Preliminary Investigation of Supercell Storms in China: Characteristics of Environmental Conditions and Doppler Weather Radar Echoes

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Outline

• Spatial distribution
• Characteristics of environmental conditions
• Characteristics of radar echoes
• Summary
Doppler Weather Radar Network in China

The planned network consists of 216 radar, and up to now 165 Doppler weather radar have been installed.
Spatial Distribution

2002-2009 reported supercell storms in China
(224 events: incomplete)
Spatial Distribution

• Based on 2002-2009 incomplete statistics;
• A supercell event means that during a severe convection process at least one supercell is identified;
• During a supercell event, one to ten supercell storms can occur;
• Most supercell storms occur in east, south east, central, south west and north east parts of China.
Characteristics of Environmental Conditions
CAPE distribution among 224 supercell events

High frequency range of CAPE distribution is between 1000 to 2500 J/kg, the extreme value is greater than 6000 J/kg.
High frequency range is between 15 to 25 m/s, the extreme value is 34 m/s.
Scattering diagram between CAPE and 0-6km shear
Characteristics of Radar Echoes
Several high frequency peaks: 40-50 min, 70-80 min and 90-100 min, with longest duration over 200 min.
The high frequency range is between 60 to 75 dBz, with extreme value greater than 75 dBz.
High frequency range is from 15 to 25 m/s, with extreme value of 35 m/s.
The high frequency range is from 4.0 to 7.0 km, with minimum, average, and maximum value being 2.0 km, 6.1 km and 14.5 km, respectively.
Distribution of vertical vorticity associated with mesocyclone

The high frequency range is from 1.0 to 1.5 $10^{-2}$ s$^{-1}$, with maximum value greater than 4.0 $10^{-2}$ s$^{-1}$.
The high frequency range is from 10.0 to 15.0 m/s, with minimum value less than 5.0 m/s, and maximum value greater than 25 m/s.
Summary

• 224 supercell events have been identified from 2002 to 2009, most of them occurred over east, south east, central, south west and north east parts of China;

• The environment of supercell storms is characterized by relative high value of 0-6km shear and moderate to significant value of CAPE, their high frequency ranges are 15 to 25 m/s and 1000 to 2500 J/kg, respectively;

• The high frequency range of maximum reflectivity is between 60 to 75 dBz, with extreme value greater than 75 dBz;
Summary (continue)

- High frequency range of mesocyclone rotation speed is from 15 to 25 m/s, with extreme value of 35m/s;

- The high frequency range of mesocyclone diameter is from 4.0 to 7.0 km, with minimum, average, and maximum value being 2.0 km, 6.1km and 14.5 km, respectively.

- Over 90% of supercell storms produced large hail, damage wind, tornadoes, or heavy rain, less than 15% of supercells produced tornadoes.