Weather and climate focus

WRF Downscaling: "Choosing the Best Grid-Resolution and Model Configuration for Explicit Forecasts of Precipitation"

Barry Lynn, Ruby Leung, Alexander Khain, Daniel Rosenfeld, Guy Kelman, and Amir Givati

June 23, 2011

Compare WRF Forecasts for Twelve (30 hr) Case Study Days in 2010-11

Model Simulations with WSM6

1.3 km Grid Resolution

4 km Grid Resolution

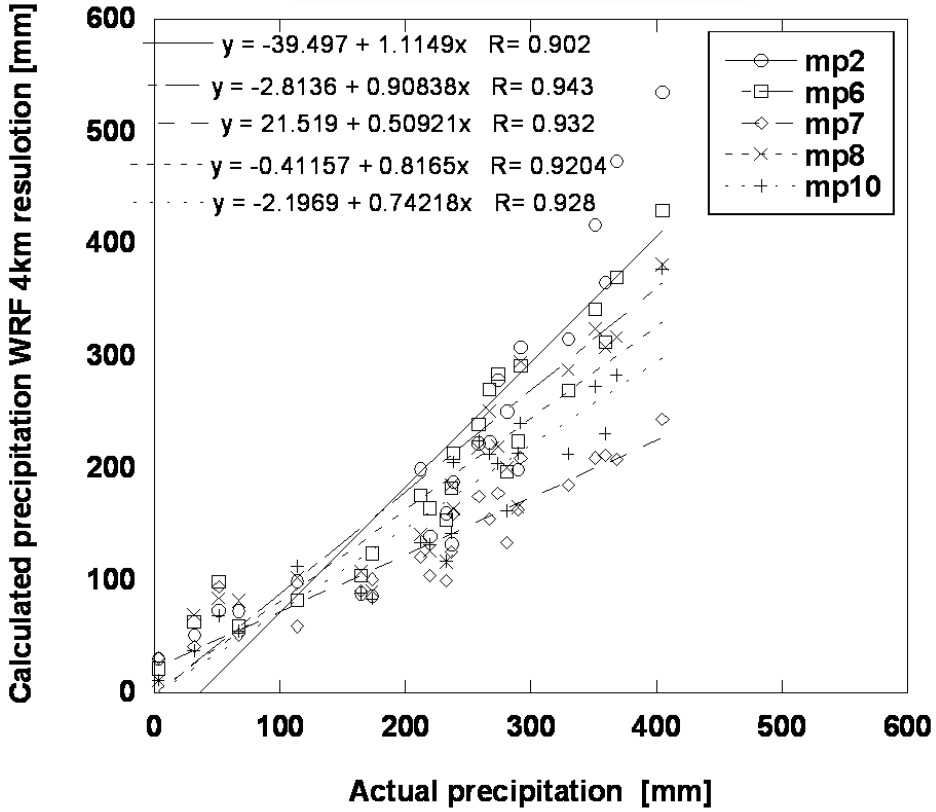
1.3 km Grid Res. GEFS Ensemble

4 km Grid Res. GEFS Ensemble

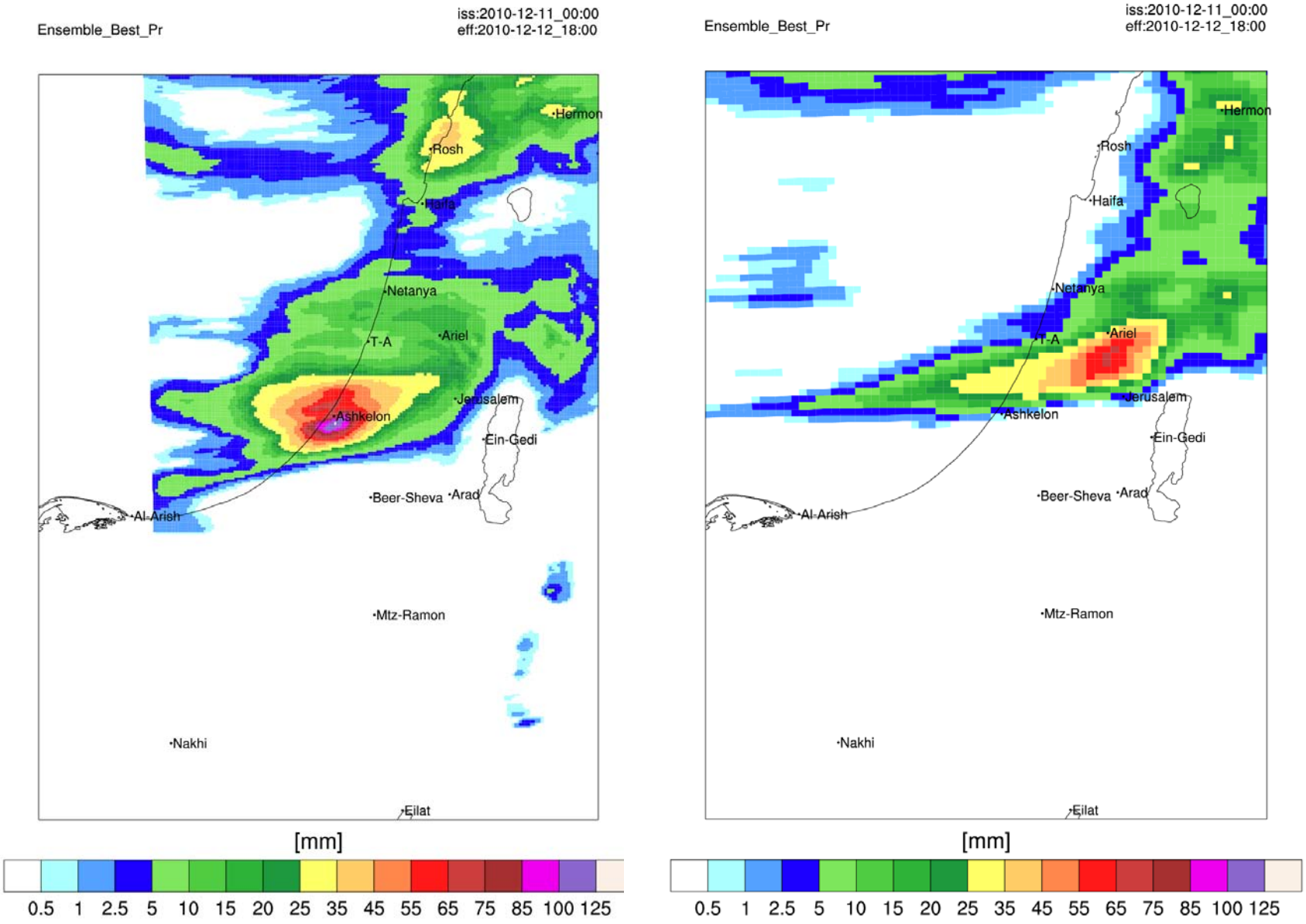
1.3 km Grid Res. With SBM (with polluted cities)

Which Configuration Has Better Precipitation Skill?

