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The impacts of climate, CO2, LAI changes on the global runoff trend during the 20^{th} and 21^{st} century

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The increase of the observed river runoff over the 20^{th} century (Labat et al. 2004) has been attributed to decreased stomatal conductance (Gedney et al. 2006), and to climate and land use changes (Piao et al. 2007). Here, we use the Land Surface Model ORCHIDEE to perform transient simulations from 1900 into 2100, first to validate the model's performance for the 20^{th} century and second, to test the impact of different factors, such as climate, stomatal conductance and leaf area index, on the runoff trend change over 21^{st} century. We find that the climate is the largest player in the 20^{th} and 21^{st} runoff trend, whereas the stomatal conductance plays a minor, but not negligible, role, especially in the 21^{st} century. Because of CO2 fertilization effect, the LAI effect induces a small decrease of the global runoff until 2030, where the drying tropical regions and the warming temperature after this date (2030) induces global LAI mean decrease. This latter, contribute to an additional small runoff increase.