Real Time Hazard Level Approximation of Convective Storms Using Weather Radar and Emergency Data

Pekka Rossi[(1)], Vesa Hasu[(2)], Antti Mäkelä[(1)], Jarmo Koistinen[(1)], Heikki Pohjola[(3)]

[(1)] Finnish Meteorological Institute,
Erik Palménin Aukio 1, PL 503, 00101, Helsinki, Finland

[(2)]Aalto University, Department of Automation and Systems Technology, Helsinki, Finland

[(1)] Vaisala Oyj, Helsinki, Finland

Issuing warnings on severe convective weather is nowadays a part of operational weather services. Thanks to the development of real time accurate observations and computer-based models, operative forecasters have access to numerous automatic severe weather nowcasting and warning tools that facilitate their work. However, these methods do not include reported damages that have already taken place due to severe weather.

We introduce an automatic real time hazard level determination method for convective storms using a new information source: real time emergency reports. During severe convective storms, emergency call centers log a large number of reports, for example, due to flash floods, lightning damages and uprooted trees. Since 2006, Finnish Meteorological Institute has received these reports from the emergency call centers in real time. In addition to the location of the emergency, the reports contain a coarse classification of the emergency type and a short verbal description of the incident for on-line use. We propose attaching this information automatically to weather radar detected storms to characterize their hazardous properties.

The proposed method uses a weather radar based convective storm tracking algorithm in the background. Detected tracks of individual storms and incoming emergency reports are analyzed to determine the relationship between each report and a convective storm. Then, the method estimates the hazard level for each storm based on number of associated emergency reports. Finally, based on the hazard level, we can highlight potentially dangerous convective storms in nowcasting products.

As the flow of emergency reports is more intense in densely populated areas, the estimated hazard level is scaled using the population density of incoming emergency report locations. Moreover, with the history information from the tracking algorithm, storms preserve the estimated hazard level over several time frames. The potential of the method is demonstrated through several case studies in Finland.