

Notes on the Coding and Recording of Cumulonimbus

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Whereas the research meteorologist is fully aware of the outstanding role the cumulonimbus plays in the transfer of energy and moisture, in the production of hazardous weather, and in the analysis of tropospheric processes, the forecaster at latitudes less than 40° receives inadequate information in relation to the importance of this cloud.

The synoptic code assigns two figures, $C_L=3$ and $C_L=9$, to cumulonimbus (Cb). Neither figure specifies whether there is just one Cb or many Cb's all over the sky, whether it is (they are) isolated or accompanied by "cumulus, stratocumulus, stratus or pannus" as the Plain Language Specifications say (U. S. Weather Bureau, 1955). The difference between the numbers 3 and 9 refers only to the fibrosity of the Cb's top.

This coding has been devised primarily by meteorologists living north of $40N$, and is generally sufficient at those latitudes. For lower latitudes, where Cb's are more common, the information given by the synoptic code is not sufficient, partly because of the lack of descriptions of the amount of Cb mass, partly because essential features are not reported.

Recent work by many authors (e.g., Dessens, Hirschfeld, Ludlam, Portig) shows the importance of plumes for the severity of the weather to come. The forecaster gets at best an inkling about plumes from winds aloft reports. But he has no certainty about the existence of this phenomenon which generally is so easily observed. The *International Cloud Atlas* (Vol. 1, page 17) does not list the plume as a "supplementary feature" so that its

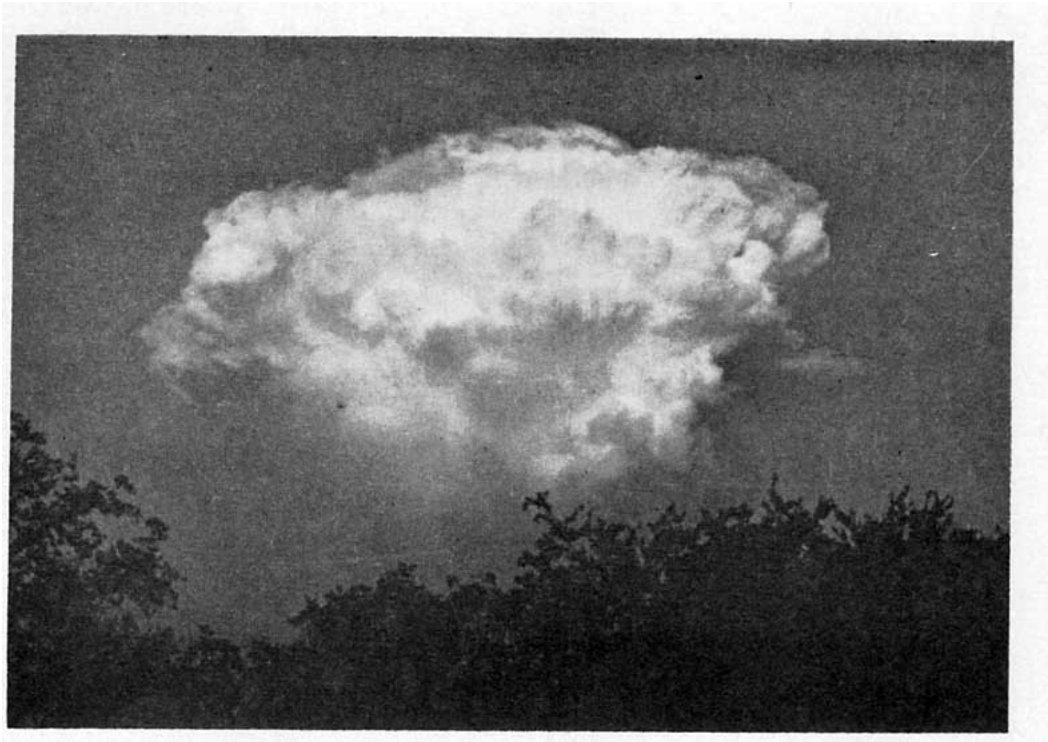


FIG. 1. An isolated cumulonimbus at Austin, Texas, in November 1959. It represents a local storm.

