Abstract

Assessment of cirrus cloud coverage belongs to one of the more difficult problems in data collection. Spatial as well as temporal resolution is limited due to their optical properties, the restrictions of terrestrial observations, and the evanescence of cirrus in satellite images. Cirrus clouds often cause ice halos, in particular 22-degree halos. Other halo features, such as parhelia and various other subspecies of complex halo displays can be seen as well. Collecting data on these halos will, as a longitudinal set, allow assessment about the frequency, type, and diurnal distribution of cirrus clouds. Data on complex halo features allow for more inferences about the types of ice crystals, which (in the future) may lead to an assessment of their growth conditions. We present our results on the observation of cirrus coverage over the first half of 2015, using an all-sky camera and our own image-analysis software for the detection of ice halos. We record several thousand images per day. These images are then analyzed for the presence of ice halos, which allows us to compile statistics of their appearances, duration, intensity and correlation with other weather specifics. We present a halo-detection algorithm, which was developed by iterative testing on large sets of images under varying sky conditions. Our goal is, to develop this combined all-sky camera/software system to a point at which it becomes portable to other locations, such as schools. This may allow a spatial resolution on the appearance of ice halos and their implications, in addition to the time resolution.

Halo Observations

Showed a log-log relationship time for the first several months of 2015. The data have been Gaussian – broadened to enhance the influence of sequential halo signals.

Halo Identification program

Outlook and questions

How frequent are halos, really?
How can they be used to assess temporal and spatial cirrus coverage?
Can halo observations be used to assess the characteristics of cirrus clouds?
When will long-term observations allow to observe changes in cirrus coverage?
With better camera arrangements, will it be feasible to access detailed information on crystal distributions, optical thickness, time evolution?
Can this information be used to make inferences about the growth conditions at cirrus altitude?
We are also working on a Lidar project to measure the clouds in the third dimension.

Acknowledgments

The authors wish to extend their gratitude to UM-M alumni Stephen Sorenson, Shelby Richard, and James Froberg, who laid the groundwork for the software development. This work is supported by the UROP program of the University of Minnesota, as well as a grant to the University of Minnesota Morris from the Howard Hughes Medical Institute through the Precollege and Undergraduate Science Education Program. The acquisition and installation of the camera was supported by the UM-M physics discipline, the division for Science and Mathematics and a Faculty Research Enhancement Grant of the University of Minnesota.

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Analysis of Ice Halo Appearances Using an All-Sky Camera