Over Several Storms
WSM6 Was The Best!



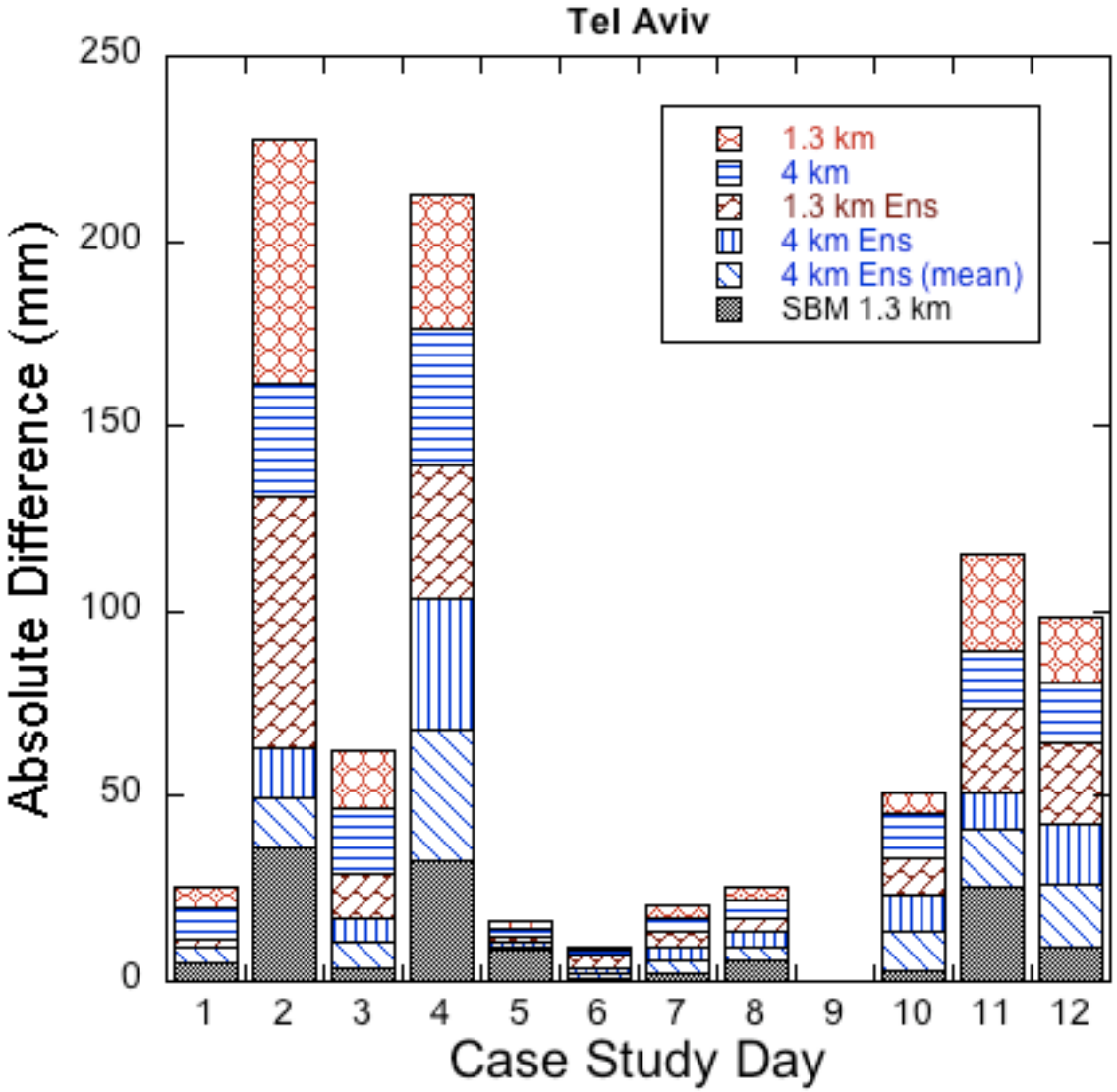
1.3 km Ensemble Forecast (Left) Versus 4 km Ensemble Forecast (Right)