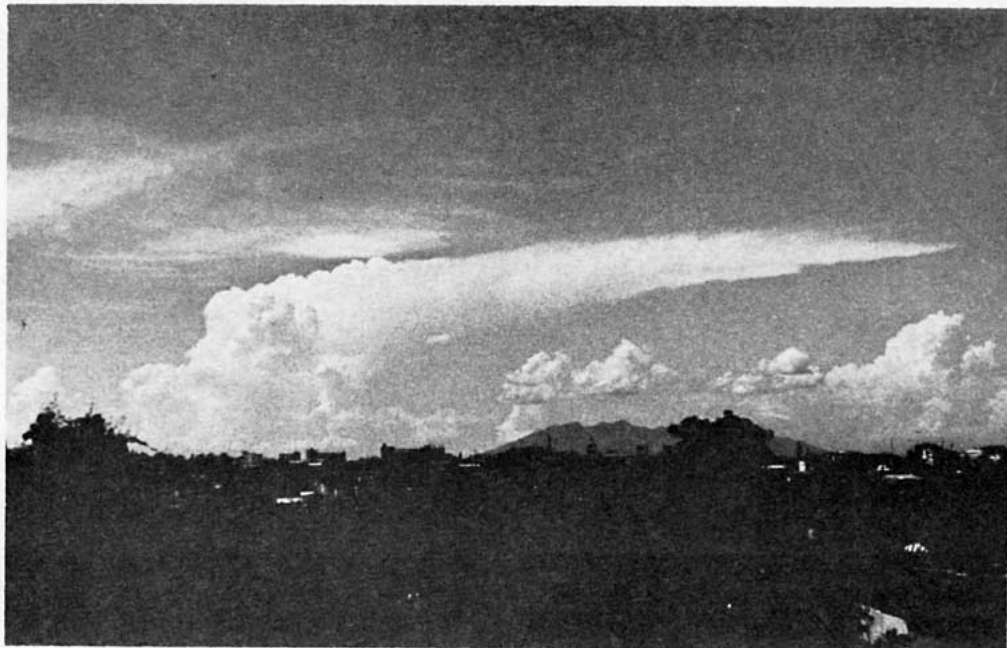


FIG. 2. A Cb with a long plume and with a "velum" over the strongest updraft, taken at San Salvador, Central America, on 25 May 1959 at 1345L.

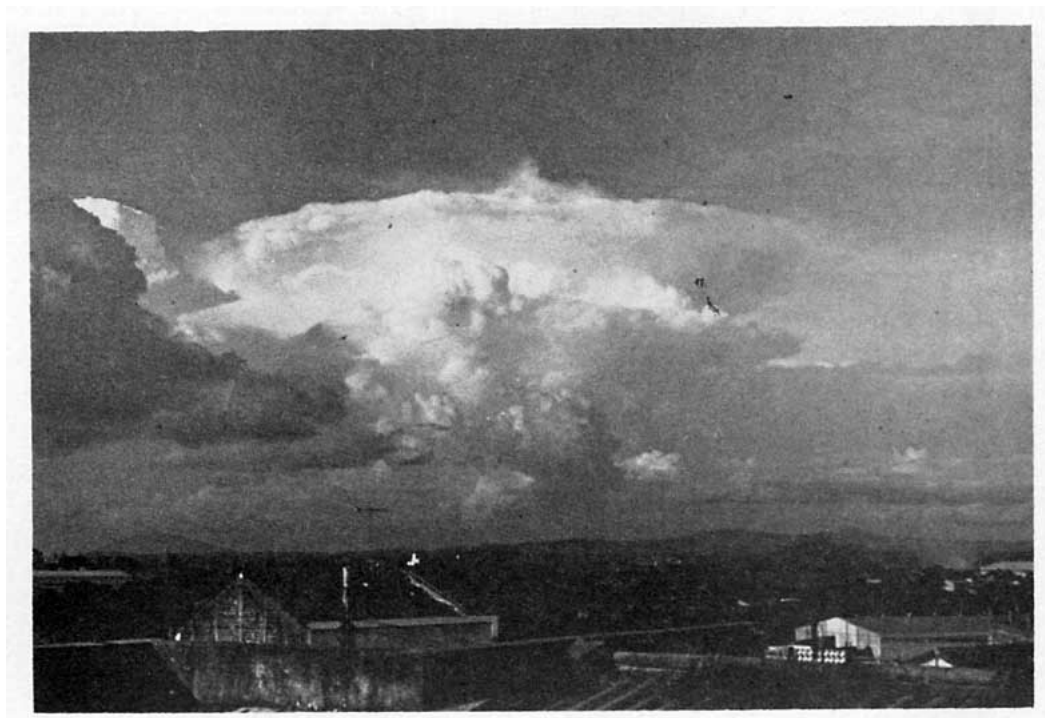


FIG. 3. A Cb with two anvils one on top of the other, taken at San Salvador on 3 May 1959 at 1700L.

