Western Gila County Arizona Flash Flood on 9 September 2003

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WFO Phoenix, Arizona

1. Introduction

Significant flash flooding occurred over a localized portion of western Gila County, Arizona, an area of relatively rugged terrain east of Phoenix (Figure 1), during the early morning hours of 9 September 2003. KIWA WSR-88D precipitation estimates indicate that 8 to 10 inches of rain fell over a 5 sq mi area centered 4 miles south of Roosevelt, Arizona, in a 4-hour period (11 pm MST 8 September to 3 am MST 9 September), while in excess of 6 inches of rain fell over a 100 sq mi area just south and east of Roosevelt Lake (Figure 2). According to a storm spotter in the area, in excess of 10 inches of rain was measured at a couple of rain gauges just south of Roosevelt Lake. Flash flooding occurred on several creeks and numerous washes in the primary drainage basin, with the worst flood damage reported over a small portion of western Gila County between 2 and 4 am MST; 5 homes were declared total losses due to flooding, while over 200 others sustained significant flood damage (East Valley Tribune newspaper article, 13 September 2003). Peak rainfall totals from this single event exceeded yearly average rainfall observed over Greater Phoenix, and were on the order of 50-60% of the average yearly total over the affected area.

This TA-Lite provides a brief overview of the synoptic and mesoscale conditions which preceded and accompanied the flash flooding, and highlights the importance of situational awareness with regard to the issuance of timely, accurately-worded flash flood products.

2. Synoptic Overview

At 1200 UTC 8 September, a mid-latitude trough existed near 120 W, while ridges existed near 150 W and 90 W. A vigorous short wave trough was moving through the Pacific Northwest, with a secondary upstream disturbance observed over the eastern Pacific Ocean. A surface cold front extended from northwest Utah through central Nevada. By 0000 UTC 9 September, the vigorous Pacific Northwest trough had tracked east, staying mainly north of Arizona; however, the base of the trough extended south to southern California (Figure 3). The low-mid level pressure gradient had tightened, leading to a strengthening and backing of the low-mid tropospheric winds over Arizona. This trend continued overnight as the secondary disturbance strengthened and moved southeast to the California coast.

The low level (sfc-700 hPa layer) air mass over Arizona possessed an above-average equivalent potential temperature: Phoenix's average temperature for 8 September, 94 F, was 6 degrees above climatology, while the average surface dew point of 63 F was 7 degrees above climatology. Precipitable water was 1.25"-1.5" over south central Arizona during much of the day, then increased to in excess of 1.5" during the night of 8-9 September as moist southwest flow increased (precipitable water was 130-140% of normal over south central Arizona during the night of 8-9 September). GOES precipitable water imagery indicated that a moist axis extended from northwest Mexico to north-central Arizona. The GFS indicated that deep layered (700-300 hPa) synoptic scale vertical motion would increase over south central Arizona during the night of September 8, peak during the day of September 9, then decrease the following evening. The 0300 UTC Phoenix sounding (Figure 4) indicated relatively large CAPE (> 1000 j/kg) and very small CIN (convective inhibition), similar to 0000 UTC soundings taken at Tucson and Flagstaff; however, precipitable water had increased over Phoenix between 0000 and 0300 UTC. The combination of increasingly favorable dynamics, presence of a ridge of equivalent potential temperature, and increasingly moist, unstable air supported the potential for isolated strong thunderstorm development, with locally heavy rain, over south-central Arizona during the night of 8-9 September, with more widespread development during the day of 9 September.

3. Evolution of the Flash Flood

Isolated thunderstorms formed to the north and west of Phoenix shortly after 5 pm September 8, then affected northwest Maricopa County between 6 and 730 pm. A few storms developed south and east of Phoenix around 745 pm, but most activity had died out and skies were generally clear west of Phoenix by 930 pm. Between 950 pm and 1115 pm, cloud-to-ground lightning was sparse over south-central Arizona; only 2 negative strikes were detected. Radar reflectivity images confirmed that convective activity had diminished (Figures 5, 6 , 7, 8 depict conditions as of 0600 UTC 9 September). However, infrared satellite images and surface observations indicated that low and mid-level cloudiness increased over and east of the Phoenix area between 930 and 11 pm, suggesting that synoptic scale upward vertical motion was occurring. Given the unstable conditions, with little inhibition noted on the soundings, coupled with the increase in cloudiness over south-central Arizona, forecasters at WFO Phoenix expected thunderstorm activity to increase over and east of Phoenix; shortly after 11 pm, areal coverage and intensity of convective showers began to increase, mainly east of Phoenix over extreme eastern Maricopa County and western Gila County. By 1145 pm, an intense thunderstorm had developed over the Salt River Lakes Recreational Area in extreme eastern Maricopa County, which prompted issuance of the first severe thunderstorm warning for this event.

Between midnight and 3 am MST, a quasi-stationary MCS developed and affected extreme eastern Maricopa County and western Gila County (Figures 9, 10 , 11, 12, 13, 14, 15, 16, 17, 18, 19, 20). Although individual cells moved toward the east-northeast at 20 mph, discontinuous cell redevelopment occurred on the southwest flank of the thunderstorm complex over extreme eastern Maricopa County as thunderstorm outflow interacted with ambient southwest flow, resulting in the nearly stationary storm complex. Training of echoes was primarily focused in a 5-mile wide band extending from 10 miles south-southwest of Roosevelt to 35 miles east-southeast of Roosevelt, where rainfall rates in excess of 3 inches per hour were observed, especially between midnight and 3 am MST. Three hour precipitation (THP) accumulation valid at 3 am September 9 indicated several areas in the heavy rain band had received 7 to 8 inches of rain (Figure 21), with much of the aforementioned area receiving in excess of 3 inches of rain. This rain fell over a basin drained by several creeks and washes, including Campaign, Spring and Pinto Creeks, as well as Blevens Wash. Flash flooding occurred in Roosevelt Estates, a residential area on the southeast side of Lake Roosevelt, between 2 and 3 am; however, the most significant flash flood damage occurred over and near State Route 88, where flooded Pinto and Spring Creeks initially merged.

4. Discussion and Conclusions

Timely, accurate flash flood products were issued by WFO Phoenix before and during this catastrophic event. Situational awareness, as usual, was key to successful short-term forecast operations. Forecasters were well-aware that flash flood conditions would be in place during the day on 9 September (a flash flood watch was already in effect), and noted the following factors which supported the potential for strong thunderstorms with locally heavy rainfall over south central Arizona the night of 8-9 September: 1) the 1800 UTC 8 September GFS model run forecasted deep-layered (700-300 hPa) upward vertical motion in excess of 4 microbar/sec to develop and be centered over the affected area by 0600 UTC 9 September, with strongest low-level (700 hPa) ascent centered over the Greater Phoenix area, which suggested that convective development was likely over and just east of Phoenix, while more persistent deep convection would be possible east of Phoenix (the 0000 UTC 9 September GFS run generated a similar vertical motion forecast); 2) the GFS forecast a 35 knot jet streak at the 500 hPa level over central Arizona by 0600 UTC, with attendant differential positive vorticity advection; 3) water vapor satellite imagery indicated increasingly diffluent upper level flow over south-central Arizona during the afternoon and evening of 8 September; 4) infrared satellite imagery and surface observations indicated low (7500-8500 foot MSL cloud bases) and middle-level (15000 foot MSL cloud bases) developed rapidly over south central Arizona between 0430 and 0600 UTC 9 September; 5) GOES precipitable water images indicated that a moisture ridge existed over east-central Arizona, with precipitable water increasing to 130-140% of normal over south central Arizona during the night of 8-9 September; 6) west-southwest surface winds 10-15 mph were noted over south central Arizona through at least 11 pm on 8 September (stronger wind, with more upslope component than usually observed); 7) Phoenix Sky Harbor surface pressure bottomed out at 1003.6 mb at 0200 UTC 9 September, about 1 millibar lower than the climatological norm; 8) Phoenix maximum temperature and average dew point were above climatological norms; and 9) the 0000 UTC Phoenix sounding exhibited above normal CAPE and precipitable water, with below normal convective inhibition.

The primary lesson reinforced from this event was: when atmospheric instability is greater than normal, convective inhibition is negligible, precipitable water is greater than climatology (especially in the lower levels of the atmosphere), and low-level southwest (upslope) flow is present, it takes only weak to modest kinematic forcing to set the stage for a significant convective event. In this case, a quasi-stationary MCS produced extremely heavy rainfall, with rainfall rates and 3-hour rainfall totals seldom observed anywhere over the Phoenix CWFA.

TA-Lite Figure Captions for 9 September 2003 Flash Flood

Figure 1. High-resolution topographical map. "Home" identifies the area that experienced the most significant flash flood damage.

Figure 2. Storm Total Precipitation (STP) from the KIWA WSR-88D, valid 1200 UTC 9 September.

Figure 3. Water vapor image, with boundary layer CAPE, metar observations, 1 hour lightning and 700-300 hPa layer div Q, valid at 0000 UTC 9 September.

Figure 4. Phoenix Arizona upper air sounding, valid at 0300 UTC 9 September.

Figure 5. Same as figure 3, except at 0600 UTC 9 September.

Figure 6. Infrared image, with 1 hour lightning and metar observations, valid at 0600 UTC 9 September.

Figure 7. 3.4 degree base reflectivity, 5 minute lightning, and metar observations, valid at 0600 UTC 9 September.

Figure 8. One Hour Precipitation (OHP) from the KIWA WSR-88D, valid at 0600 UTC 9 September.

Figure 9. Same as figure 6, except valid at 0700 UTC.

Figure 10. Same as figure 7, except valid at 0700 UTC.

Figure 11. Same as figure 8, except valid at 0700 UTC.

Figure 12. Same as figure 6, except valid at 0800 UTC

Figure 13. Same as figure 7, except valid at 0800 UTC.

Figure 14. Same as figure 8, except valid at 0800 UTC.

Figure 15. Same as figure 6, except valid at 0900 UTC.

Figure 16. Same as figure 7, except valid at 0900 UTC.

Figure 17. Same as figure 8, except valid at 0900 UTC.

Figure 18. Same as figure 6, except valid at 1000 UTC.

Figure 19. Same as figure 7, except valid at 1000 UTC.

Figure 20. Same as figure 8, except valid at 1000 UTC.

Figure 21. Three Hour Precipitation (THP), midnight to 3 am MST 9 September, from the KIWA WSR-88D.

