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Forest structures retrieval from LiDAR onboard ULA

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Following the United Nations Framework Convention on Climate Change, the assessment of forest carbon stock is one of the main elements for a better understanding of the carbon cycle and its evolution following the climate change. The forests sequester 80% of the continental biospheric carbon and this efficiency is a function of the tree species and the tree health. The airborne backscatter LiDAR onboard the ultra light aircraft (ULA) can provide the key information on the forest vertical structures and evolution in the time. The most important structural parameter is the tree top height, which is directly linked to the above-ground biomass using non-linear relationships. In order to test the LiDAR capability for retrieving the tree top height, the LiDAR ULICE (Ultraviolet LIdar for Canopy Experiment) has been used over different forest types, from coniferous (maritime pins) to deciduous (oaks, hornbeams ...) trees. ULICE works at the wavelength of 355 nm with a sampling along the line-of-sight between 15 and 75 cm. According to the LiDAR signal to noise ratio (SNR), two different algorithms have been used in our study. The first algorithm is a threshold method directly based on the comparison between the LiDAR signal and the noise distributions, while the second one used a low pass filter by fitting a Gaussian curve family. In this paper, we will present these two algorithms and their evolution as a function of the SNR. The main error sources will be also discussed and assessed for each algorithm. The results show that these algorithms have great potential for ground-segment of future space borne LiDAR missions dedicated to the forest survey at the global scale.

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