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CLOUD-RADIATIVE FORCING BY A MULTIPLE SCATTERING MODEL FOR THE ATMOSPHERE-SNOW SYSTEM (ABSTRACT)

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The shortwave cloud-radiative forcing (CF_{sw}) at the top and base of the atmosphere in a snow-covered region is investigated by a multiple scattering model for the atmosphere-snow system. As the cloud changes the planetary albedo and snow surface albedo, the radiant flux densities at the top and base of the atmosphere also change. The model calculation for the effect of the cloud showed the following; The upward flux density at the top of the atmosphere is increased by the cloud. However, the upward flux density at the snow surface is increased or decreased by the cloud according to the solar zenith angle. Moreover, there is a case in which the upward flux density at the snow surface exceeds the extraterrestrial solar flux density. This is due to the multiple reflection between the cloud and snow surface. Such a phenomenon is possible at low solar zenith angle in the visible region with high albedo. The CF_{sw} at both the top and base of the atmosphere are negative. However, radiation absorption by gases is not considered in this model, in which the atmosphere is composed of a Rayleigh atmosphere and cloud particles. If radiation absorption by gases is considered, there is a possibility that the CF_{sw} at the top of the atmosphere is positive.

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