Figure 1

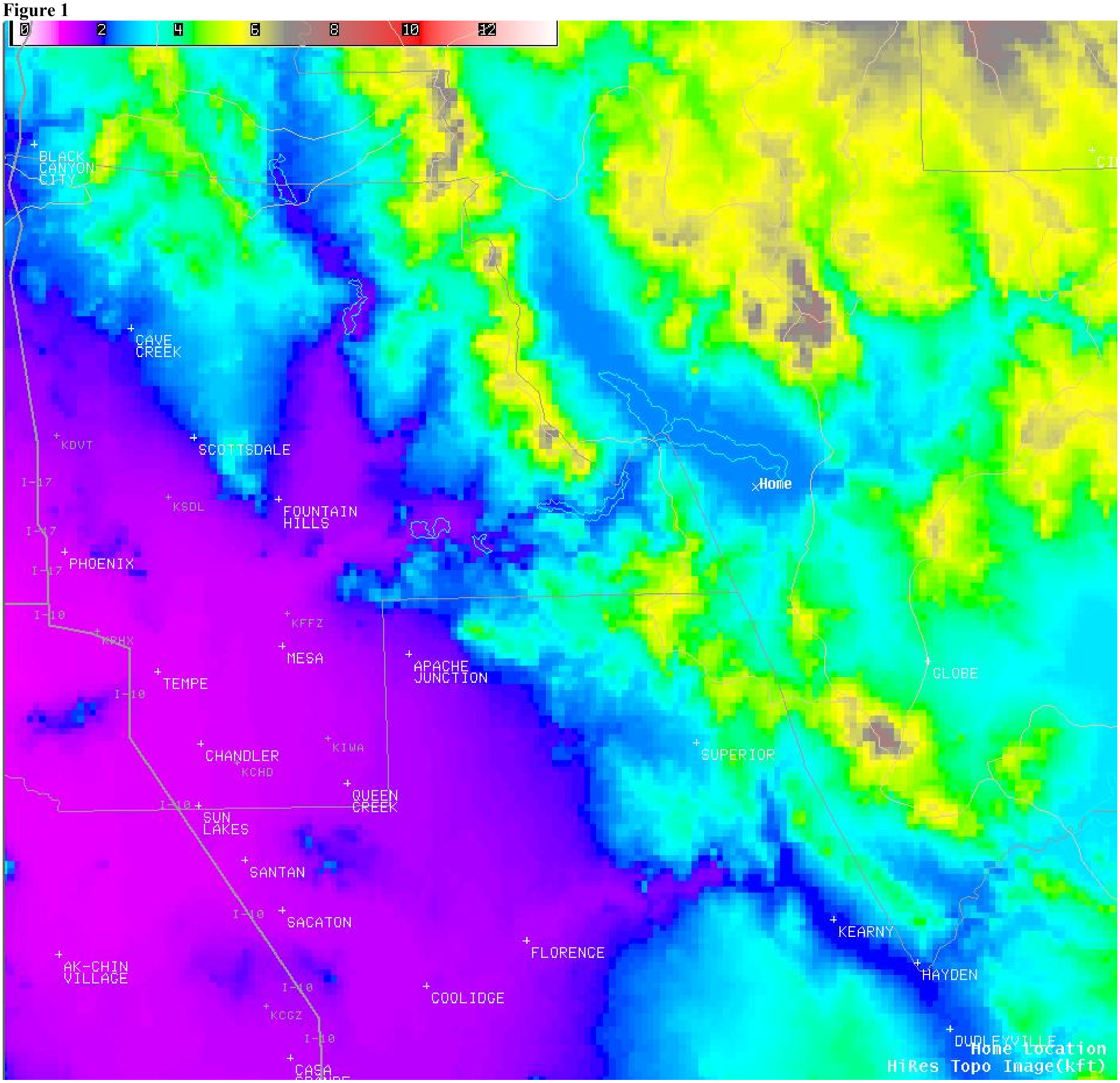
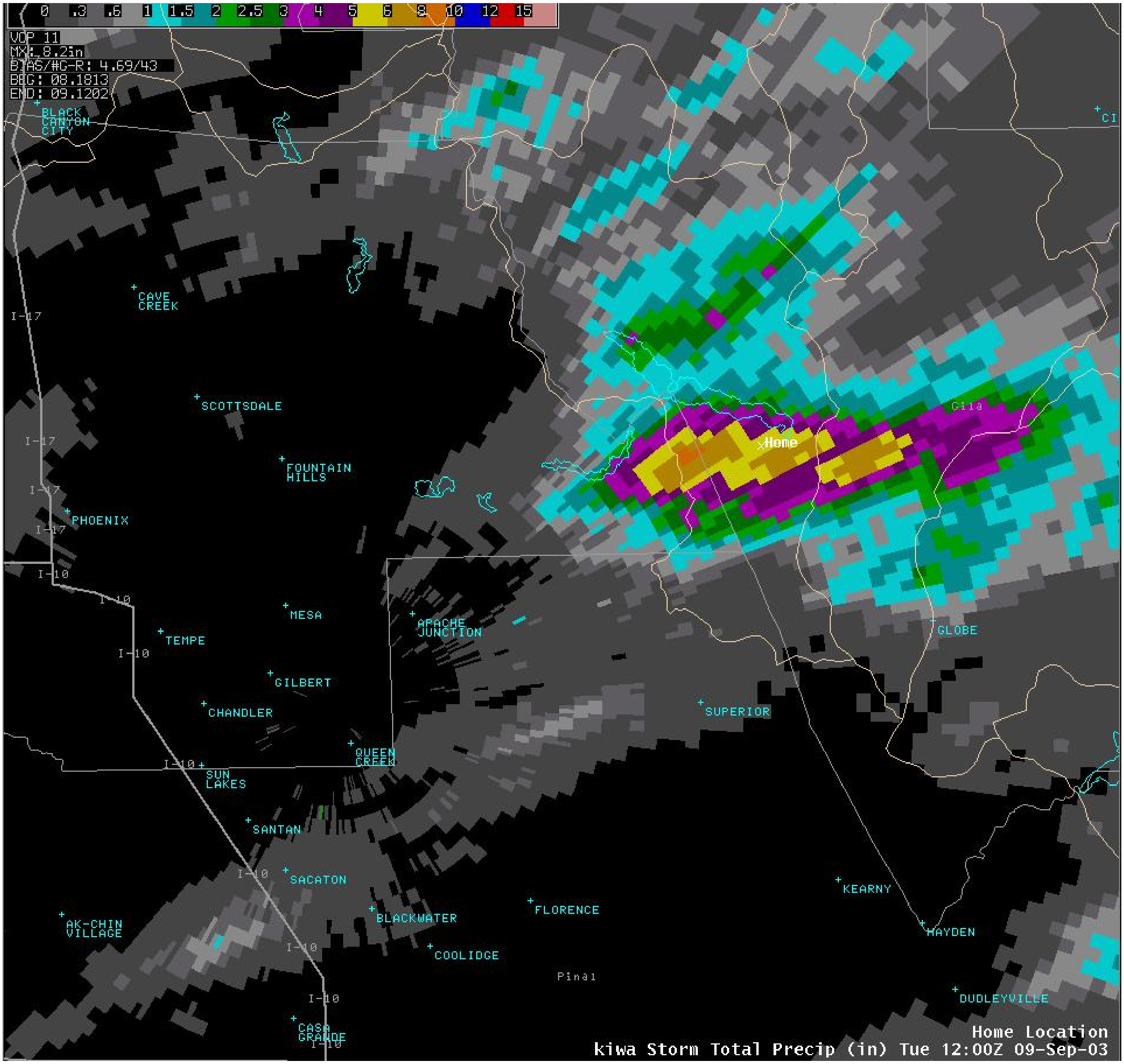


Figure 2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MX: 8.2in
BIAS/#G-R: 4.69/43
BEG: 08.1813
END: 09.1202
BLACK CANYON CITY
CAVE CREEK
I-17
SCOTTSDALE
FOUNTAIN HILLS
PHOENIX
I-10
MESA
TEMPE
APACHE JUNCTION
GILBERT
CHANDLER
QUEEN CREEK
SUN LAKES
SANTAN
SACATON
AK-CHIN VILLAGE
BLACKWATER
FLORENCE
COOLIDGE
Pinal
CASA GRANDE
SUPERIOR
GLOBE
Gila
Home
KEARNY
HAYDEN
DUDLEYVILLE
Home Location
kiwa Storm Total Precip (in) Tue 12:00Z 09-Sep-03

Figure 3

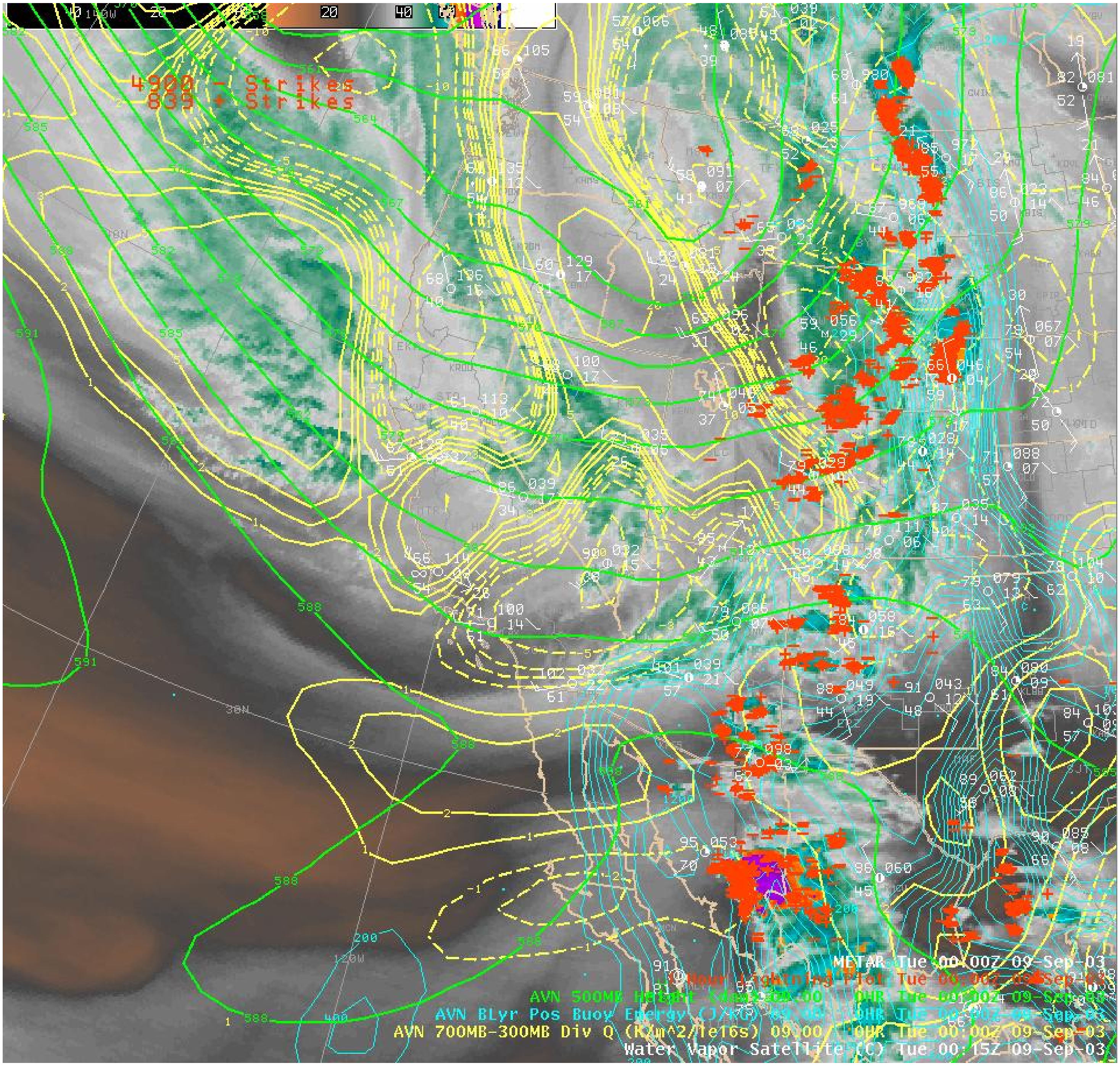

4900 - Strikes
835 + Strikes
METAR Tue 00:00Z 09-Sep-03
AVN 500MB Height (dam) 09.00 0HR Tue 00:00Z 09-Sep-03
AVN BLyr Pos Buoy Energy (J/KG) 09.00 0HR Tue 00:00Z 09-Sep-03
AVN 700MB-300MB Div Q (K/m^2/1e16s) 09.00 0HR Tue 00:00Z 09-Sep-03
Water Vapor Satellite (C) Tue 00:15Z 09-Sep-03