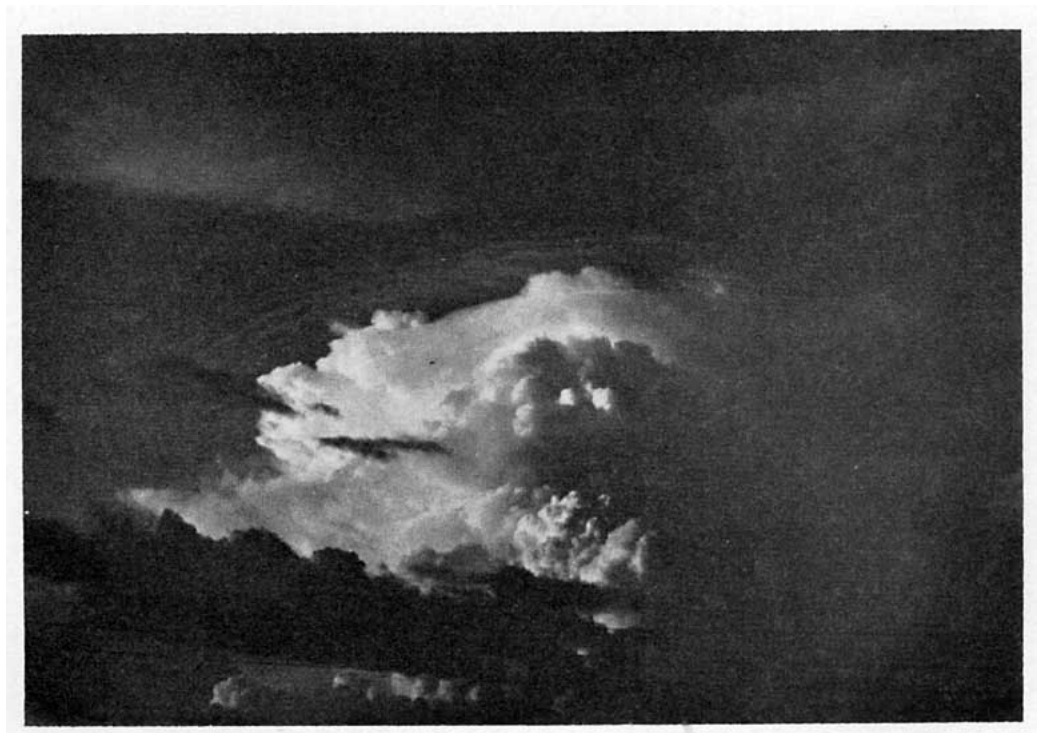


FIG. 4. The same storm as Fig. 3, taken 60 minutes later.

existence is not even recorded for postanalysis at stations that apply strictly the WMO nomenclature. The same publication states on page 41 that "Cb are rare in polar regions and more frequent in temperate and tropical regions." This is true, yet Volume 2 shows in the main section only pictures of Cb's taken at latitudes higher than 40°.¹

The figures are supposed to give an idea of the very different cloud forms which all are called cumulonimbus.

Fig. 1 is an isolated Cb taken at Austin, Texas, in November 1959. It represented a local storm.

Fig. 2 shows a Cb with a long plume and with a "velum" over the strongest updraft, taken in San Salvador, Central America, on 25 May 1959 at 1345L. The plume trails toward the east, opposite to the low level flow. There was little or no rain in the subsequent hours which could be correctly forecast by means of the existence of the plume. (For reasoning see Ludlam, 1963, especially page 27). The cloud information from the code or from the observer's diary would have vaguely called for "showers and thundershowers."

Fig. 3 shows a Cb with two anvils one on top of the other. The picture was taken on 3 May 1959 at 1700L in San Salvador, but the author took an almost identical picture near New Orleans, La.

Fig. 4 presents the same storm as Fig. 3, but taken 60 minutes later. It has meanwhile developed a well-defined pileus around it and a velum over it, the latter showing concentric waves around the axis of the updraft. Such waves have been observed also in Texas according to verbal reports from Texan meteorologists.

The *International Cloud Atlas* states in Volume 1 on page 42 that, "Cumulonimbus does not present any

varieties." This contradicts clearly the evidence presented in Fig. 3, which would be called "Cumulonimbus duplicatus" in the international nomenclature.²

The problematics of our present cloud code is well-known to many researchers (Alaka, Malkus and Riehl, Palmer). The purpose of these lines is to give a new impulse for further discussions with the goal of improving code and definitions. The discussion is hampered by a vicious circle, since international code and international nomenclature prevent the automatic accumulation of those data which would give evidence of the necessity to improve the documentation.

² "Duplicatus" is defined as a "variety."

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¹ The location of plate 54 could not be identified.