Applications for a fast Monte Carlo model for Lidar simulations

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Lidars have the means to probe a multitude of components of the atmosphere with fairly exact spacial precision. However, in order to correctly retrieve atmospheric observables it is necessary to take into account geometrical effects as well as the contribution of multiply scattered photons. Thus retrieval algorithms need thorough validation by an exact model. In particular, physical or geometrical effects not taken into account by, or approximated in the retrieval algorithm must be proven to be unimportant, or correctly approximated. To this end I present a fast yet exact Lidar simulator based on the Monte Carlo method. The simulator is part of the Monte Carlo solver MYSTIC contained in the libRadtran software package. The Lidar simulator can be applied to several types of Lidars, such as HSRL (e.g. EarthCare), trace gas detectors (e.g. A-Scope), and wide angle Lidars (e.g. WAIL) for space- and air-borne Lidars as well as ground Lidars.