Figure 4

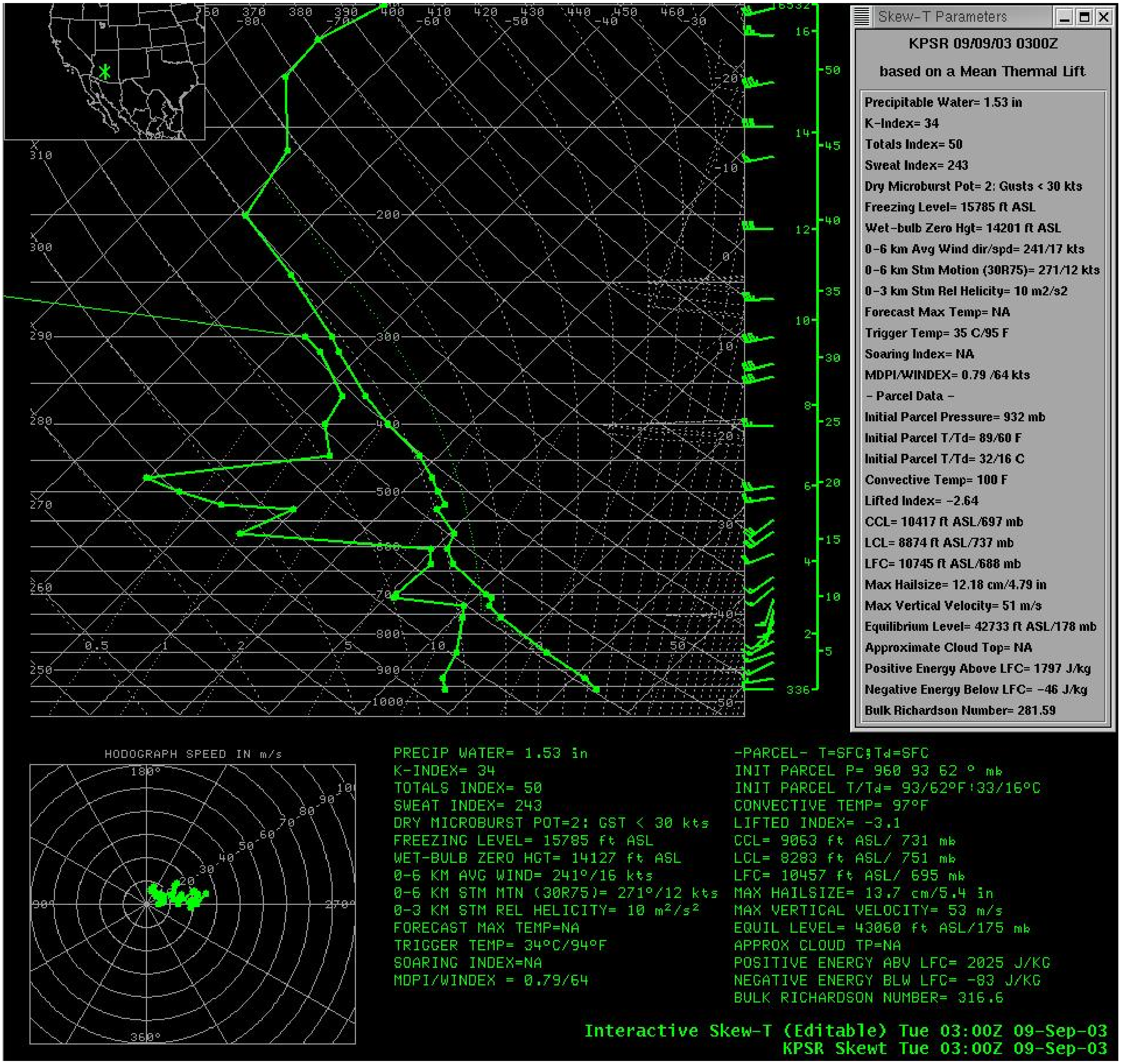

Skew-T Parameters
KPSR 09/09/03 0300Z
based on a Mean Thermal Lift
Precipitable Water= 1.53 in
K-Index= 34
Totals Index= 50
Sweat Index= 243
Dry Microburst Pot= 2: Gusts < 30 kts
Freezing Level= 15785 ft ASL
Wet-bulb Zero Hgt= 14201 ft ASL
0-6 km Avg Wind dir/spd= 241/17 kts
0-6 km Stm Motion (30R75)= 271/12 kts
0-3 km Stm Rel Helicity= 10 m2/s2
Forecast Max Temp= NA
Trigger Temp= 35 C/95 F
Soaring Index= NA
MDPI/WINDEX= 0.79 /64 kts
- Parcel Data -
Initial Parcel Pressure= 932 mb
Initial Parcel T/Td= 89/60 F
Initial Parcel T/Td= 32/16 C
Convective Temp= 100 F
Lifted Index= -2.64
CCL= 10417 ft ASL/697 mb
LCL= 8874 ft ASL/737 mb
LFC= 10745 ft ASL/688 mb
Max Hailsize= 12.18 cm/4.79 in
Max Vertical Velocity= 51 m/s
Equilibrium Level= 42733 ft ASL/178 mb
Approximate Cloud Top= NA
Positive Energy Above LFC= 1797 J/kg
Negative Energy Below LFC= -46 J/kg
Bulk Richardson Number= 281.59
HODOGRAPH SPEED IN m/s
PRECIP WATER= 1.53 in
K-INDEX= 34
TOTALS INDEX= 50
SWEAT INDEX= 243
DRY MICROBURST POT=2: GST < 30 kts
FREEZING LEVEL= 15785 ft ASL
WET-BULB ZERO HGT= 14127 ft ASL
0-6 KM AVG WIND= 241°/16 kts
0-6 KM STM MTN (30R75)= 271°/12 kts
0-3 KM STM REL HELICITY= 10 m²/s²
FORECAST MAX TEMP=NA
TRIGGER TEMP= 34°C/94°F
SOARING INDEX=NA
MDPI/WINDEX = 0.79/64
-PARCEL- T=SFC;Td=SFC
INIT PARCEL P= 960 93 62 ° mb
INIT PARCEL T/Td= 93/62°F!33/16°C
CONVECTIVE TEMP= 97°F
LIFTED INDEX= -3.1
CCL= 9063 ft ASL/ 731 mb
LCL= 8283 ft ASL/ 751 mb
LFC= 10457 ft ASL/ 695 mb
MAX HAILSIZE= 13.7 cm/5.4 in
MAX VERTICAL VELOCITY= 53 m/s
EQUIL LEVEL= 43060 ft ASL/175 mb
APPROX CLOUD TP=NA
POSITIVE ENERGY ABV LFC= 2025 J/KG
NEGATIVE ENERGY BLW LFC= -83 J/KG
BULK RICHARDSON NUMBER= 316.6
Interactive Skew-T (Editable) Tue 03:00Z 09-Sep-03
KPSR Skewt Tue 03:00Z 09-Sep-03

Figure 5

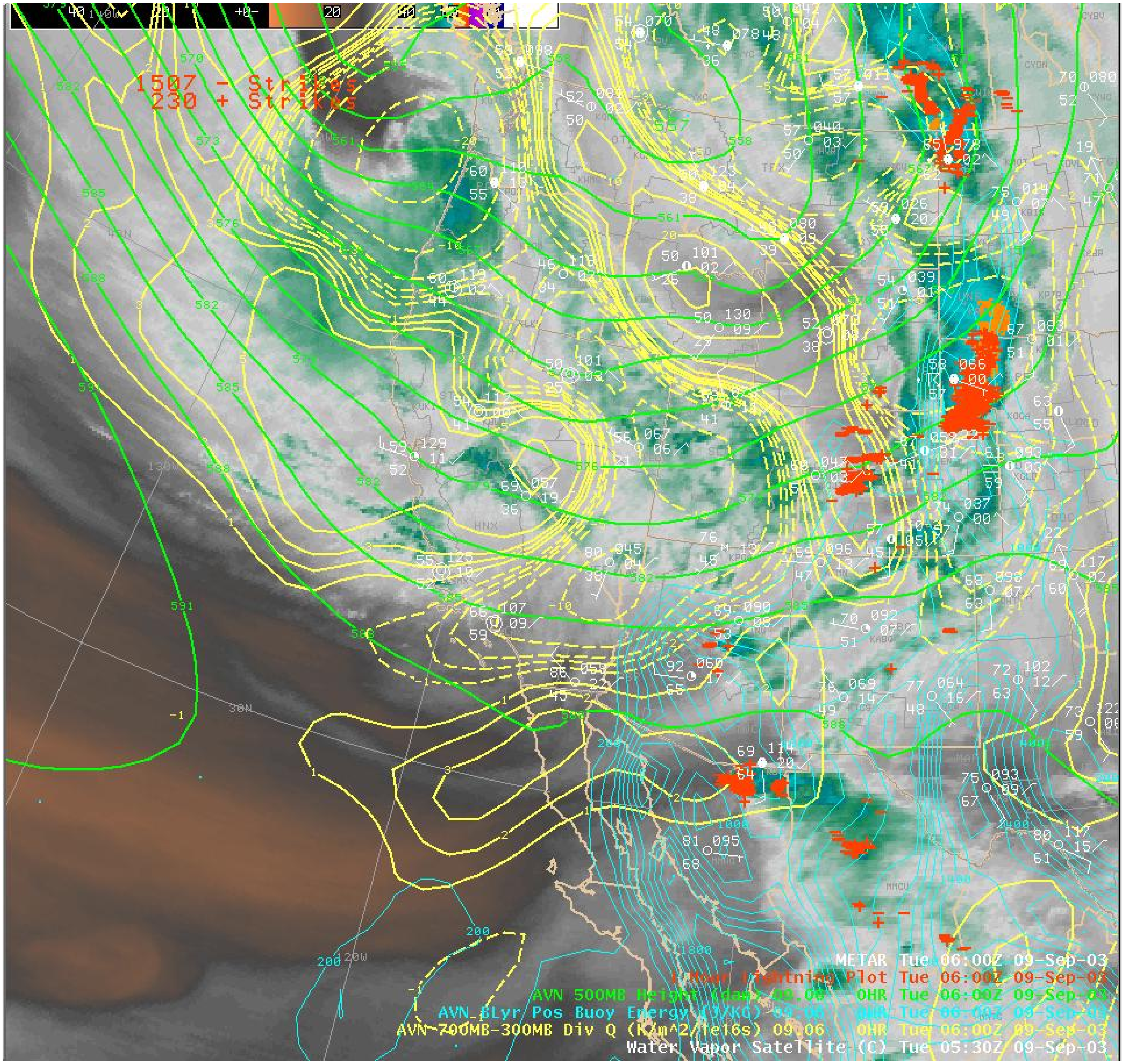

1507 - Strikes
230 + Strikes
METAR Tue 06:00Z 09-Sep-03
1 Hour Lightning Plot Tue 06:00Z 09-Sep-03
AVN 500MB Height (dam) 09.06 0HR Tue 06:00Z 09-Sep-03
AVN BLyr Pos Buoy Energy (J/KG) 09.06 0HR Tue 06:00Z 09-Sep-03
AVN 700MB-300MB Div Q (K/m^2/1e16s) 09.06 0HR Tue 06:00Z 09-Sep-03
Water Vapor Satellite (C) Tue 05:30Z 09-Sep-03

Figure 6

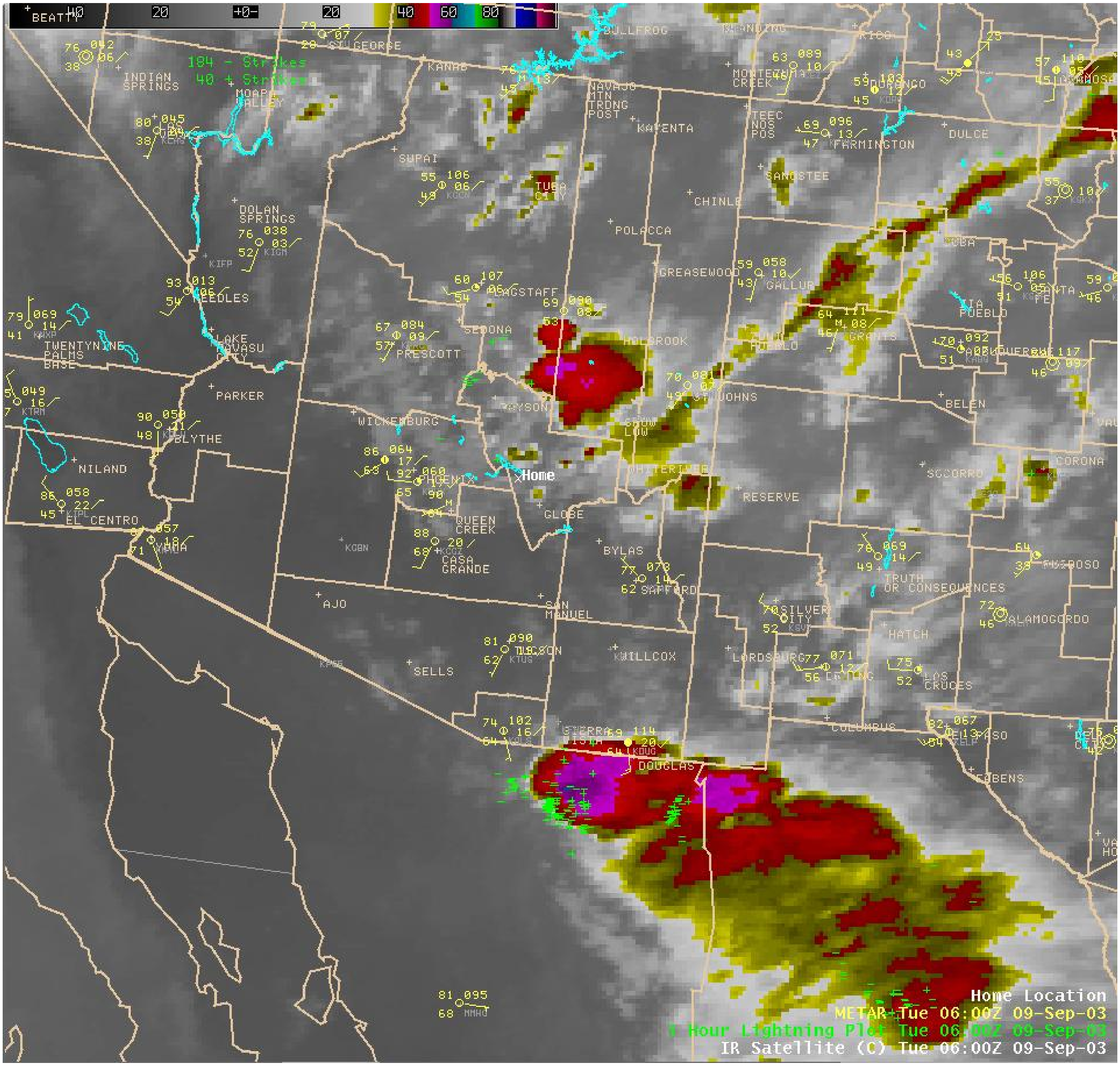
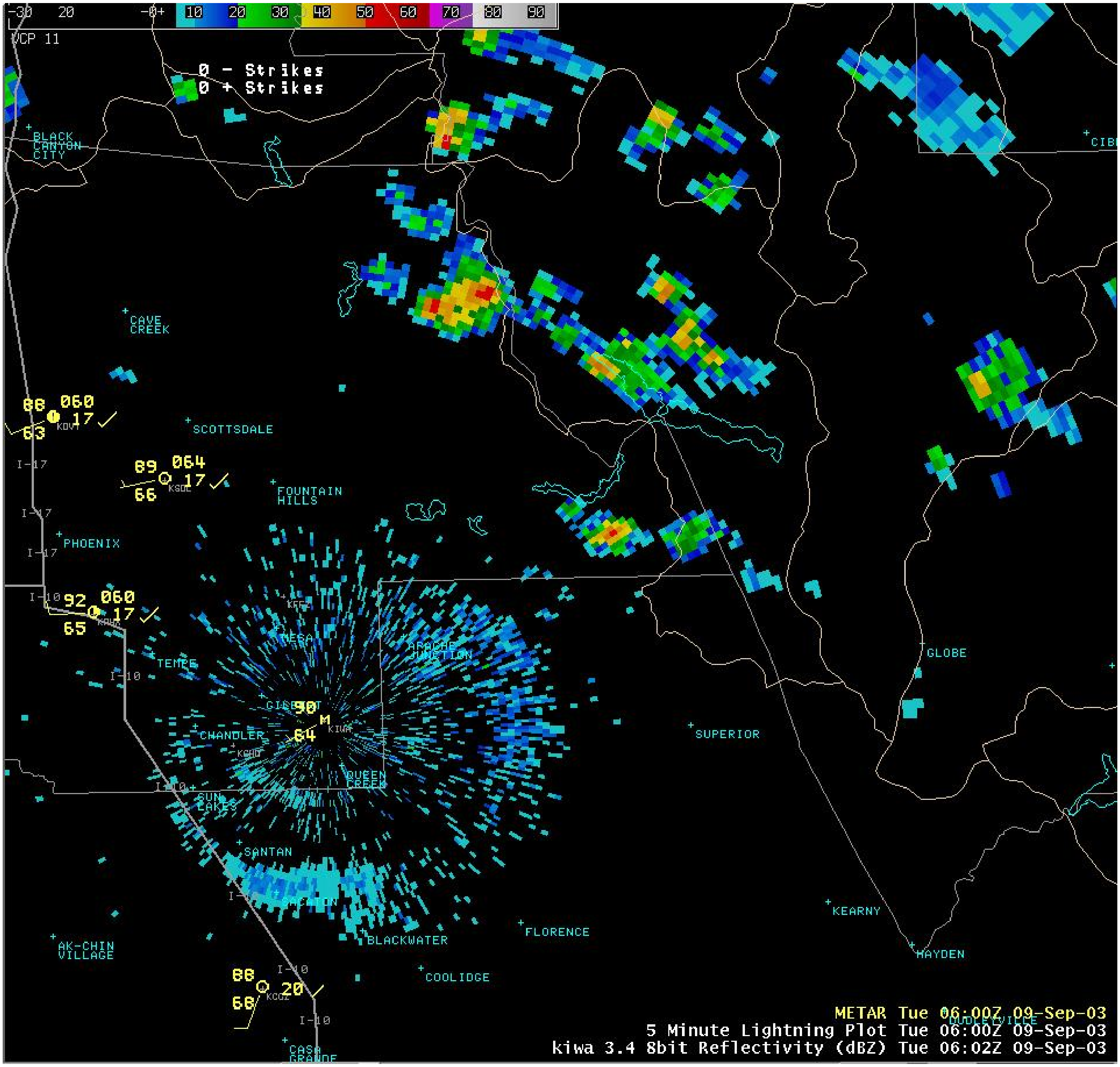
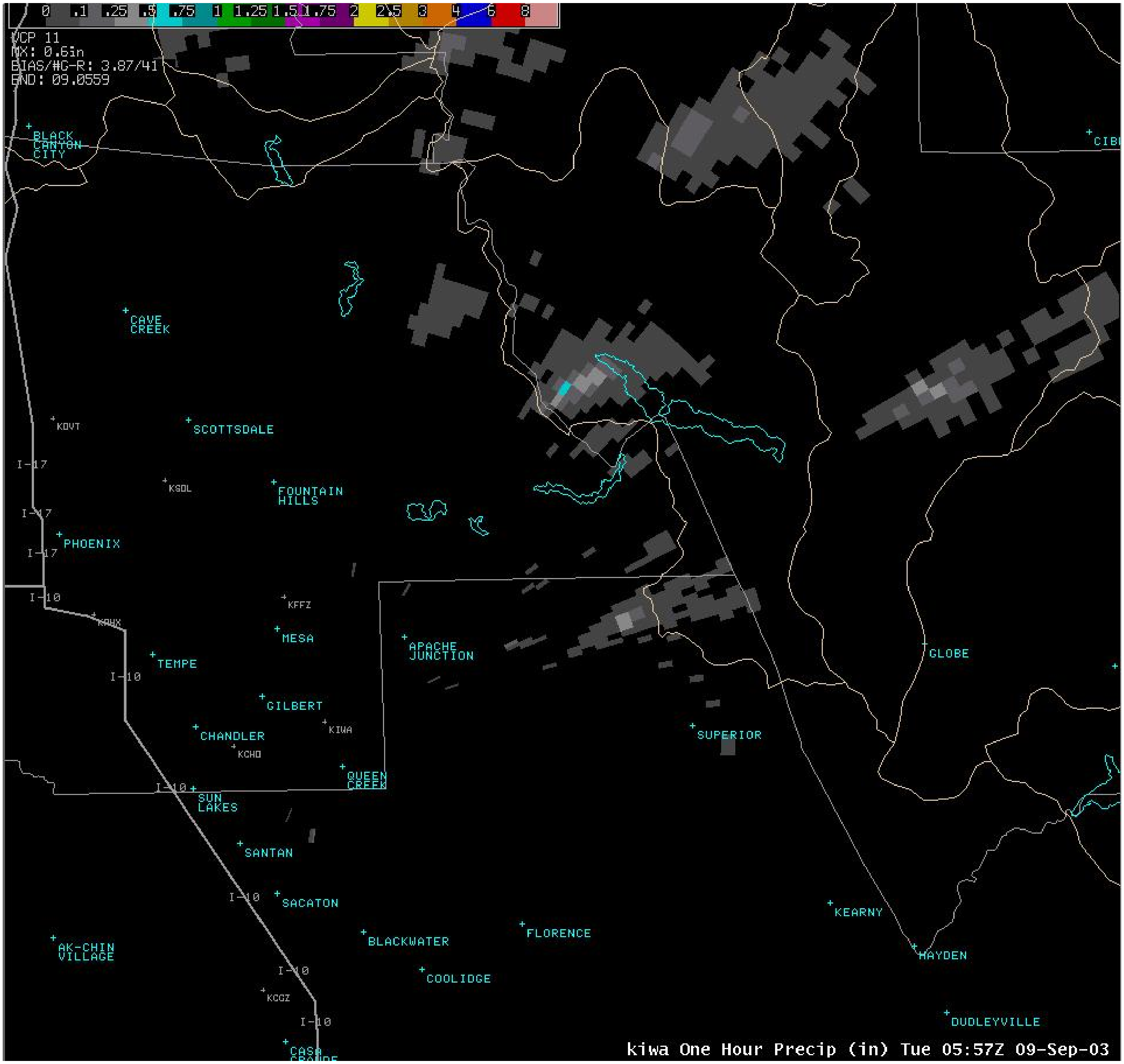

