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Atmospheric Measurement Techniques Discussions

# *Interactive comment on* "Laser pulse bidirectional reflectance from CALIPSO mission" *by* Xiaomei Lu et al.

**Anonymous Referee #2**

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The paper presents in a clear and accurate way the application of a new methodology for the determination of bidirectional reflectivity of the solid earth surface, in particular from ice and snow.The proposed method uses the pulse produced by CALIOP on the surface to determine the bidirectional reflectance. The authors follow two approaches for the determination of reflectance, based respectively on the analysis of the entire response pulse or on the tail. The linearity of the reflectance dependence calculated with the first method with respect to that calculated with the second method justifies the use of the calculation made with the single tail, which is particularly relevant as it extends the application to the saturated signal cases. To validate the new method, the bidirectional surface reflectance obtained from the surface signal tail was successfully compared with the data produced by the Moderate-resolution Imaging Spectro-



radiometer (MODIS) tool. The proposed method significantly integrates the current passive detection capabilities. In fact, MODIS does not provide data in high latitude areas during the polar night, while the proposed method provides reflectance data both day and night and also when the surface is obscured by transparent clouds or aerosol layers. The authors report the results of the determination of the reflectance of snowy surfaces under clouds with an optical depth of the cloud of about 1, in these cases the reflectance of the surface is systematically lower than that of the conditions of clear sky. This observation opens the field to the possibility of cloud screening starting from the measurement of surface reflectance. The article also describes the work aimed at improving the accuracy of the bidirectional high-atmosphere reflections using the background data of CALIOP. The data obtained in this application are compared with those of the reflectance measured with the Wide Field Camera (WFC) of CALIPSO. The article analyzes in detail the possible causes of disagreement, but overall the direct comparison is convincing. This article fully deserves to be published.

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