



Significant-hail producing thunderstorms in Finland: Synoptic environment

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Significant hail (diameter of 5 cm or larger) is a relatively rare phenomenon in Finland but once it occurs, it possesses a high risk for both life and property. Understanding the environment in which significant-hail producing thunderstorms develop is crucial for their forecasting. One could expect that environmental properties concerning vertical wind shear, instability and moisture are quite similar during significant-hail events anywhere they occur. However, the synoptic setting that brings the right ingredients together may vary from place to place.

We have studied synoptic-scale circulation patterns during 35 significant-hail days in Finland in the period 1957–2016 by using reanalysis data from National Centers for Environmental Prediction–National Center for Atmospheric Research. Daily synoptic settings were clustered into four distinct synoptic classes and an unclassified category. Composite means and synoptic composite maps with conceptual models were drawn for each significant-hail synoptic class.

All four significant-hail synoptic patterns in Finland are characterized by strong baroclinic weather systems. There is a strong upper-level flow and significant hail occur in vicinity of an upper-level jet in all classes. All classes have frontal boundaries close to the event and in three classes the significant hail occur in the warm sector of frontal boundaries close to the location of a low-level jet. The remaining class differs from the others since hail seems to form on the cold side of the surface cold front. Two of the classes have similarities with the patterns commonly observed in severe thunderstorm situations in the United States and in tornado situations in Finland.