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# The study of changes in the Arctic climate and polar clouds by lidar sensing

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Due to unique environmental conditions and various feedback mechanisms, the Arctic region is particularly sensitive to climate change. Cloudiness plays a very important role in the formation of the climate of the polar regions of the Earth, exerting a great influence on the radiation fluxes in the atmosphere and to a large extent determining the thermal balance of the surface. At the same time, modern observational data on the characteristics of polar clouds are characterized by great uncertainty. Acting as the main polarizing objects in the atmosphere, polar clouds can be studied from the spectra of their radiation using high-resolution polarimetric instruments, or from the results of modeling measurements of similar devices. In this regard, specialized on-board measurements using various instruments, the most common of which is the lidar, are also needed. Lidar measurements make it possible to determine the thermodynamic phase of the cloud layer, close enough to the lidar system, by analyzing the slope of the emission of the pulse, the absolute value of the backscattering, and the depolarization coefficient. Thus, one can obtain a unique data set with which one can characterize the behavior of polar clouds, as well as their optical properties. As a result, a lot of scientific research programs were carried out, where lidar sounding of different layers of atmospheres s, including over the Arctic, (AMALi, ASTAR, CALIPSO, DELICAT), in part of which a full partner was A.M. Obukhov Institute of Atmospheric Physics (IAPh).
Working with the obtained data, it is also planned to obtain estimates of the spectral density of the signal and to study the polarization properties of aerosols and arctic clouds.