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Coupling vegetation and BVOC emissions in the OsloCTM

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Terrestrial ecosystems affect climate via a number of mechanisms, including sequestration and emission of CO_2 and changes in surface albedo. Additionally, forests emit biogenic volatile organic compounds (BVOCs), such as terpenes and monoterpenes. These oxidize rapidly in the atmosphere, generating ozone and secondary organic aerosols (SOA), which in turn affect climate both directly and indirectly through interactions with radiation and clouds. The chemistry-transport model OsloCTM has been used in assessments of the formation and distribution of SOA resulting from both anthropogenic and biogenic VOCs. However, there is currently no direct link between vegetation and BVOC emissions in the model, and studies depend on input of emission inventories. This limits the ability to assess implications of changes in vegetation and vegetation structure, for instance under alternative future forest management strategies. Building on existing knowledge of the relationship between emissions and driving variables such as temperature, solar radiation, leaf area index, a new module coupling the vegetation and BVOCs in the OsloCTM is developed. The new module is tested with a focus on the Fennoscandinavian region, using detailed information about present-day forest structure and management, and evaluated against existing measurements of SOA.