184 - Strikes
40 + Strikes
Home Location
METAR Tue 06:00Z 09-Sep-03
1 Hour Lightning Plot Tue 06:00Z 09-Sep-03
IR Satellite (C) Tue 06:00Z 09-Sep-03

Figure 7



VCP 11
0 - Strikes
0 + Strikes
BLACK CANYON CITY
CAVE CREEK
SCOTTSDALE
FOUNTAIN HILLS
PHOENIX
TEMPE
MESA
APACHE JUNCTION
CHANDLER
QUEEN CREEK
SUN LAKES
SANTAN
BLACKWATER
FLORENCE
COOLIDGE
AK-CHIN VILLAGE
CASA GRANDE
SUPERIOR
GLOBE
KEARNY
HAYDEN
METAR Tue 06:00Z 09-Sep-03
5 Minute Lightning Plot Tue 06:00Z 09-Sep-03
kiwa 3.4 8bit Reflectivity (dBZ) Tue 06:02Z 09-Sep-03

Figure 8



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VCP 11
MX: 0.6in
BIAS/#G-R: 3.87/41
END: 09.0559
BLACK CANYON CITY
CAVE CREEK
KDVT
SCOTTSDALE
KSDL
FOUNTAIN HILLS
PHOENIX
I-17
I-10
KFFZ
KPHX
MESA
APACHE JUNCTION
TEMPE
GILBERT
CHANDLER
KIWA
KCHD
QUEEN CREEK
SUN LAKES
SANTAN
SACATON
BLACKWATER
FLORENCE
COOLIDGE
KCGZ
AK-CHIN VILLAGE
CASA GRANDE
SUPERIOR
GLOBE
KEARNY
HAYDEN
DUDLEYVILLE
kiwa One Hour Precip (in) Tue 05:57Z 09-Sep-03

Figure 9

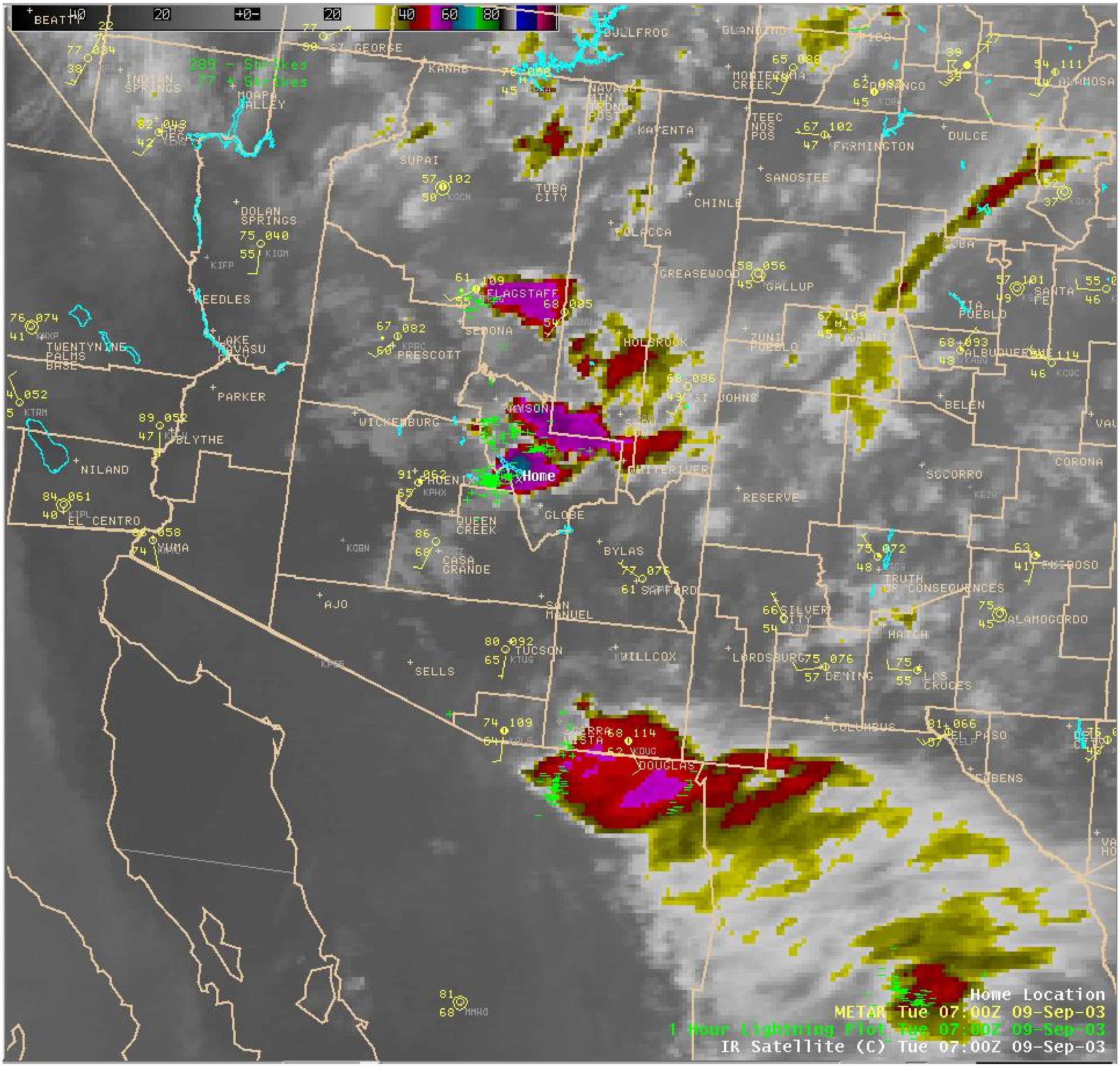

Home Location
METAR Tue 07:00Z 09-Sep-03
1 Hour Lightning Plot Tue 07:00Z 09-Sep-03
IR Satellite (C) Tue 07:00Z 09-Sep-03

Figure 9

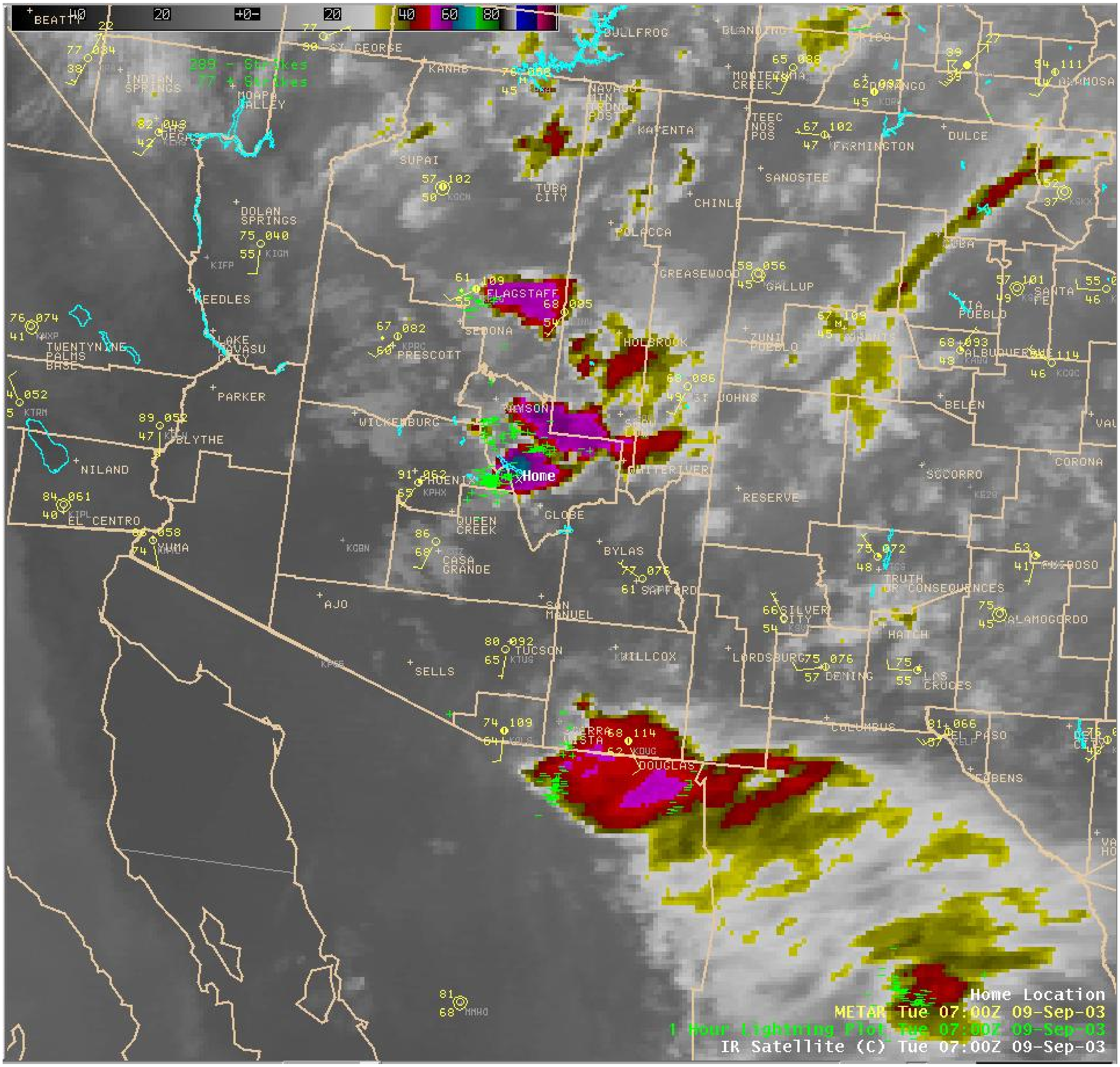

Home Location
METAR Tue 07:00Z 09-Sep-03
1 Hour Lightning Plot Tue 07:00Z 09-Sep-03
IR Satellite (C) Tue 07:00Z 09-Sep-03

