CHARACTERIZATION OF HAILSTONE SIZE SPECTRA IN HAILPAD NETWORKS IN FRANCE, SPAIN AND ARGENTINA

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1. ABSTRACT

Hailstone size distribution has been an integral part of measurements of hailfalls in several research projects (Federer and Waldvogel, 1978; Morgan, 1962, Giaiotti et al, 2001; Giaiotti and Ster, 2006).

It is usually assumed that the exponential distribution is an adequate representation of hailstone size spectra (e.g., Ulbrich, 1977, Wong et al., 1987). Intercomparisons of different spectra offer a potential of additional information on hailstone formation and growth under different meteorological conditions.

This study presents the results of the fitting to the exponential distribution of databases obtained from various hailpad networks installed in southern France (3 networks with 1,081 hailpads), Spain (2 networks with 269 hailpads), and Argentina (3 networks with 567 hailpads). These networks employ the same type of Styrofoam, method of calibration and semi-automatic measurement procedure.

The characteristic parameters of the fittings are very different in each area, even in areas that lie geographically quite close to each other.

Piece-wise regression (Toms and Lesperance, 2003) models are "broken-stick" models, where two or more lines are joined at unknown points called "breakpoints". These points have been used to estimate critical thresholds associated with transitions between two hailstone size distributions.

Only one of the 8 networks studied had no breakpoint. The rest are bimodal with two distributions, both exponential, even though the characteristic parameters of each network differ. Except in the case of France (the 3 networks), the breakpoints appear in severe sizes and there are hardly any differences.

It is not easy to suggest an explanation to this difference, but it may be said that the cloud bases and some meteorological conditions in southern France differ considerably from the conditions found in the areas where the networks are installed in Spain and Argentina. Consequently, hail embryos may also be different.

There is experimental evidence gathered from the networks of these two countries suggesting that hailstones of over 3-4 mm in diameter are formed by smaller hailstones 'stuck' together by a high amount of LWC which is presumably found in some parts of the storms where these hailstones were formed and grew.

2. REFERENCES

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