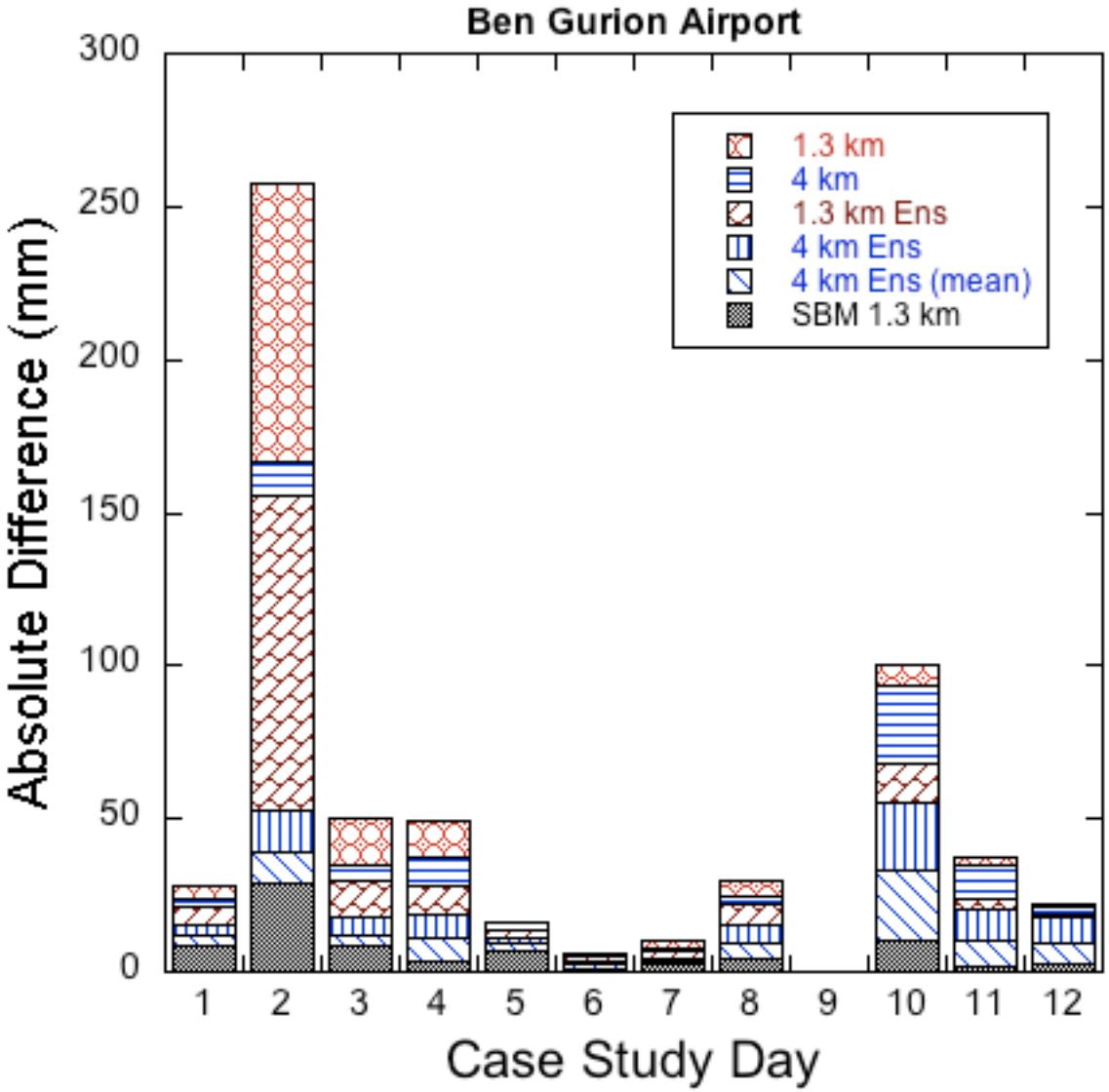


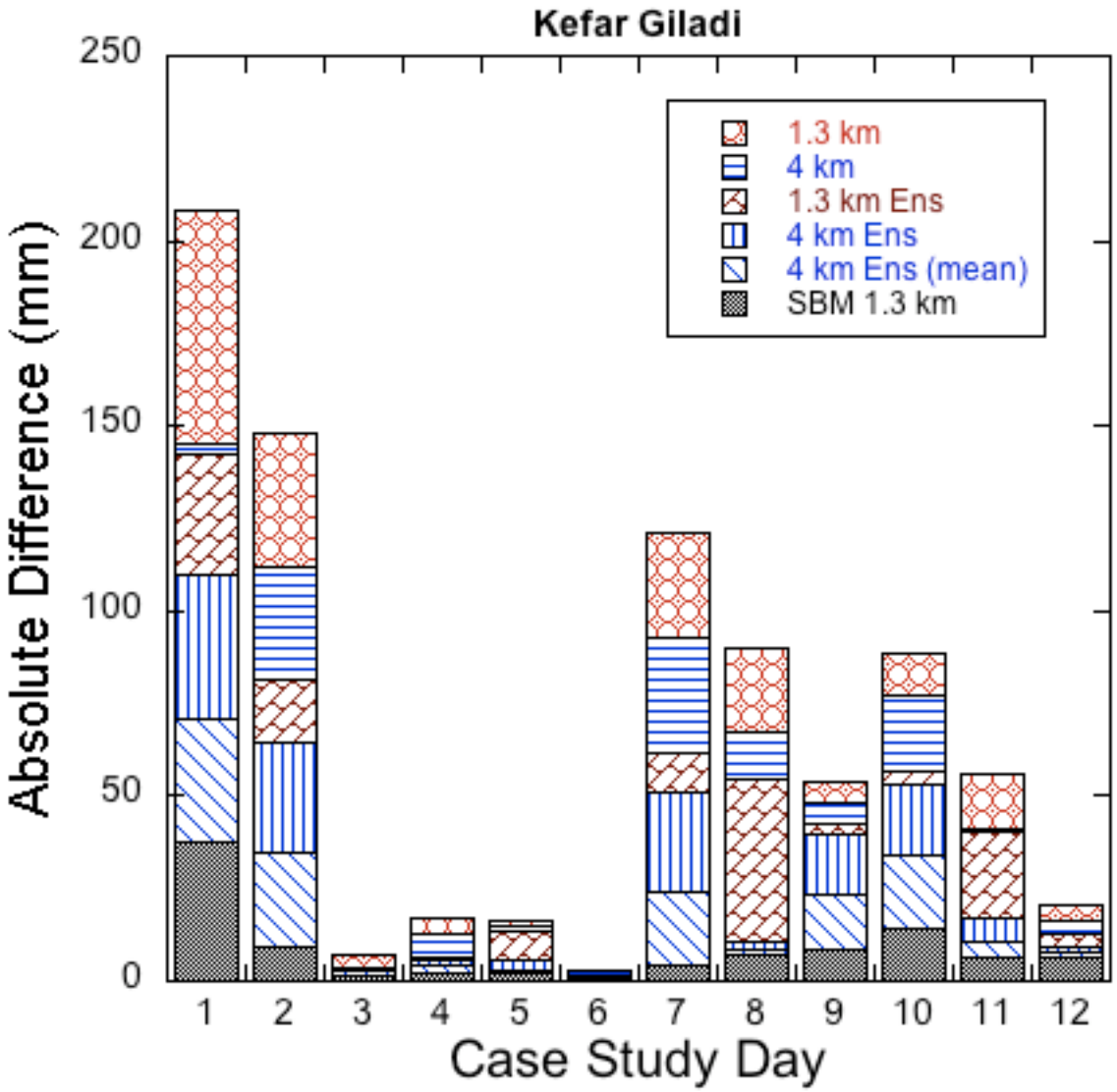
Two Ensembles: Different Forecasts

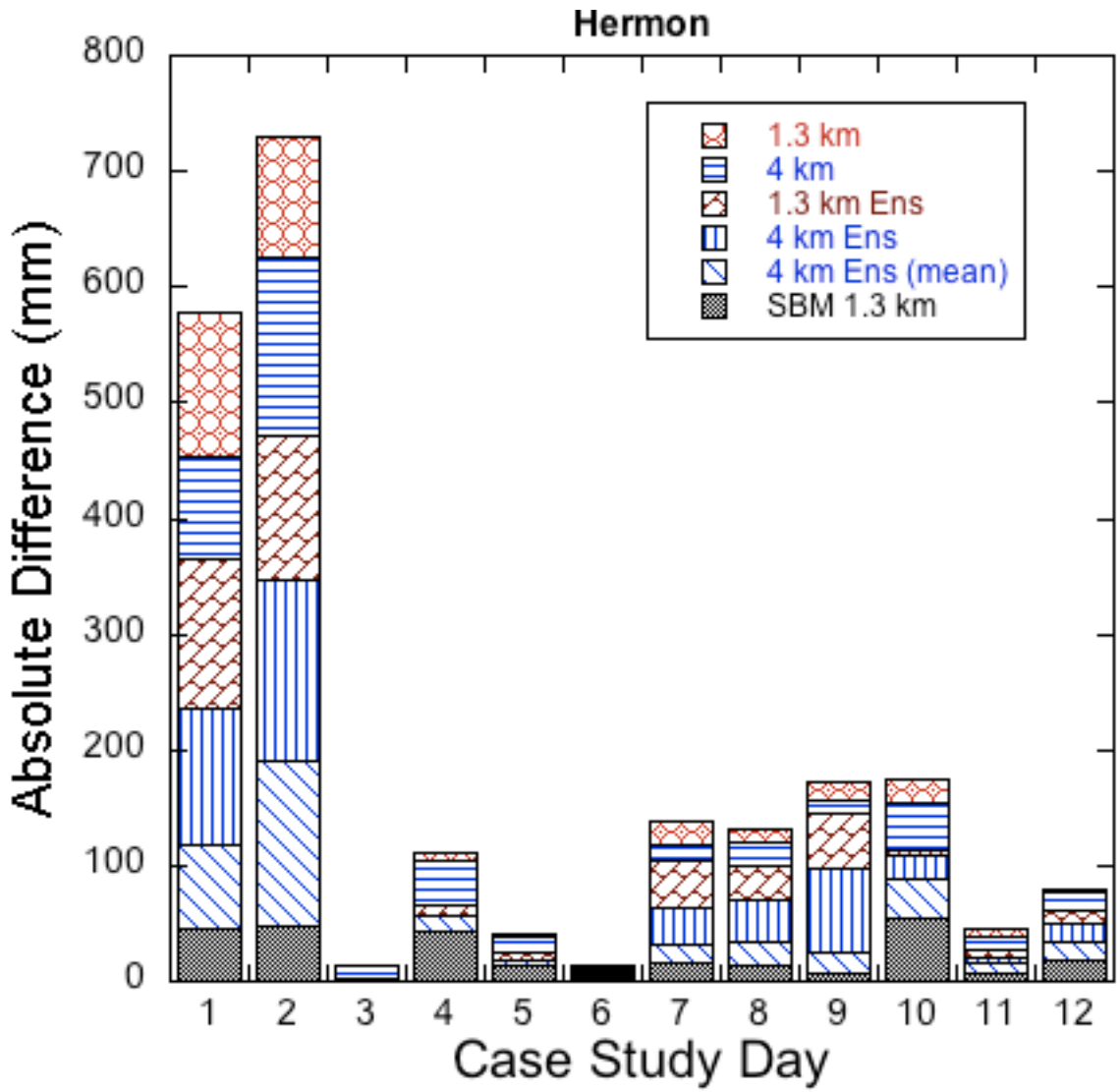
Station Comparison

