

A Brief Description of How Freezing Rain and Ice Pellets Are Detected in the Positive/Negative Energy and the Czys Precipitation Type Algorithms

The positive/negative precipitation type (also called the Area Method) looks at the vertical temperature profile and computes the amount of energy above (positive) and below (negative) the 0°C isotherm (see image below). One can distinguish between ice pellets and freezing rain by calculating the positive area (PA) and negative area (NA) and plugging the values into these equations:

ice pellets if $NA > 66 + 0.66PA$

freezing rain if $NA < 46 + 0.66 PA$

freezing rain and/or ice pellets if $46 + 0.66PA \leq NA \leq 66 + 0.66PA$

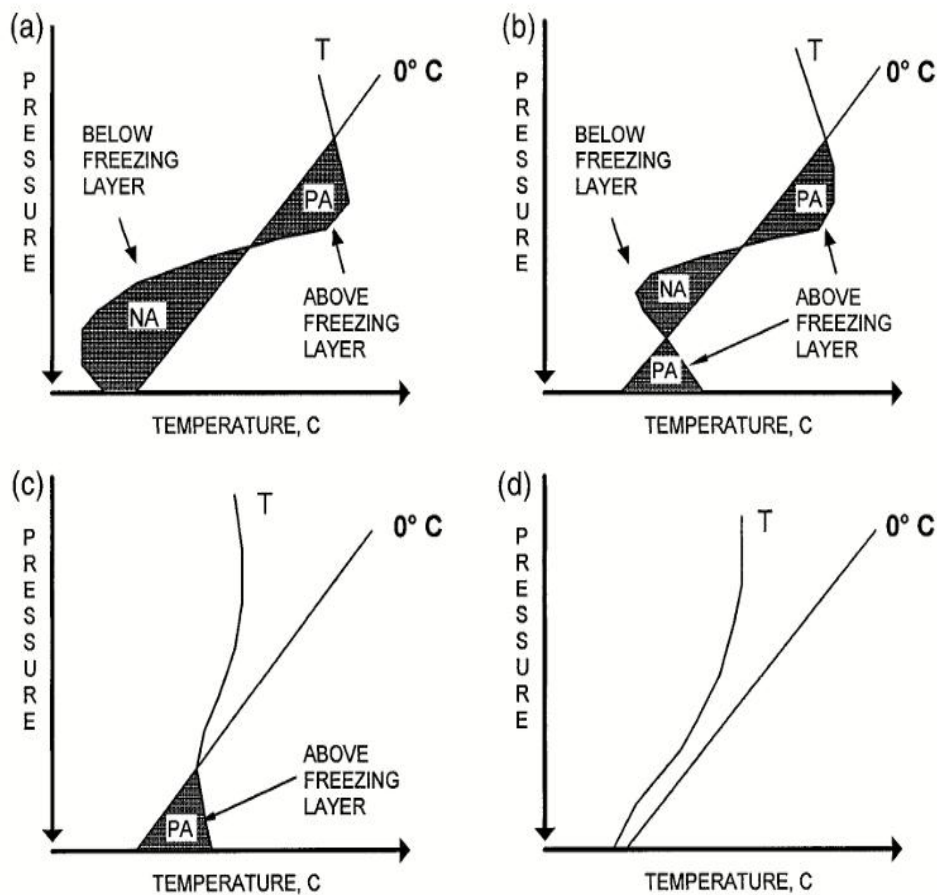


FIG. 1. Schematic diagram showing typical vertical temperature profiles leading to (a) freezing rain or ice pellets, (b) ice pellets or rain, (c) snow or rain, and (d) snow. Positive (PA) and negative (NA) areas are indicated (see text for details).

Similarly, the Czys method (also called the Tau method) looks at the vertical temperature profile for areas where the temperature is above freezing. The tau is calculated by taking the ratio of the depth of this warm layer to the mean temperature of the layer. If the value for a given ice particle radii (typically about 400 μm) is above the pleth on the image below, then freezing rain can be expected, signifying that the ice particle spent enough time in the warm layer to melt. Otherwise, ice pellets can be expected.

