LIDAR OBSERVATION OF THE CONVECTION IN THE LOWER ATMOSPHERE

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ABSTRACT

Nobody has so far seen the atmospheric convection except through the presence of the convection cloud. However, we would be able to see the convection by the use of lidar, because the convection flow is accompanied with the aerosol originating from the ground. Fig. 1 shows a distribution of lidar echoes in the vertical plane.* The lidar observation was made over a flat terrain around the noon in the period of active convection on a fine day with breeze. Numerical figures at the contour lines indicate the relative intensity of echo expressed in DB-unit. The part of high concentration of aerosol indicated by H in the figure clearly shows the ascending flow of convection.

The ascending flow with little change of its position for half an hour or more is frequently observed in the convention and the maximum height of flow is well correlated with the mixing

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*** Naito, K., I. Tabata and Y. Yokota, 1968: The vertical distribution of aerosol in the lower atmosphere observed by lider. Pap. in Meteoro. and Geophysics., 19, 615-625.**

depth obtained by the radiosonde observation. Some people have thought the convection to be bubble-like and others to be plume-like so far. In our lidar observations, the bubble-like convenction has not been recognized yet, but the plume-like or bonfire-like convection has been presented, as is shown in Fig. 1.

It is well known that there are a few modes of convection observed in laboratory experiments, and therefore we have tried to find out whether or not there is any other mode than the bonfire-like in the boundary layer. What has been observed by our lidar is such that the upward flow of convection is sometimes bank-like in rows, as is illustrated in Fig. 2. The bank is found quite long beyond the limit of lidar observation. The bank-like mode in rows appears frequently when the sea-breeze is developed with little change of its direction up to the height of 1 km or more in our case.

The bonfire-like or bank-like convection over a flat terrain seems to be explained by the consideration of the unhomogeneous heating of the ground surface, the convergence flow in the surface layer, the mixing through entrainment and the general field of wind.

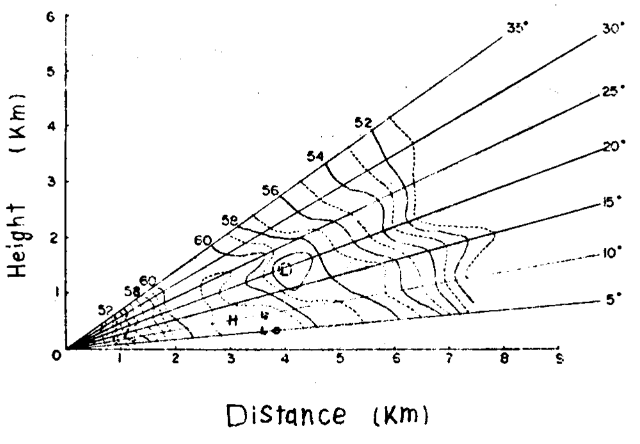
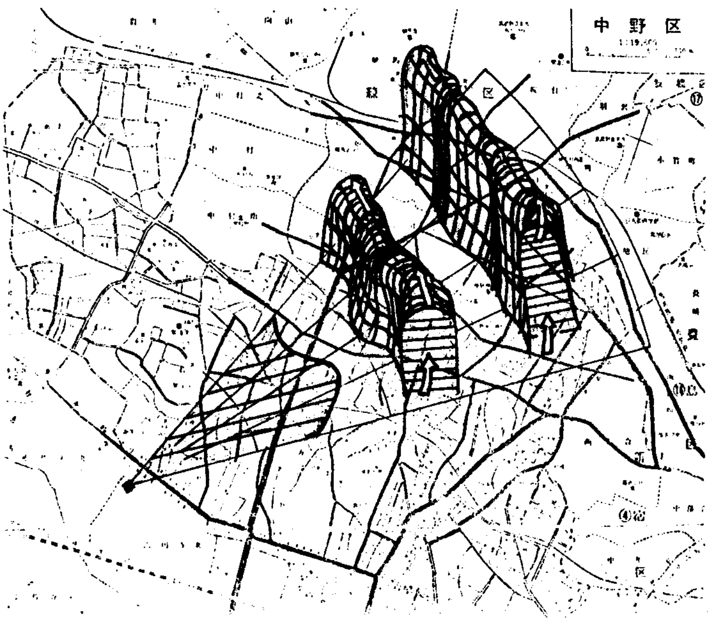


Fig. 1 Plume-or bonfire-like convection observed by a lidar.



Fog. 2 Convection banks in rows observed by a lidar.