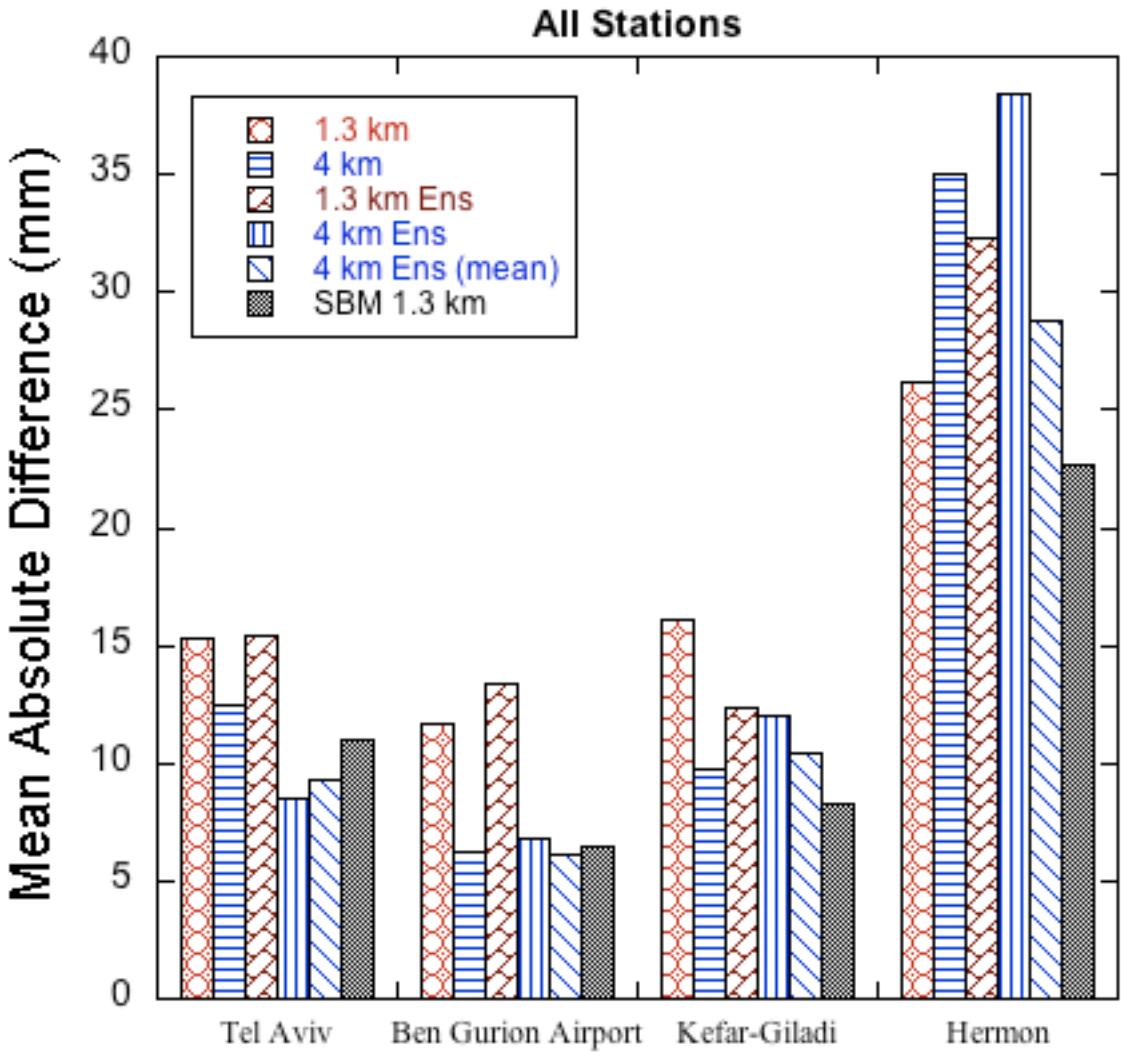
- Hermon (Northern Mountain Area)
- Kefar Giladi (Northern Hills)
- Tel-Aviv (Coastal City)
- Ben-Gurion Airport (Inland Plain)

