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LIDAR POLARIZATION MEASUREMENTS NECESSITY IN TWO CASES OF STUDY OF PROCESSES IN THE ATMOSPHERIC PLANETARY BOUNDARY LAYER

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INTRODICTION

The lidar polarization measurements provide additional information at studying of a number of objects and processes in the atmospheric planetary boundary layer. So far, they are most frequently employed in cases of study of clouds (usually sirius) and air pollution (to locate the areas of spreading, e.g. of dust nonspherical particles).

In the present work two cases which are of interest for polarization lidar observations when investigating the planetary boundary layer are pointed.

METHODS AND APPARATUS

The present studies were carried out using two laser radars: a triple-beam meteorological lidar which was situated in the region of the Institute of Electronics of the Bulgarian Academy of Sciences [3] and a scanning one which was arranged at the base of the National Institute of Meteorology and Hydrology in the Akhtopol town [4].

EXPERIMENTAL RESULTS

During the first study a formation of the mixing layer after the sunrise (i.e. under an influence of the radiation processes) was observed. In this case the constuting thermals lifts moisture as well, which at certain heights condenses thus forming the so called fair-weather clouds.

The convective cloud base could easely be determined from the lidar records (see Fig. 1). Whenever the

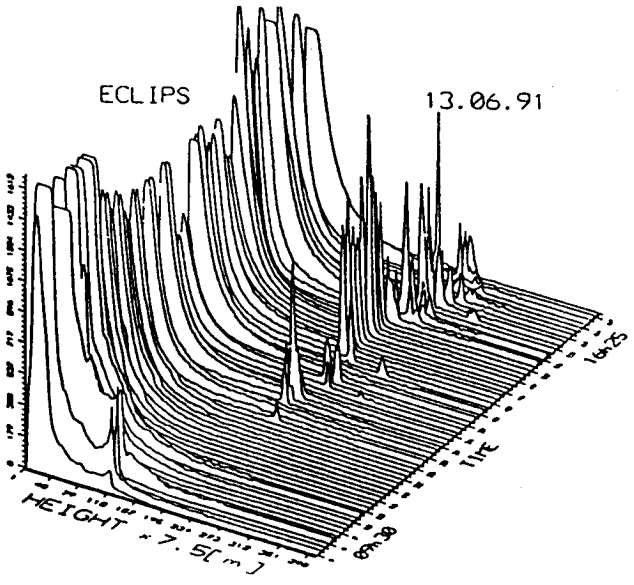

Fig. 1

lidar pulse hits a cloud, a large "spike" is recorded in the lidar return due to the greatly increased back-scattering. For the present case a threshold return value (8, 9 times the background lidar return) was set for the determination of the cloud base, similarly to [1, 2]. In this case, using a polarization technique, the process of the formation of such a type of clouds could be studied, instead of an establishment of the

presence of already formed ones.

In the second study a constituting of breeze circulation was observed. During a formation of the Internal Boundary Layer in the case of dry land air avection over the sea surface the lidar return increases; one can propose that the aerosol particles grow moist and thus become spherical, which can result in the observed increase.

In this case a sequence of individual lidar return is recorded in a step-up and down scans in a view of a height-range indicator (Fig. 2) through the

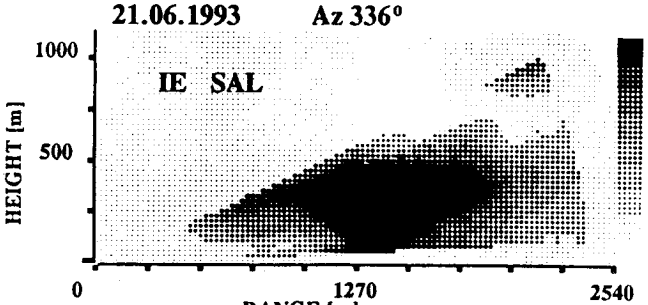

Fig. 2 Height - Range Indicator 20:24-20:42 LST

planetary boundary layer.

CONCLUSION

In these two examples, using a polarization technique for our studies, additional (to the information about the processes in the planetary boundary layer) data about the microphysical characteristics (and their variations due to the occurring processes) of the aerosol could be obtained.

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