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Global methane emission estimates from UV irradiation of terrestrial plant foliage

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The production of a range of volatile organic compounds from terrestrial vegetation is well known but several recent studies have reported an in situ methane emission from vegetation foliage. Atmospheric methane is thought to originate mostly from anaerobic microbial processes but recent publication of experimental observations, atmospheric measurements and subsequent analyses suggest that there is the possibility of a modest methane flux from the foliage of terrestrial vegetation. However, there remains considerable debate about its significance as a global source. One mechanism reported to produce methane from vegetation is the effect of solar ultraviolet radiation on plant pectins, which are structural components of plant cell walls. In this paper we have combined a relationship for spectrally-weighted methane production from foliar pectin with a global UV irradiation climatology model, satellite-derived leaf area index and air temperature data to estimate the potential global methane emissions from vegetation foliage by this mechanism.

This paper will present our estimate of the potential global contribution of methane from foliar pectins, its distribution between biomes and with latitude and we will compare our values with other published estimates. Recent studies have reported that pectin is not the only molecular source of UV-driven methane emissions and that other environmental stresses may also generate methane. Consequently, further evaluations of such mechanisms of methane generation are needed to confirm the contribution of vegetation foliage to the global methane budget.