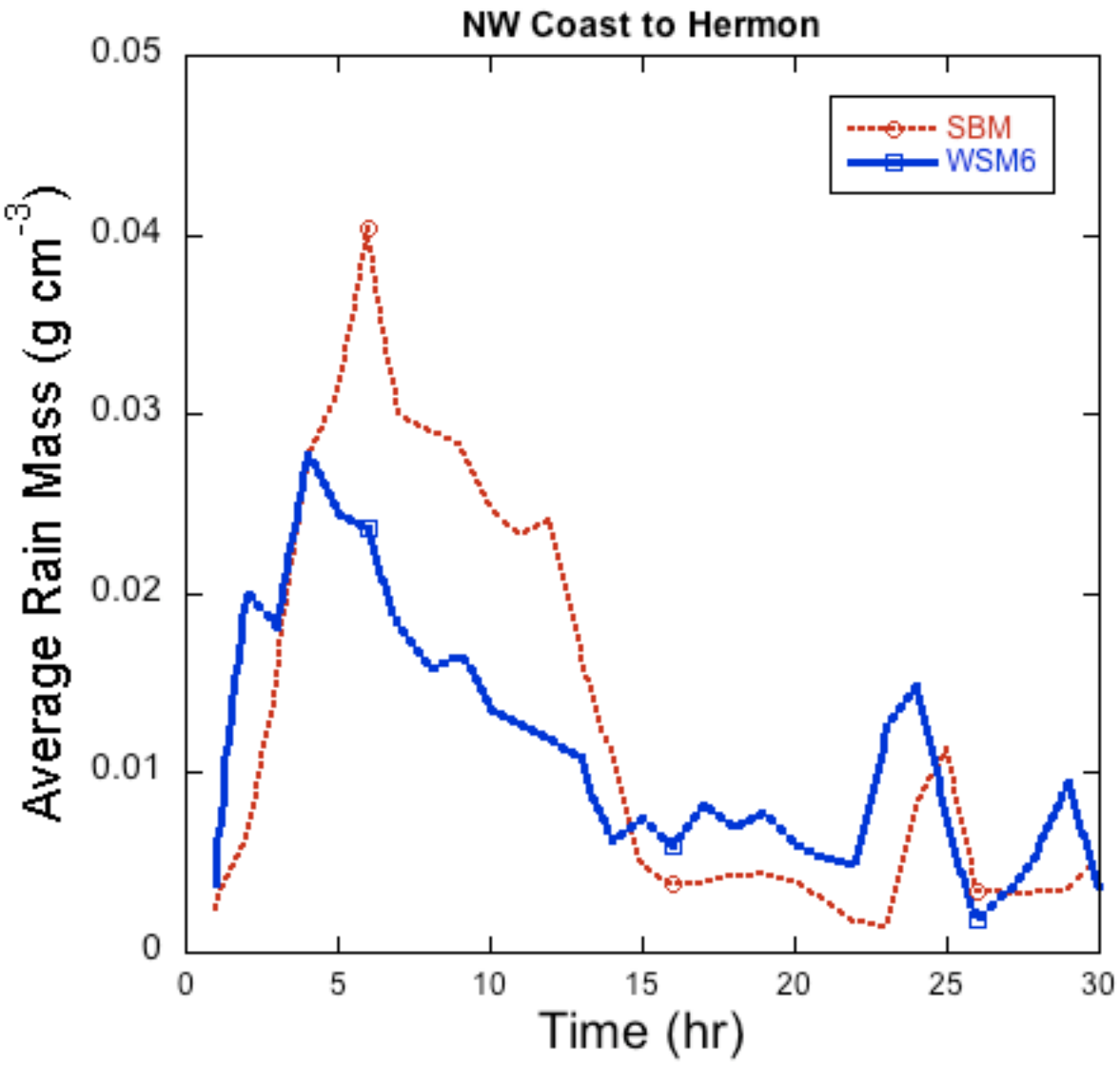

Tel Aviv
Absolute Difference (mm)
250
200
150
100
50
0
1
2
3
4
5
6
7
8
9
10
11
12
Case Study Day
1.3 km
4 km
1.3 km Ens
4 km Ens
4 km Ens (mean)
SBM 1.3 km

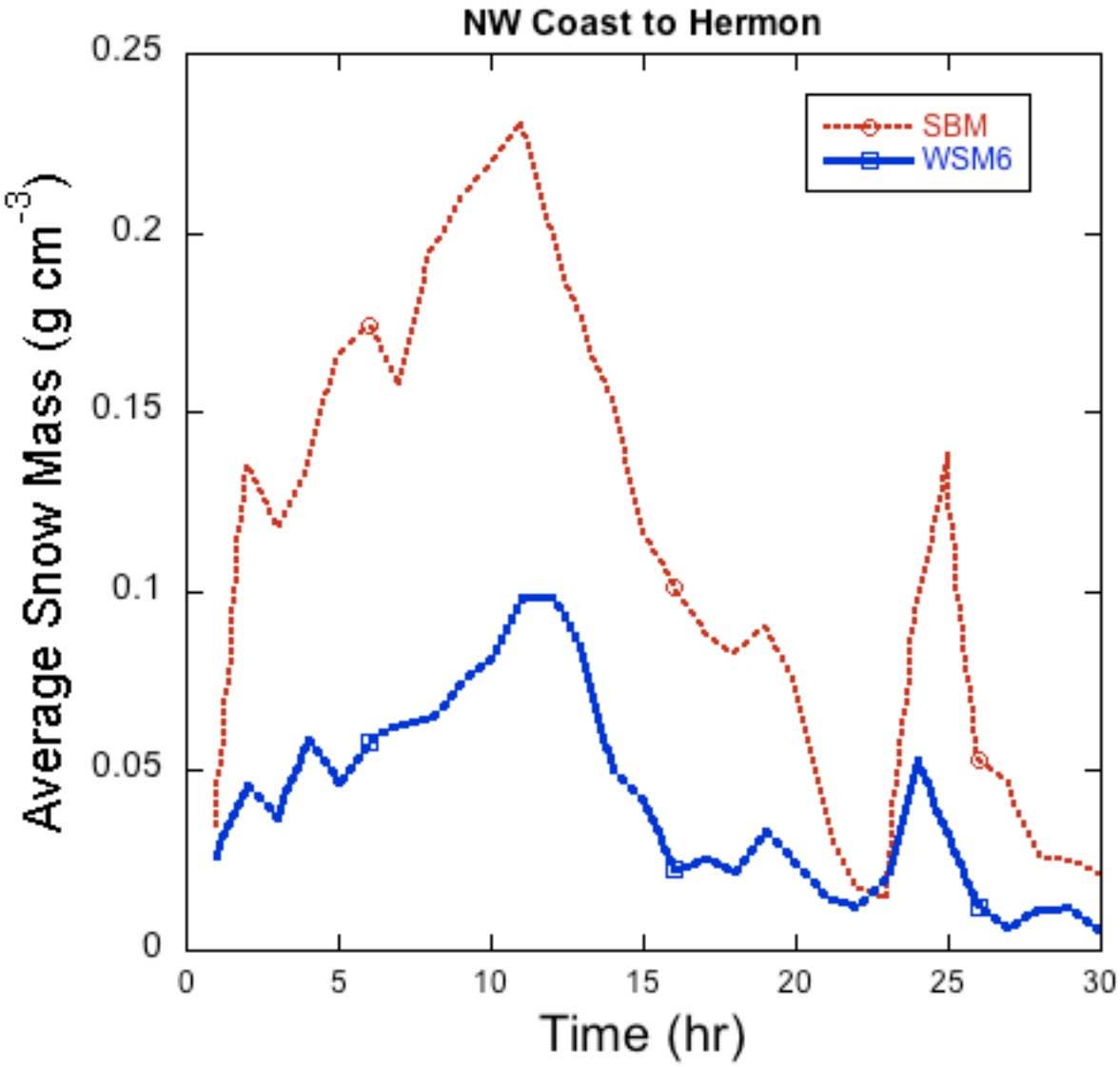

Ben Gurion Airport
Absolute Difference (mm)
300
250
200
150
100
50
0
1
2
3
4
5
6
7
8
9
10
11
12
Case Study Day
1.3 km
4 km
1.3 km Ens
4 km Ens
4 km Ens (mean)
SBM 1.3 km