Figure 10

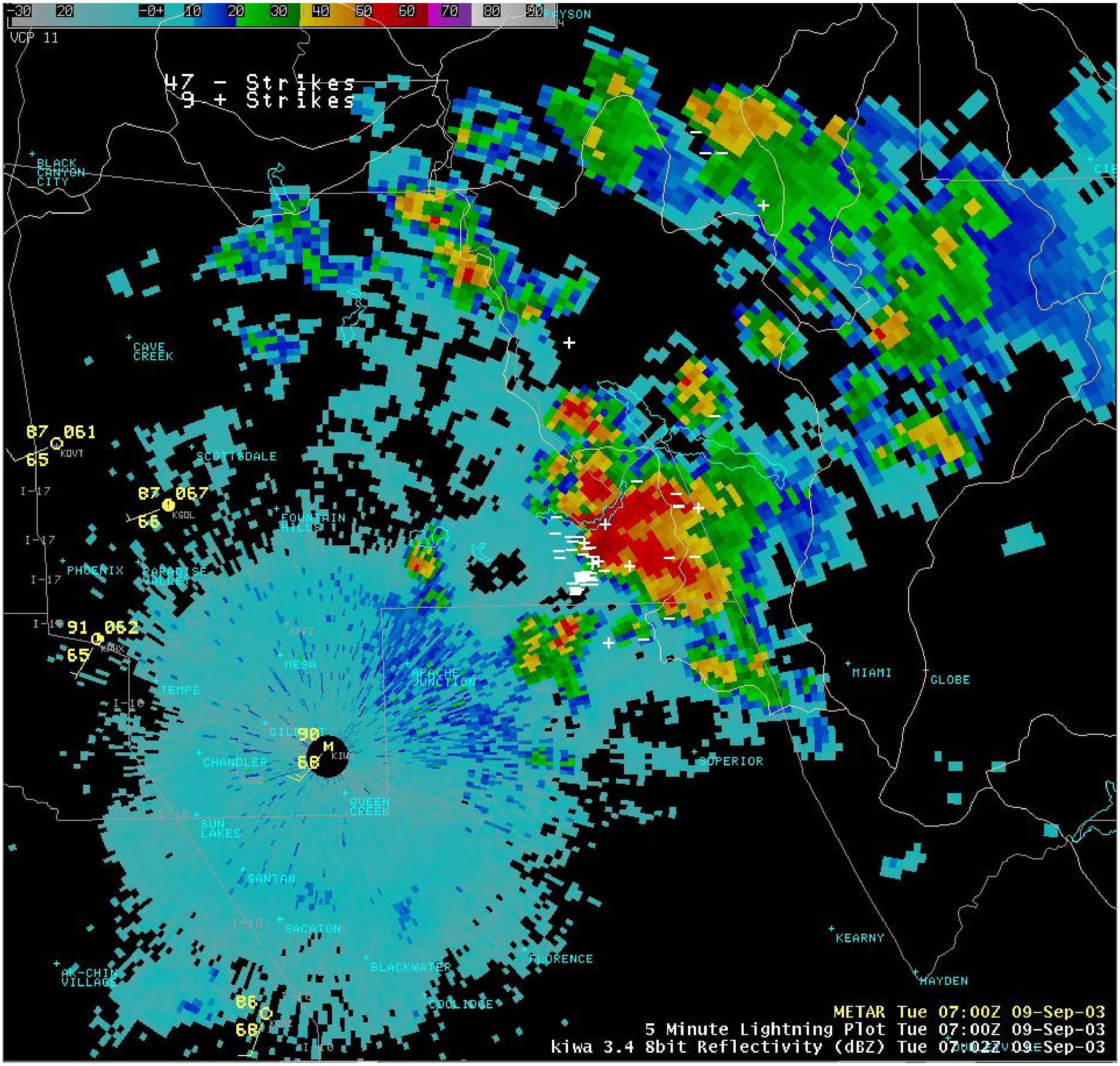

VCP 11
47 - Strikes
9 + Strikes
PAYSON
BLACK CANYON CITY
CAVE CREEK
SCOTTSDALE
FOUNTAIN HILLS
PHOENIX
PARADISE VALLEY
MESA
TEMPE
APACHE JUNCTION
CHANDLER
GILBERT
QUEEN CREEK
SUN LAKES
SANTAN
SACATON
BLACKWATER
FLORENCE
COOLIDGE
AK-CHIN VILLAGE
MIAMI
GLOBE
SUPERIOR
KEARNY
HAYDEN
METAR Tue 07:00Z 09-Sep-03
5 Minute Lightning Plot Tue 07:00Z 09-Sep-03
kiwa 3.4 8bit Reflectivity (dBZ) Tue 07:02Z 09-Sep-03

Figure 11

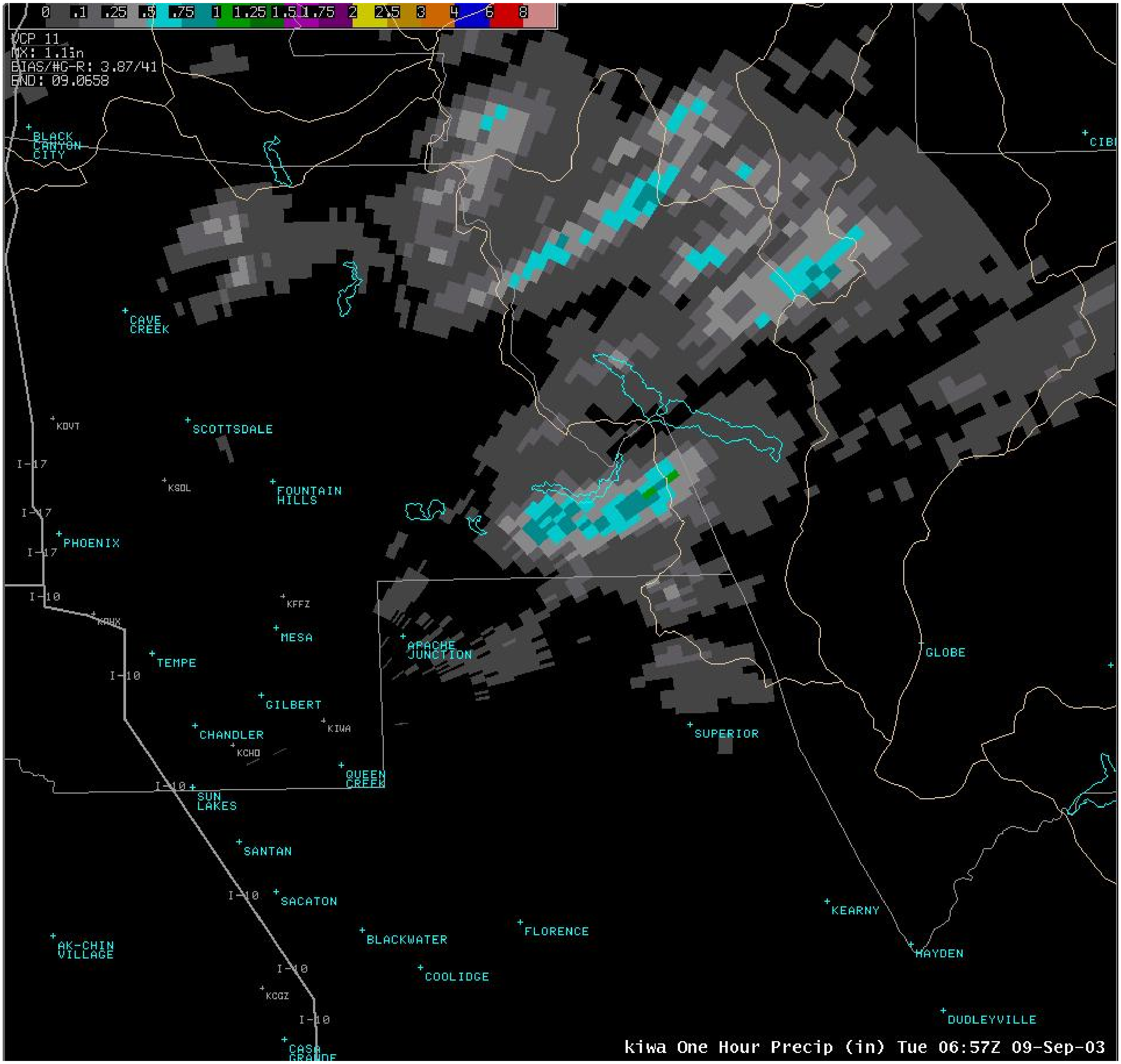

0 .1 .25 .5 .75 1 1.25 1.5 1.75 2 2.5 3 4 6 8
VCP 11
MX: 1.1in
BIAS/#G-R: 3.87/41
END: 09.0658
BLACK CANYON CITY
CAVE CREEK
KDVT
SCOTTSDALE
I-17
KSDL
FOUNTAIN HILLS
PHOENIX
I-10
KFFZ
KPHX
MESA
APACHE JUNCTION
TEMPE
GILBERT
CHANDLER
KIWA
KCHD
QUEEN CREEK
SUN LAKES
SANTAN
SACATON
BLACKWATER
FLORENCE
AK-CHIN VILLAGE
COOLIDGE
KCGZ
CASA GRANDE
GLOBE
SUPERIOR
KEARNY
HAYDEN
DUDLEYVILLE
kiwa One Hour Precip (in) Tue 06:57Z 09-Sep-03

Figure 12

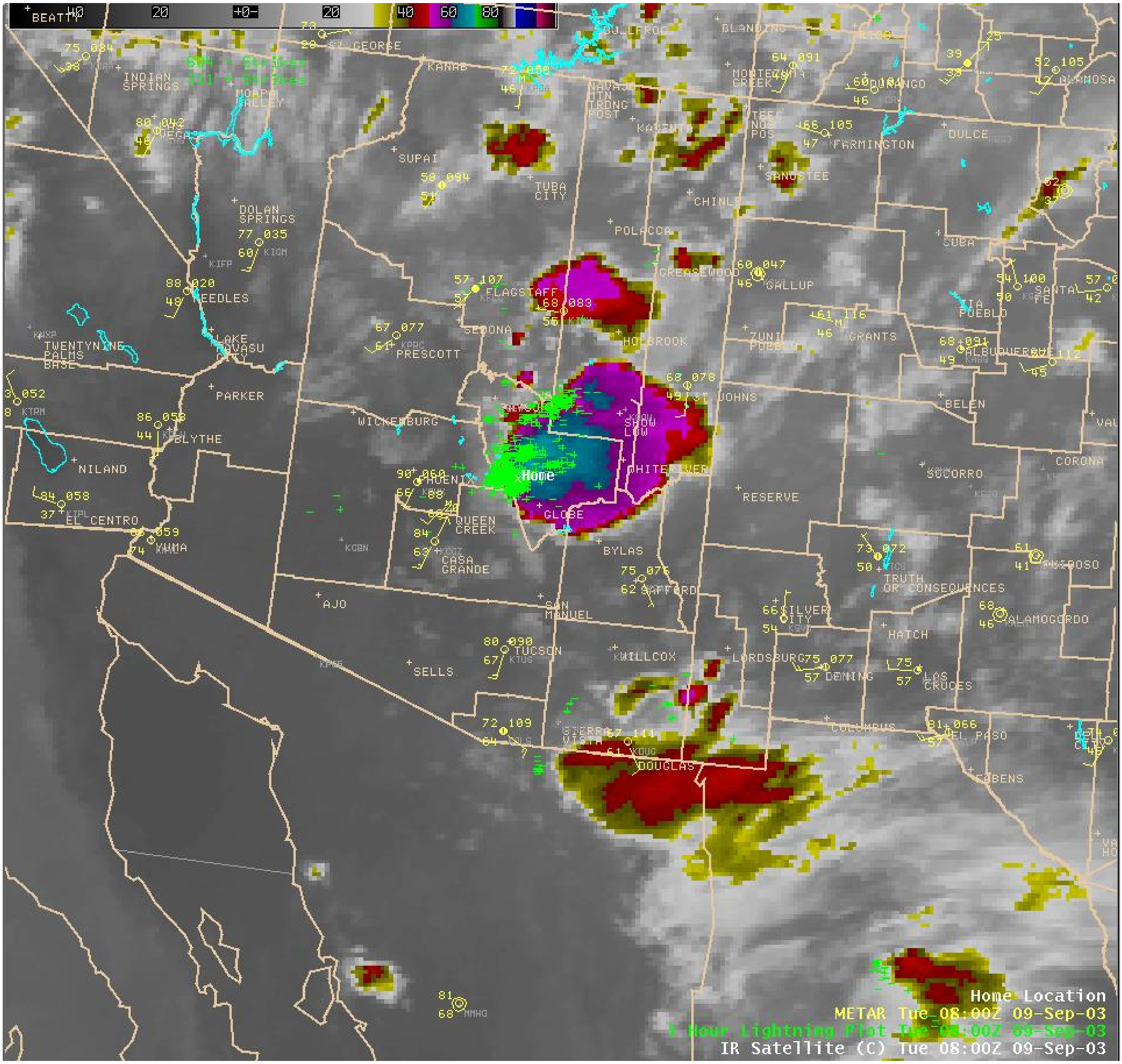

Home Location
METAR Tue 08:00Z 09-Sep-03
1 Hour Lightning Plot Tue 08:00Z 09-Sep-03
IR Satellite (C) Tue 08:00Z 09-Sep-03

