

## SEARCH FOR CORRELATIVITY OF LIGHTNING(STROKE) WITH ATMOSPHERIC STRATIFICATION FACTORS

Zhang Xixuan (张喜轩) and Zhang Cuihua (张翠华)

Lanzhou Institute of Plateau Atmospheric Physics, Academia Sinica, Lanzhou

Received February 15, 1990

### ABSTRACT

In this paper the statistical analysis is carried out on the correlation between lightning strokes and atmospheric stratification factors. It is shown that the total number of strokes in lightning process is mainly decided by environmental temperature at altitude with the residual instability of  $5^{\circ}\text{C}$  ( $T_r$ ). The instability should also affect the total number of stroke in lightning process. A forecasting equation of stroke in lightning process has been deduced and two interesting preliminary conclusions have been obtained.

**Key words:** atmospheric stratification, instability, residual instability, lightning flashes, correlativity

### I. INTRODUCTION

Lightning is generally related to severe convective weather such as thunderstorm. The total quantity of death people from lightning disaster is much larger than that from any other meteorological severe damages, including tornadoes and hurricanes. On the other hand, the effect of lightning on forest should quite be noticeable, because forest, a kind of valuable natural resources, has been in the tendency towards reducing and forest fire from lightning is the major reason for it (Taylor, 1969). For this purpose, we use the data of number of the lightning flashes obtained by the double channel lightning counter (model DB) at Dongxiang of Lanzhou and Pingliang of Gansu Province during the summertime of 1977, 1978 and 1985. The lightning counter is triggered by electric field changes caused by cloud-to-cloud or cloud-to-ground flashes with a sensibility of 0.4s and an effective detectability of 40km (Xu and Lu, 1982). Combining the corresponding morning sounding data, we carried out a preliminary study on the correlation between lightning and atmospheric stratification factors.

### II. STATISTICAL ANALYSIS

The observing results of the number of lightning flashes show that the lightning frequency of hail cloud is much higher than that of thundercloud (Ye et al., 1982). The size of hail which falls on the ground primarily depends on the instability, the ambient temperature at altitude with the residual instability of  $5^{\circ}\text{C}$  ( $T_r$ ) and the humidity of stratification (Zhang, 1980). The statistical results for data of morning sounding in Pingliang and the forecasting practice for thunderstorm and hailstorm indicate that these weather phenomena occur under the condition of medium relative humidity (Zhang, 1976; 1983). Therefore, when we carry out statistical analysis, it is possible for us to use bivariate regression procedure, thus simplify the calculation. All variables used here are anomalies. The results are listed in Table 1.