Kefar Giladi
1.3 km
4 km
1.3 km Ens
4 km Ens
4 km Ens (mean)
SBM 1.3 km
Absolute Difference (mm)
0
50
100
150
200
250
1
2
3
4
5
6
7
8
9
10
11
12
Case Study Day


Hermon
Absolute Difference (mm)
800
700
600
500
400
300
200
100
0
1.3 km
4 km
1.3 km Ens
4 km Ens
4 km Ens (mean)
SBM 1.3 km
1
2
3
4
5
6
7
8
9
10
11
12
Case Study Day

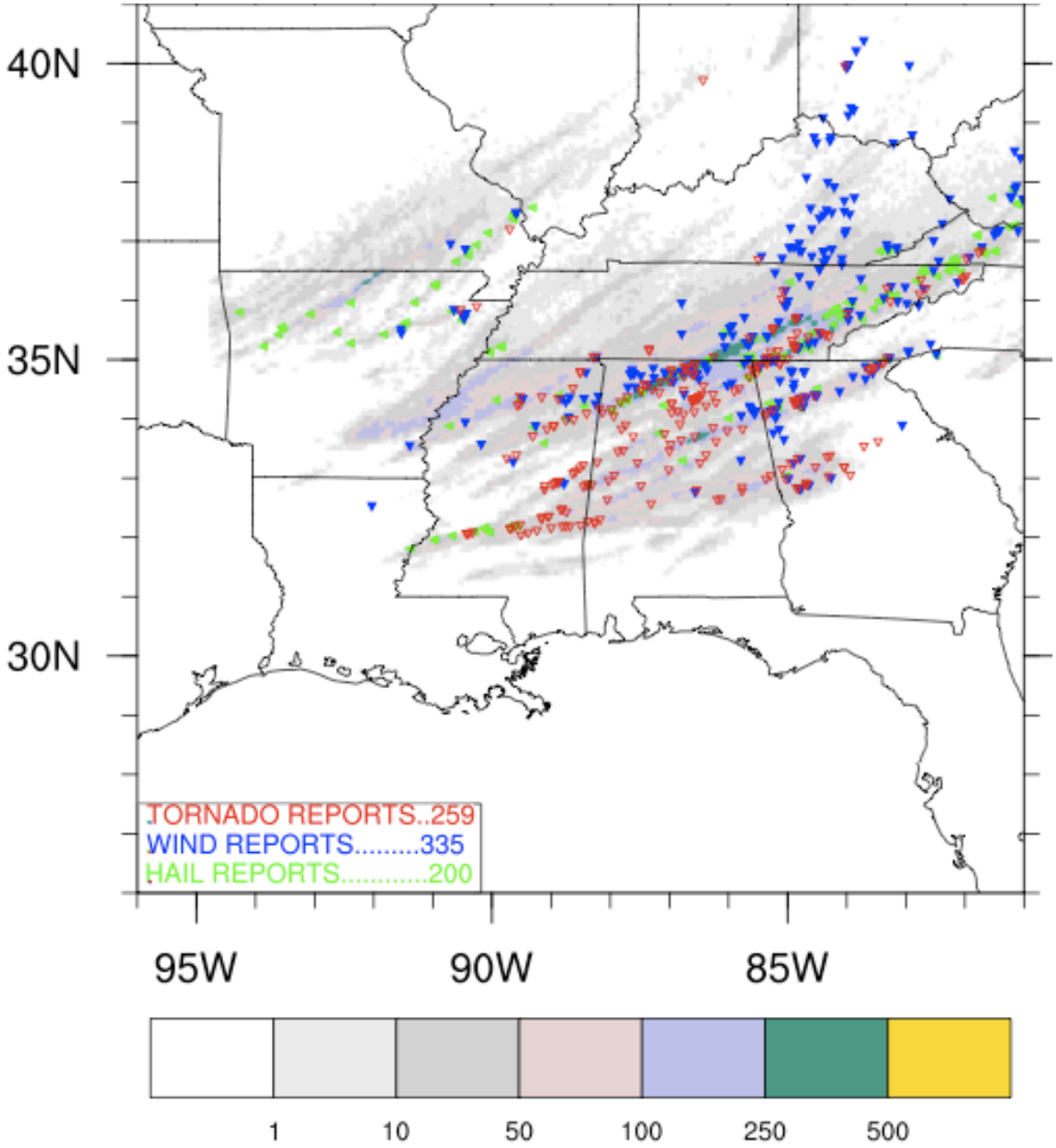

All Stations
Mean Absolute Difference (mm)
0
5
10
15
20
25
30
35
40
1.3 km
4 km
1.3 km Ens
4 km Ens
4 km Ens (mean)
SBM 1.3 km
Tel Aviv
Ben Gurion Airport
Kefar-Giladi
Hermon


NW Coast to Hermon
SBM
WSM6
Average Rain Mass (g cm-3)
Time (hr)
0.05
0.04
0.03
0.02
0.01
0
0
5
10
15
20
25
30


NW Coast to Hermon
SBM
WSM6
Average Snow Mass (g cm-3)
Time (hr)
0.25
0.2
0.15
0.1
0.05
0
0
5
10
15
20
25
30

