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Feasibility for Alerting Aircraft Lightning Potential by using Weather Radar

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Japan Aerospace Exploration Agency (JAXA) and collaborators are conducting a practical research which aims to produce aircraft lightning potential information by using weather radar data. In [1], JAXA proposed a tactical support for aircraft lightning avoidance was effective in order to reduce the number of aircraft lightning strikes. Concepts of the aircraft lightning avoidance are as follows; 1) aircraft lightning potential based mainly on weather radar, and 2) information in airport area. In contrast to a traditional system based on (natural) lightning detection, 1) arose because most of aircraft lightning strikes are aircraft-triggered. And, 2) was defined because most of aircraft lightning strikes happened in airport area. In order to study feasibility of the concept, reports of actual cases of aircraft lightning strikes and their ambient weather data were collected. The weather data contains weather radar measurements and air temperature. Analyses of the data indicated a trend in relation between the aircraft lightning strikes in the weather data, and derived thresholds on vertical integrated reflectivity and -10-degC-height reflectivity. Statistical evaluations resulted in that 60—80% of current aircraft lightning strikes can be avoided. An example of aircraft lightning potential areas identified by the analyzed thresholds are shown in Fig. 1.
In addition to the feasibility study, the newest results including the novel phased array weather radar [2], upper-altitude atmospheric data downlinked by Second Surveillance Radar (SSR) mode S [3], a network of distributed electric field mills [4], and machine learning identification of aircraft lightning potential areas [5] could be presented.

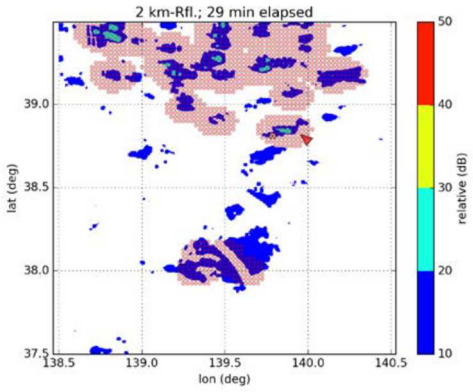

Figure 1. An Example of Aircraft Lightning Avoidance Information.
Red circles: risk areas; contour: 2-km-altitude radar echo; red triangle: airplane.

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