Optimizing the Lightning Warning Radii at Spaceport Florida

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Abstract

Air Force Manual 91-203 (AFMAN 91-203) directs that a lightning warning be issued when lightning is occurring within a 5 nautical mile (NM) radius of a predetermined location or activity. The 45 Weather Squadron (45 WS), located on the central eastern coast of Florida, provides weather support to Cape Canaveral Air Force Station, NASA Kennedy Space Center, and Patrick Air Force Base. The primary objective of this study is to optimize the lightning warning safety buffer; in particular, to determine if the 5 NM safety radius can be reduced while maintaining a desired level of safety. The research uses processed Lightning Detection and Ranging (LDAR) data for lightning aloft to map the movement of preexisting lightning storms using ellipses. These ellipses are updated with every lightning flash. A systematic recording ensues for the distance from the ellipse boundary of each flash occurring outside the ellipse. All of those exterior flash distances are then used to find the best-fit distribution from which the stand-off distance for the desired level of safety can be calculated. The distances from the edge of the ellipse are fit to a Weibull distribution and a reduction in the radius by 1 NM to 4 NM / 5 NM is selected as the optimized balance between safety and operational impact. The 4 NM / 5 NM radii are tested with a resulting failure rate of 3.58%, with a savings of 130.75 false alarms and 15.7 8-hour man days a year for the months of May through September.

Topic Areas

Applications of Lightning Data: Community events, Advanced Warnings, Lightning Safety, Protection, and Casualty Occurrence

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