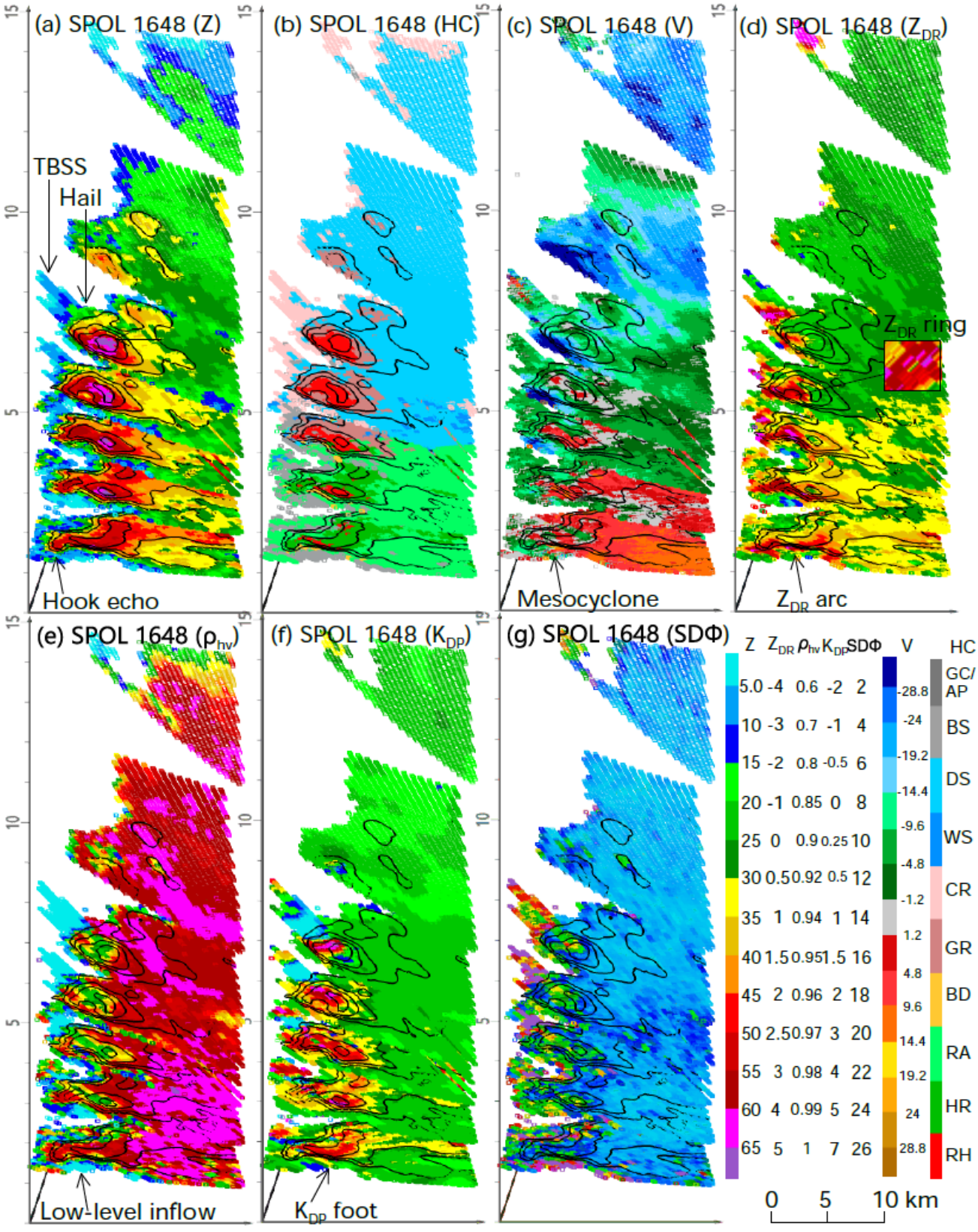
Advances in Chinese Dual-polarization and Phased-array Weather Radars: Observational Analysis of a Supercell in Southern China

*Chong Wu[1], Liping Liu[1], Xi Liu[1]

1. Chinese Academy of Meteorological Sciences

In the summer of 2016, one phased-array radar and two polarimetric weather radars, representative of advancing radar technology in use in China, jointly collected data in the Foshan area to study severe convective storms in southern China. After an introduction to the technical characteristics and a verification of the radar calibration, the advantages of the above dual-polarization and phased-array radars are discussed in terms of an observational analysis of a supercell that occurred on May 9, 2016. The polarimetric signatures within the supercell are associated with specific microphysical processes that can reveal different stages of storm evolution. The hydrometeor classification algorithm is a more straightforward and useful method for nowcasting than conventional algorithms, which makes it favorable for further recommendation in China. During the mature and dissipating stages of this supercell, observations of the phased-array radar show detailed changes on short time scales that cannot be observed by parabolic-antenna radars. The initiation and mergers of new convective cells are found in the peak-inflow region, and the formation and dissipation of the hook echo are associated with the relative intensities of inflow and outflow. The above results demonstrate that the phased-array radar and dual-polarization radars recently developed in China are powerful tools to better understand storms evolutions for nowcasting and scientific studies.

Keywords: polarimetric radar, phased array radar


(a) SPOL 1648 (Z)
(b) SPOL 1648 (HC)
(c) SPOL 1648 (V)
(d) SPOL 1648 (Z_{DR})
TBSS
Hail
Hook echo
Mesocyclone
Z_{DR} ring
Z_{DR} arc
(e) SPOL 1648 (ρ_{hv})
(f) SPOL 1648 (K_{DP})
(g) SPOL 1648 (SDΦ)
Low-level inflow
K_{DP} foot
Z Z_{DR} ρ_{hv} K_{DP} SDΦ
5.0 -4 0.6 -2 2
10 -3 0.7 -1 4
15 -2 0.8 -0.5 6
20 -1 0.85 0 8
25 0 0.9 0.25 10
30 0.5 0.92 0.5 12
35 1 0.94 1 14
40 1.5 0.95 1.5 16
45 2 0.96 2 18
50 2.5 0.97 3 20
55 3 0.98 4 22
60 4 0.99 5 24
65 5 1 7 26
V
-28.8
-24
-19.2
-14.4
-9.6
-4.8
-1.2
1.2
4.8
9.6
14.4
19.2
24
28.8
HC
GC/AP
BS
DS
WS
CR
GR
BD
RA
HR
RH
0 5 10 km