Figure 13

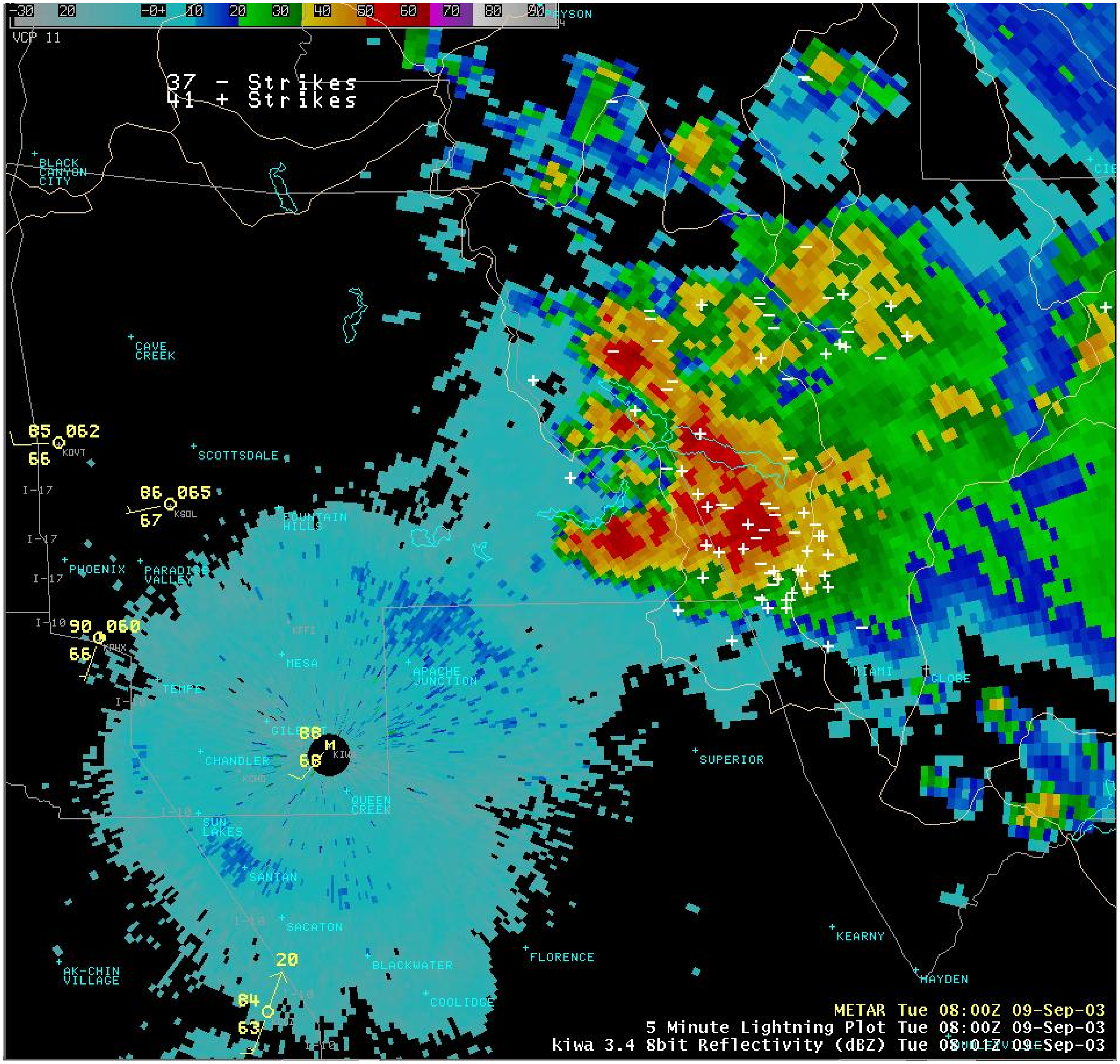
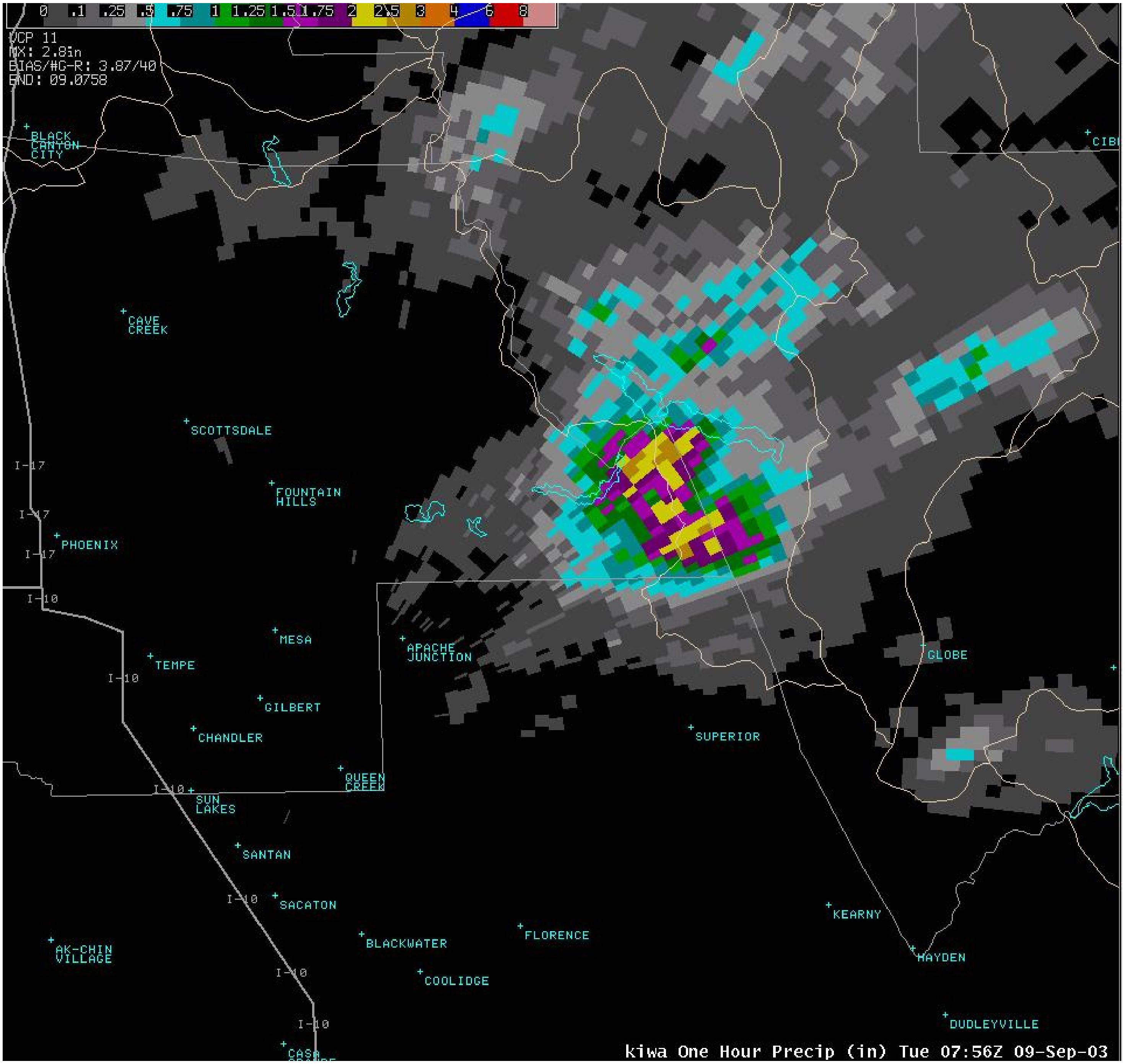

VCP 11
37 - Strikes
41 + Strikes
BLACK CANYON CITY
CAVE CREEK
SCOTTSDALE
FOUNTAIN HILLS
PHOENIX
PARADISE VALLEY
MESA
APACHE JUNCTION
TEMPE
CHANDLER
QUEEN CREEK
SUN LAKES
SANTAN
SACATON
BLACKWATER
COOLIDGE
AK-CHIN VILLAGE
FLORENCE
SUPERIOR
MIAMI
GLOBE
KEARNY
HAYDEN
METAR Tue 08:00Z 09-Sep-03
5 Minute Lightning Plot Tue 08:00Z 09-Sep-03
kiwa 3.4 8bit Reflectivity (dBZ) Tue 08:01Z 09-Sep-03

Figure 14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VCP 11
MX: 2.8in
BIAS/#G-R: 3.87/40
END: 09.0758
BLACK CANYON CITY
CAVE CREEK
SCOTTSDALE
FOUNTAIN HILLS
PHOENIX
MESA
TEMPE
APACHE JUNCTION
GILBERT
CHANDLER
QUEEN CREEK
SUN LAKES
SANTAN
SACATON
BLACKWATER
FLORENCE
AK-CHIN VILLAGE
COOLIDGE
SUPERIOR
GLOBE
KEARNY
HAYDEN
DUDLEYVILLE
I-17
I-10
kiwa One Hour Precip (in) Tue 07:56Z 09-Sep-03

Figure 15

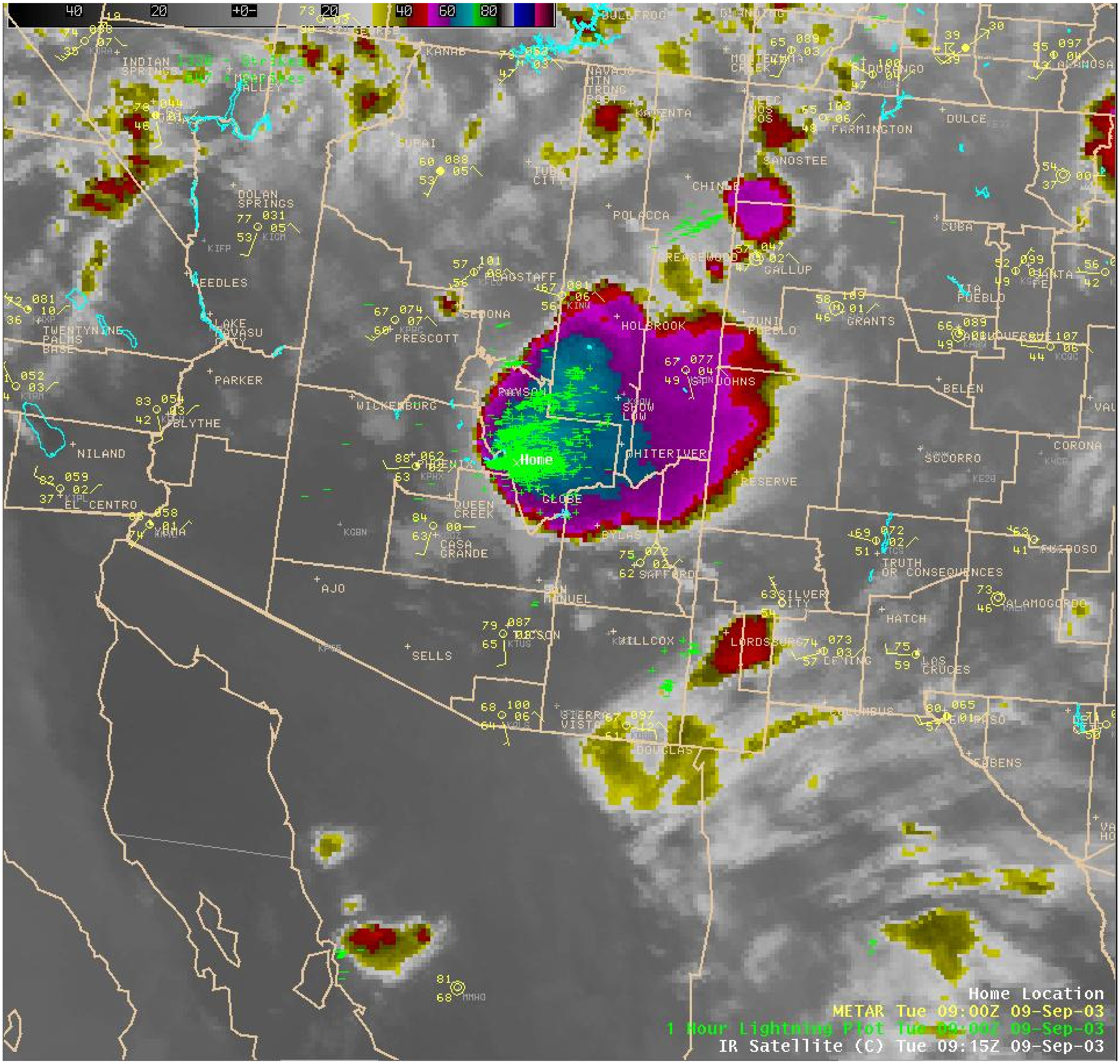

Home Location
METAR Tue 09:00Z 09-Sep-03
1 Hour Lightning Plot Tue 09:00Z 09-Sep-03
IR Satellite (C) Tue 09:15Z 09-Sep-03