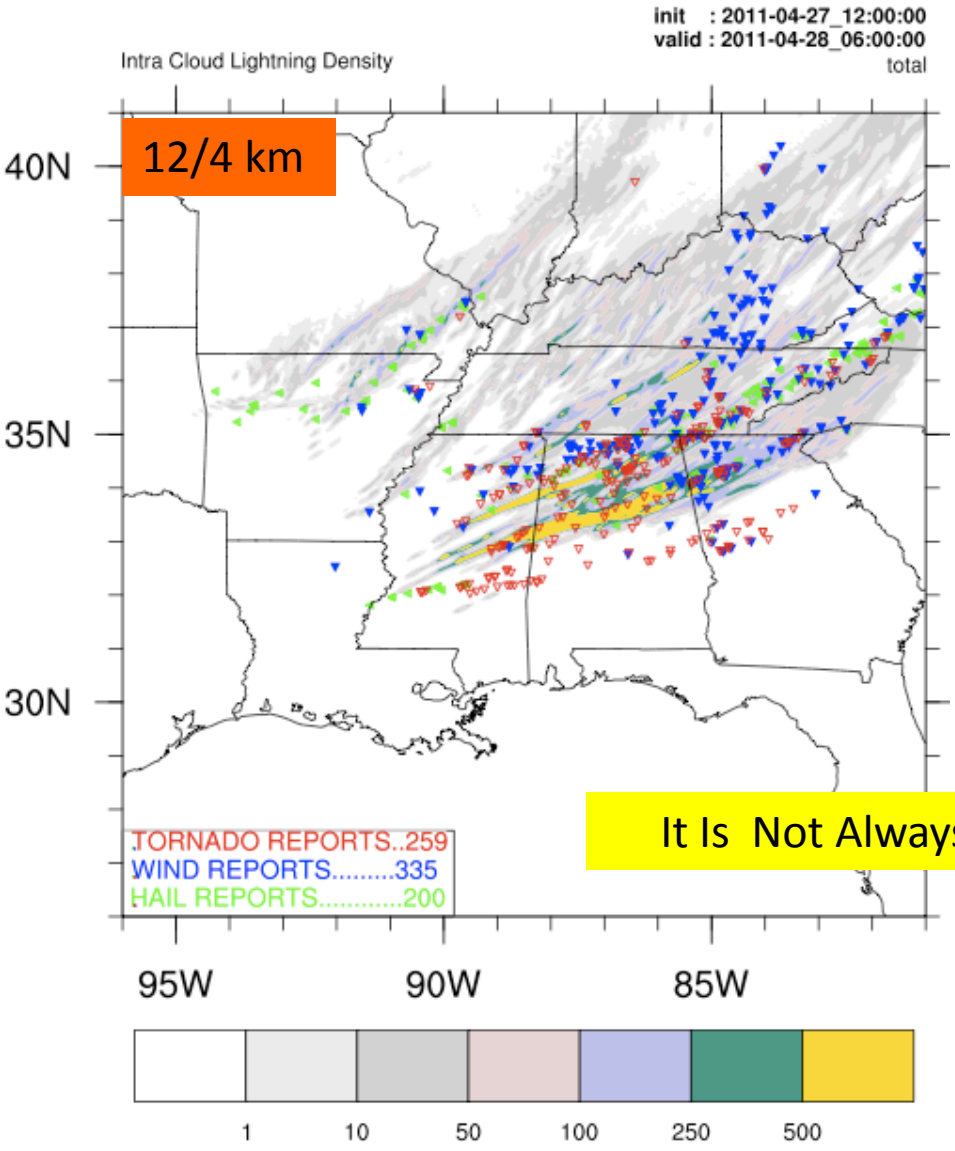
USE LIGHTNNG TO EVALUATE MODEL FORECASTS

EarthNetworks Intra-Cloud Lightning Network Obs.