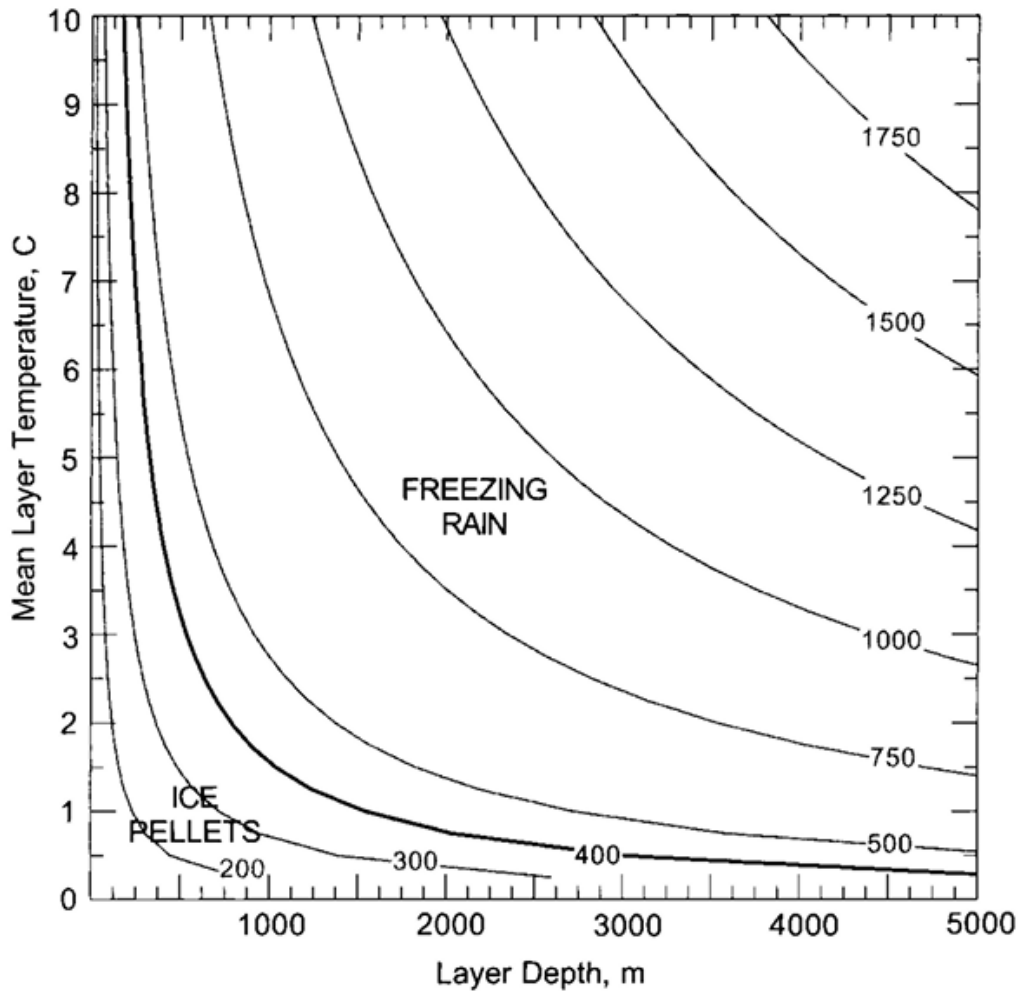


FIG. 8. Isonomogram of $\tau = 1$ for different critical ice particle radii computed over a range of warm layer depths and mean temperatures.

References

Czys, Robert R., Robert W. Scott, K. C. Tang, Ronald W. Przybylinski, Michael E. Sabones, 1996: A physically based, nondimensional parameter for discriminating between locations of freezing rain and ice pellets. *Wea. Forecasting*, **11**, 591–598.

doi: [http://dx.doi.org/10.1175/1520-0434\(1996\)011<0591:APBNPF>2.0.CO;2](http://dx.doi.org/10.1175/1520-0434(1996)011<0591:APBNPF>2.0.CO;2)

Bourgouin, Pierre, 2000: A method to determine precipitation types. *Wea. Forecasting*, **15**, 583–592.

doi: [http://dx.doi.org/10.1175/1520-0434\(2000\)015<0583:AMTDPT>2.0.CO;2](http://dx.doi.org/10.1175/1520-0434(2000)015<0583:AMTDPT>2.0.CO;2)