Figure 16

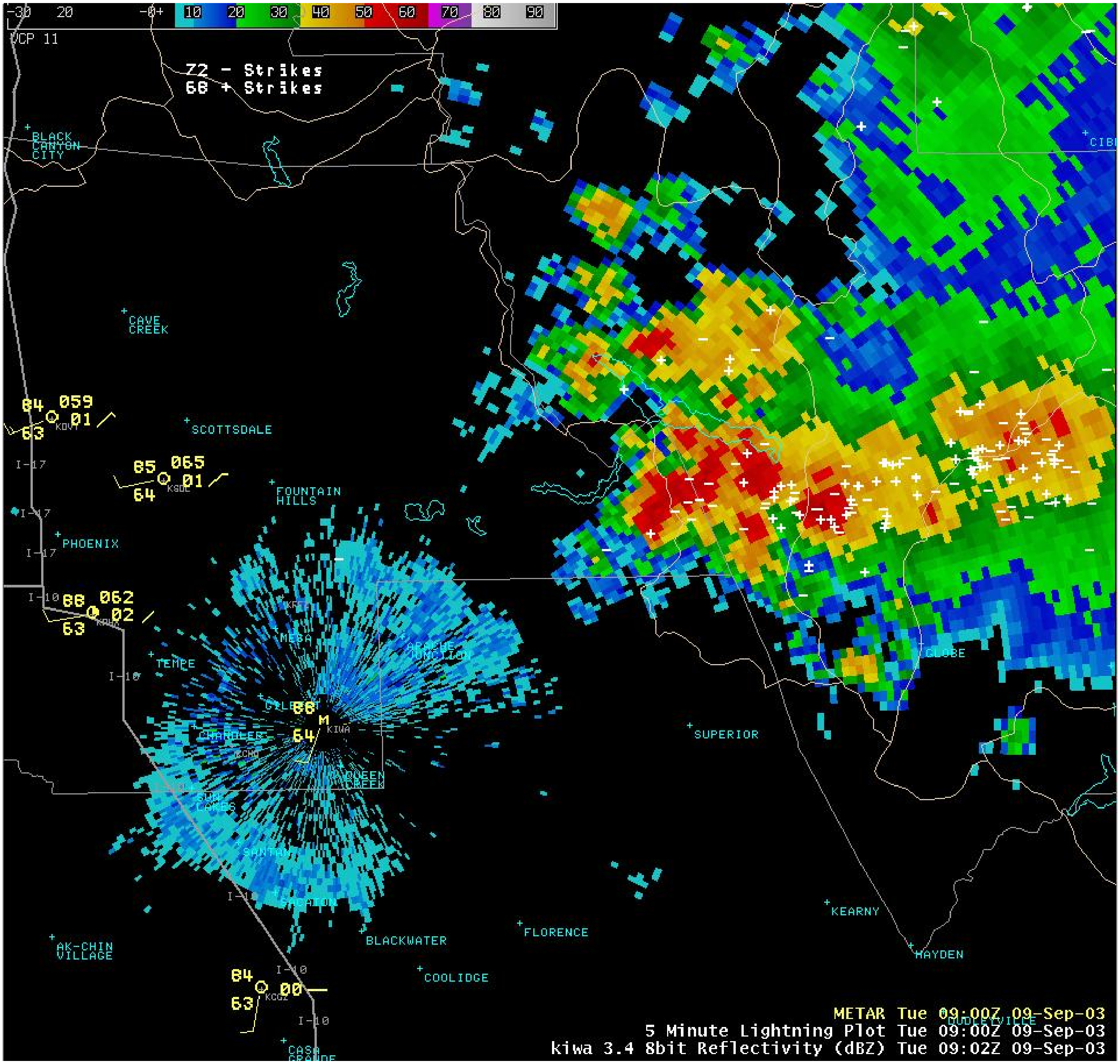
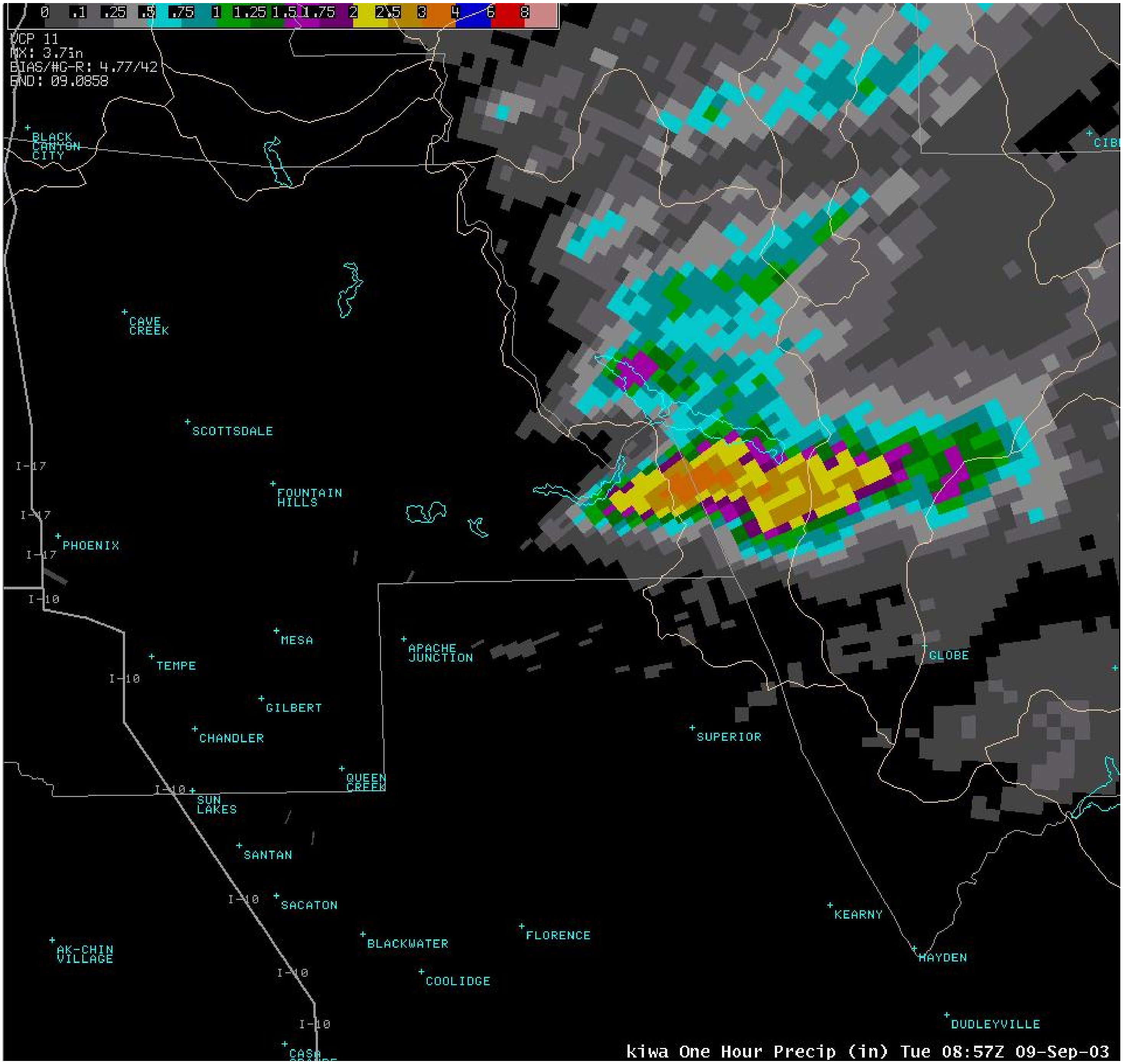
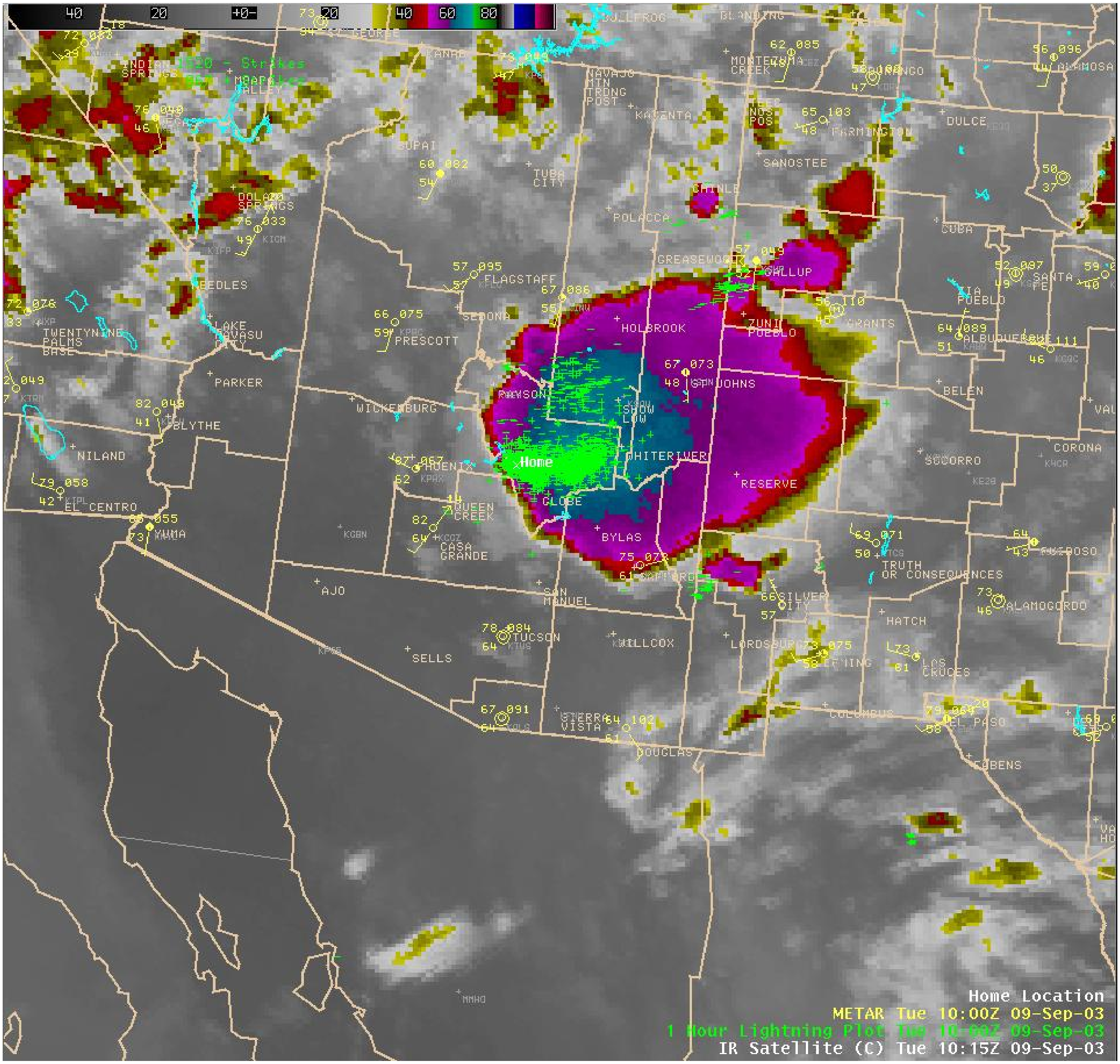

72 - Strikes
68 + Strikes
BLACK CANYON CITY
CAVE CREEK
SCOTTSDALE
FOUNTAIN HILLS
PHOENIX
TEMPE
MESA
CHANDLER
SUPERIOR
GLOBE
KEARNY
FLORENCE
BLACKWATER
COOLIDGE
HAYDEN
AK-CHIN VILLAGE
CASA GRANDE
METAR Tue 09:00Z 09-Sep-03
5 Minute Lightning Plot Tue 09:00Z 09-Sep-03
kiwa 3.4 8bit Reflectivity (dBZ) Tue 09:02Z 09-Sep-03

