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Abstract: Terrestrial vegetation is the dominant source of atmospheric volatile organic compounds (VOCs). Biogenic volatile organic compounds (BVOCs) play key roles in chemical and photochemical reactions in the atmosphere, i.e. the formation of O_3 and secondary organic aerosol (SOA). In southern China, tree plantations are an important ecosystem, accounting for 54.3% of forestation. BVOC emission estimates in a subtropical Pinus plantation forest will improve our understanding of their basic characteristics, and their contributions to O_3 and PM2.5 formation. Measurements of BVOC emissions were carried out using a relaxed eddy accumulation (REA) technique and a gradient technique on an above-canopy tower, along with measurements of solar global radiation and photosynthetically active radiation (PAR) and meteorological parameters in a subtropical Pinus plantation, Jiangxi province, China from May 2013 to January 2016. Based on PAR energy balance, an empirical model of BVOC emissions was developed. BVOC emissions from January 2013 to December 2016 were calculated using this empirical model and observational data. Monthly BVOC emissions exhibited evident seasonal variations, higher in summer and lower in winter. Combined with satellite retrieved HCHO vertical column densities (VCDs, molec cm-1), good linear relationships were found between isoprene and monoterpene emissions and HCHO VCDs: isoprene emission (mg m-2 h-1) = 1.29×10-16HCHO-0.77, monoterpene emissions (mg m-2 h-1) =1.02×10-16HCHO-0.21. On the basis of the relationships between BVOCs emissions and HCHO VCDs, BVOC emissions can also be obtained. It provides another way to obtain BVOC emissions on a regional scale.
Keywords: Biogenic volatile organic compounds, emission flux,empirical model, HCHO, subtropical Pinus plantation