quercus aff. delavayi, indicates that the trichome base density of Quercus glauca is comprehensively affected by various climate factors, but most influenced by solar radiation and latitude. The trichome base parametrics of Quercus paraglauca and the comparison of epidermal cell characteristics between Quercus paraglauca and Quercus aff. delavayi and their NLR species of subg. Cyclobalanopsis, show that the climate was warmer and more humid in the late Miocene than that of today in eastern Zhejiang, China. A study of the stomatal index of Quercus glauca and Quercus delavayi, collected in different years, demonstrates that they are very sensitive to the variation of atmospheric CO_2 concentration. By comparing the stomatal ratio between the two fossil species and their NLRs, the paleoatmospheric CO_2 concentration in the late Miocene is reconstructed as ca. 400 ppmv, i.e. higher than the present natural CO_2 concentration eliminating the industrial influence.