Figure 17



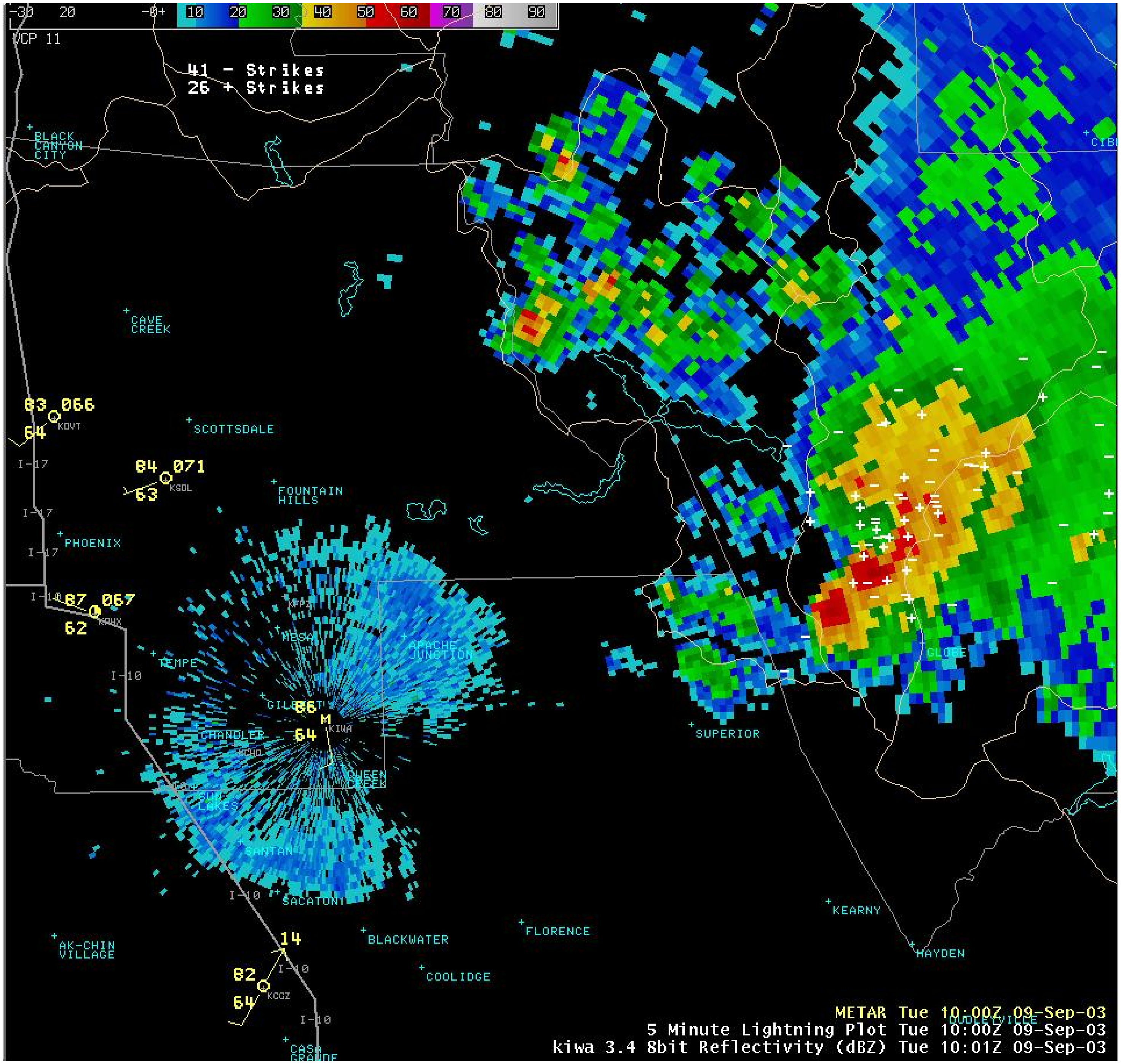
0
.1
.25
.5
.75
1
1.25
1.5
1.75
2
2.5
3
4
6
8
VCP 11
MX: 3.7in
BIAS/#G-R: 4.77/42
END: 09.0858
BLACK CANYON CITY
CAVE CREEK
SCOTTSDALE
FOUNTAIN HILLS
PHOENIX
I-17
I-10
MESA
TEMPE
APACHE JUNCTION
GILBERT
CHANDLER
QUEEN CREEK
SUN LAKES
SANTAN
SACATON
BLACKWATER
FLORENCE
COOLIDGE
AK-CHIN VILLAGE
SUPERIOR
GLOBE
KEARNY
HAYDEN
DUDLEYVILLE
kiwa One Hour Precip (in) Tue 08:57Z 09-Sep-03

Figure 18



Home Location
METAR Tue 10:00Z 09-Sep-03
1 Hour Lightning Plot Tue 10:00Z 09-Sep-03
IR Satellite (C) Tue 10:15Z 09-Sep-03

Figure 19



VCP 11
41 - Strikes
26 + Strikes
BLACK CANYON CITY
CAVE CREEK
SCOTTSDALE
FOUNTAIN HILLS
PHOENIX
TEMPE
MESA
APACHE JUNCTION
CHANDLER
GILBERT
QUEEN CREEK
SUN LAKES
SANTAN
SACATON
SUPERIOR
GLOBE
KEARNY
HAYDEN
FLORENCE
BLACKWATER
COOLIDGE
AK-CHIN VILLAGE
CASA GRANDE
I-17
I-10
METAR Tue 10:00Z 09-Sep-03
5 Minute Lightning Plot Tue 10:00Z 09-Sep-03
kiwa 3.4 8bit Reflectivity (dBZ) Tue 10:01Z 09-Sep-03

Figure 20

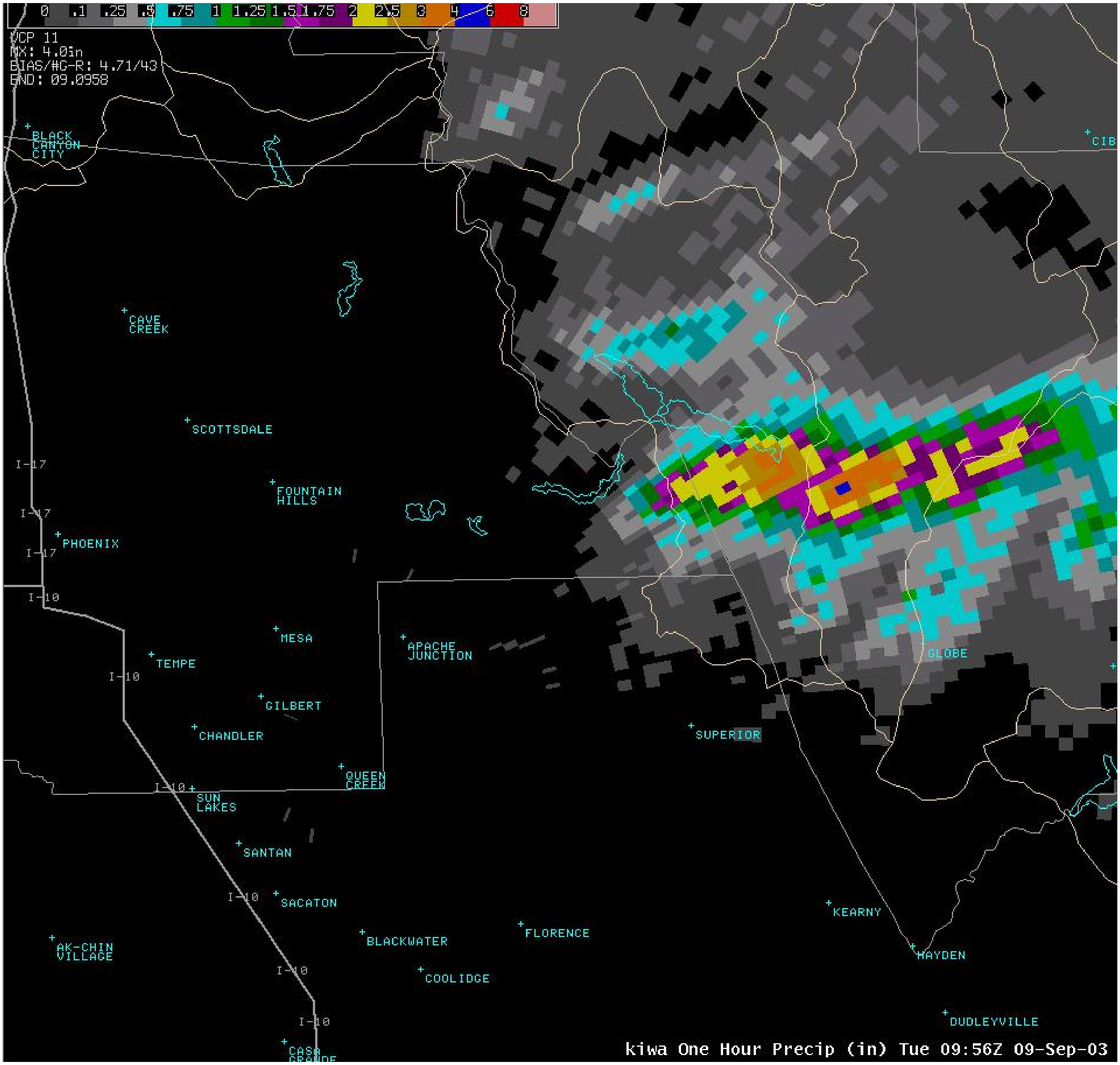
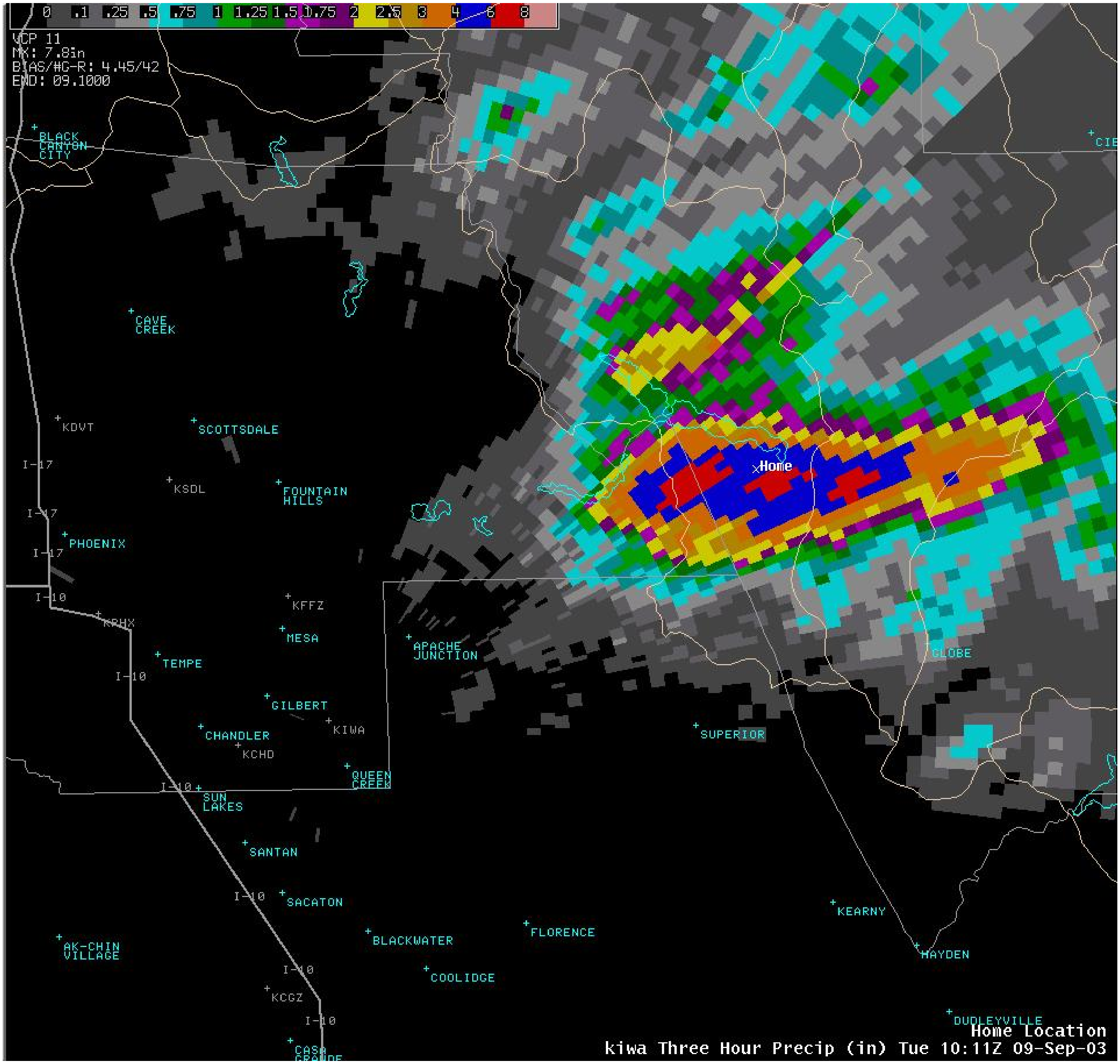

0 .1 .25 .5 .75 1 1.25 1.5 1.75 2 2.5 3 4 6 8
VCP 11
MX: 4.0in
BIAS/#G-R: 4.71/43
END: 09.0958
BLACK CANYON CITY
CAVE CREEK
SCOTTSDALE
FOUNTAIN HILLS
PHOENIX
I-17
I-10
MESA
TEMPE
APACHE JUNCTION
GILBERT
CHANDLER
SUPERIOR
QUEEN CREEK
SUN LAKES
SANTAN
SACATON
BLACKWATER
FLORENCE
KEARNY
HAYDEN
AK-CHIN VILLAGE
COOLIDGE
DUDLEYVILLE
CASA GRANDE
GLOBE
CIB
kiwa One Hour Precip (in) Tue 09:56Z 09-Sep-03

Figure 21


0 .1 .25 .5 .75 1 1.25 1.5 1.75 2 2.5 3 4 6 8
VCP 11
MX: 7.8in
BIAS/#G-R: 4.45/42
END: 09.1000
BLACK CANYON CITY
CAVE CREEK
KDVT
SCOTTSDALE
KSDL
FOUNTAIN HILLS
PHOENIX
KFFZ
KPHX
MESA
TEMPE
APACHE JUNCTION
GILBERT
KIWA
CHANDLER
KCHD
QUEEN CREEK
SUN LAKES
SUPERIOR
GLOBE
SANTAN
SACATON
BLACKWATER
FLORENCE
KEARNY
HAYDEN
AK-CHIN VILLAGE
COOLIDGE
KCGZ
DUDLEYVILLE
Home
Home Location
kiwa Three Hour Precip (in) Tue 10:11Z 09-Sep-03