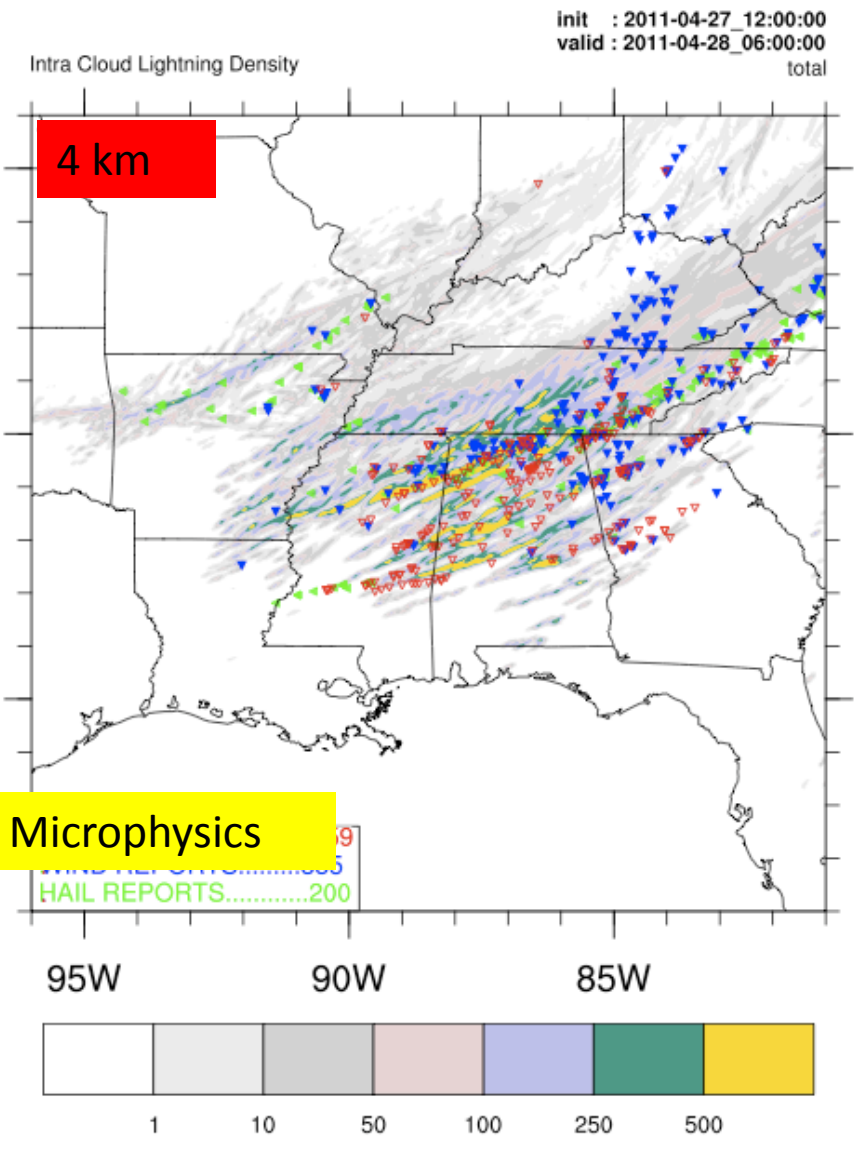


Tuscaloosa Tornado Event – Our Lightning Forecast

GFS Initial Conditions



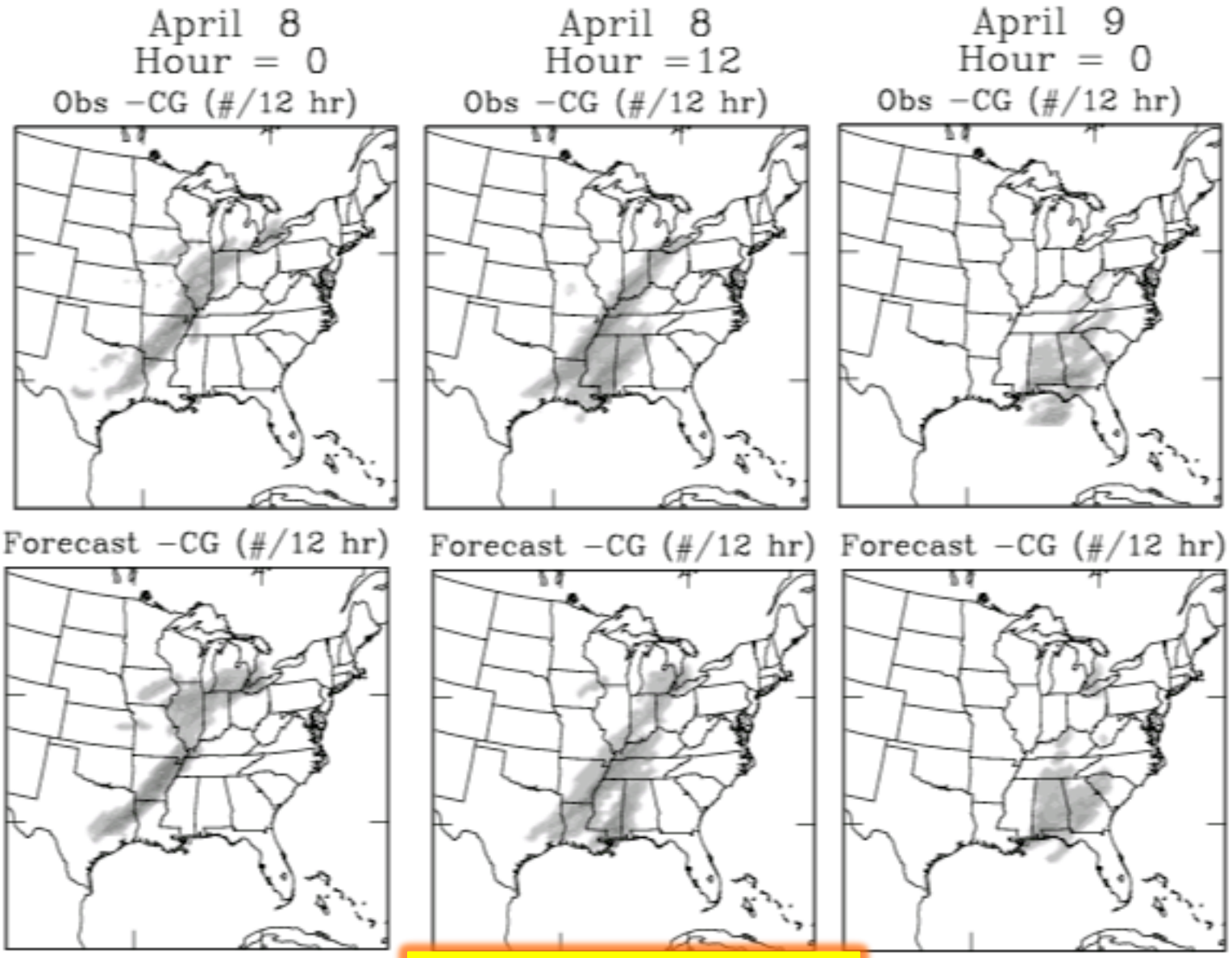
RUC2 Initial Conditions



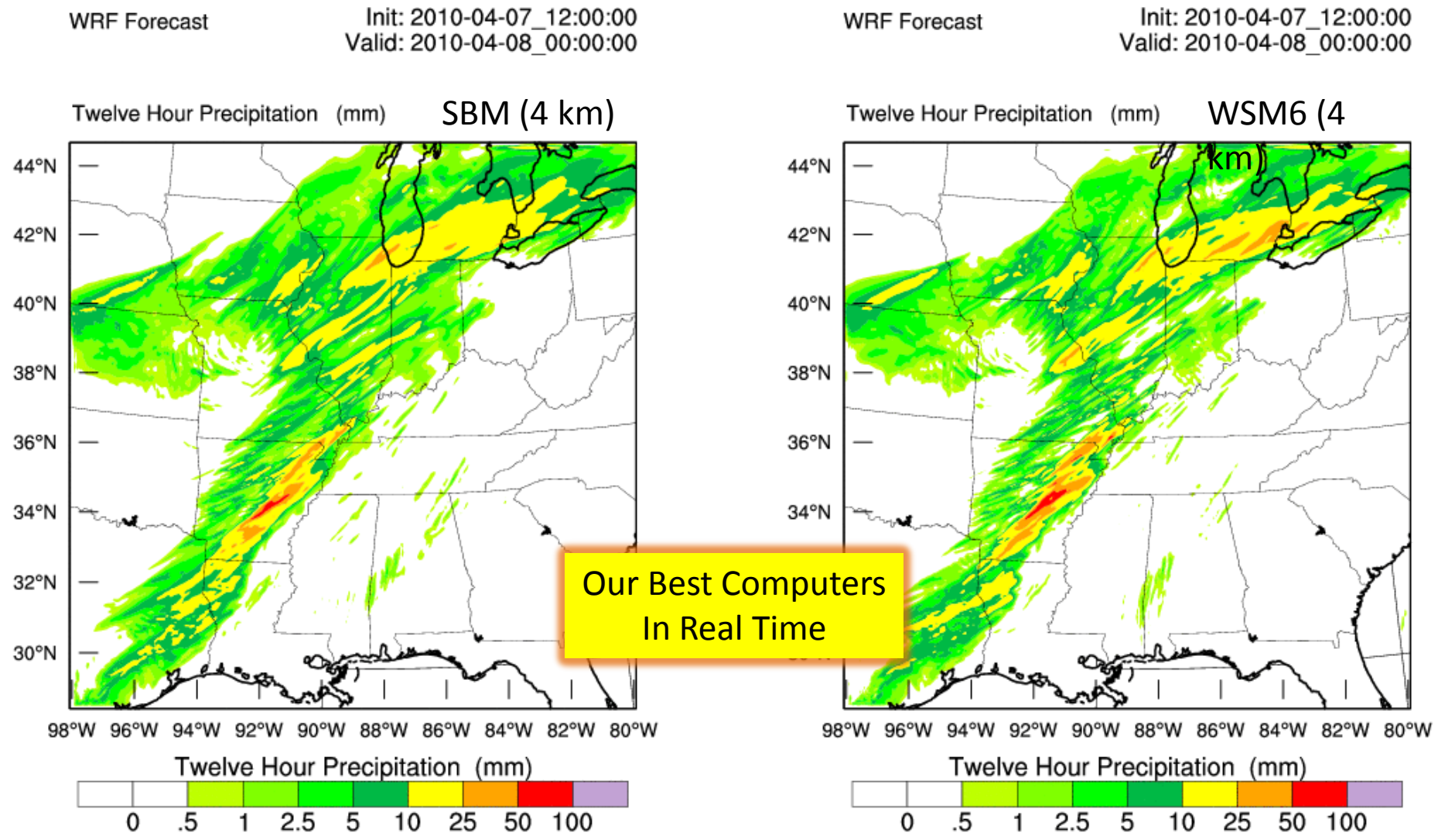
It Is Not Always the Microphysics

WSI NLDN

OUR FORECAST



Real World Consequences



Our Best Computers
In Real Time