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Did the rise of highly-transpiring angiosperms influenced Cretaceous climate ? A modelling approach with the IPSL atmosphere-land surface model.

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The Cretaceous angiosperm radiation was a major event for terrestrial plant evolution, and flowering plants represent more than 94 % of present-day plant diversity. The fossil record shows that angiosperm leaf vein densities reached particularly high values (> 12 mm/mm^2) between the Albian and the Cenomanian (108–94 Ma) compared to gymnosperms (~ 2.5 mm/mm^2). Empirical models also suggest that stomatal conductance to water vapour increases as a response to higher leaf vein densities. How much do this shift to higher values of stomatal conductance have modified the continental transpiration budget, and ultimately global hydrological cycle ? To address this question we used the IPSL coupled atmosphere-vegetation model forced by Cretaceous boundary conditions, and built plant functional types including stomatal conductance values consistent with the fossil record. We quantify the transpiration fluxes through different sensitivity experiments and explore the vegetation-atmosphere feedbacks and their impact on the Cretaceous climate.