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Recent intensification of the negative physiological effect of CO_2 on terrestrial evaporation

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The net physiological effect of rising atmospheric carbon dioxide (aCO_2) on terrestrial evaporation (ET) is highly uncertain. While increased CO_2 fertilization elevates ET through more biomass production, the reduction in stomatal conductance (g_s) that it downregulates ET. Here, using satellite-based estimates of ET and dynamic vegetation models, we investigate the physiological influence of aCO_2 on ET, and isolate the respective contribution of biomass increase and g_s reduction. Our results indicate that the CO_2 fertilization had a net negative effect of $-4.4\pm0.3\times10^{-2}$ mm ppm^{-1} on ET over 1982–2018. The negative physiological effect tends to intensify with increasing aCO_2, particularly in warm and humid forests. The high sensitivity of ET to g_s may attenuate the expected water cycle acceleration over land, although the future evolution of these two competing physiological processes remains uncertain.