Geophysical Research Abstracts
Vol. 16, EGU2014-11755, 2014
EGU General Assembly 2014

Multiple-scattering effects on spaceborne lidar dedicated to forests survey

Xiaoxia Shang and Patrick Chazette
CEA-CNRS-UVSQ, LSCE, Gif sur Yvette, France (xiaoxia.shang@lsce.ipsl.fr)

The role of forests in the climate balance of the Earth system leads us to consider their monitoring on a global scale. This militates towards the establishment of a long-term monitoring of both forest areas and their evolution, in accordance with the climatic scales. Lidar and radar are promising instruments for such observations from spaceborne stations and present strong complementarity via their use in synergy. Here, we will focus on lidar technology where one of the major difficulties is the choice of the emitted wavelength. In fact, for space observations, multiple-scattering may significantly affect the scattering of the propagating laser light through the forest canopy. Indeed, depending on the lidar system parameters (e.g. wavelength, field of view) and on the tree species, spaceborne lidar observations are more or less perturbed by multiple-scattering. To assess the multiple-scattering effects on lidar signal return, a Monte Carlo simulator has been built. The simulator is constraint by actual measurements performed by an airborne lidar using an ultraviolet wavelength (355 nm). The airborne lidar sampled forest types (e.g. oaks, maritime pines, poplars) representative of European mid-latitude forests to constitute a data base of extinction coefficient vertical profiles in the canopy. For the simulations, the leaves have been considered as Lambertian surfaces, but it is not a limitation for the statistic modelling. For example, the multiple-scattering may lead to a significant overestimation of the poplar crown depths, larger than 4 m. The footprint, accounting for the altitude of the satellite orbit, dimensions the amplitude of the multiple-scattering effects. It has to be assessed taking into account the ground slope. Results established using UV airborne lidar coupled with a Monte Carlo approach will be presented and discussed.