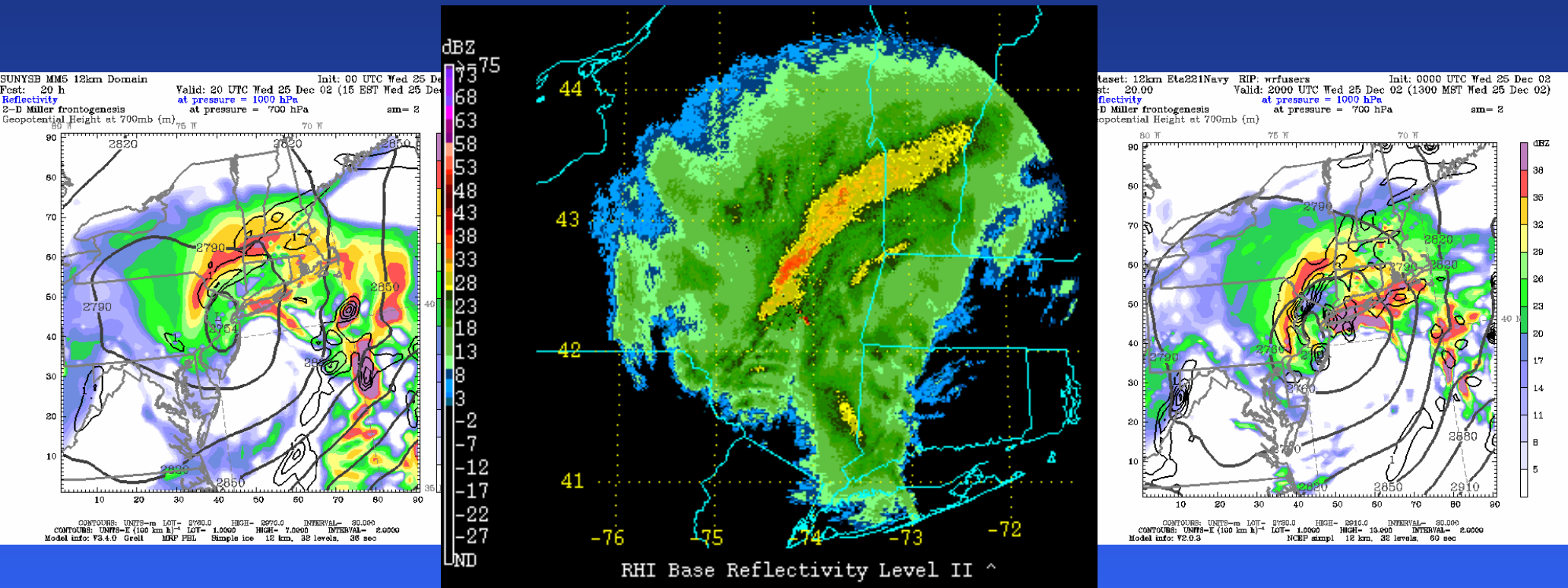


Comparison of MM5 and WRF Forecasts of the 25 December 2002 Banded Snowstorm



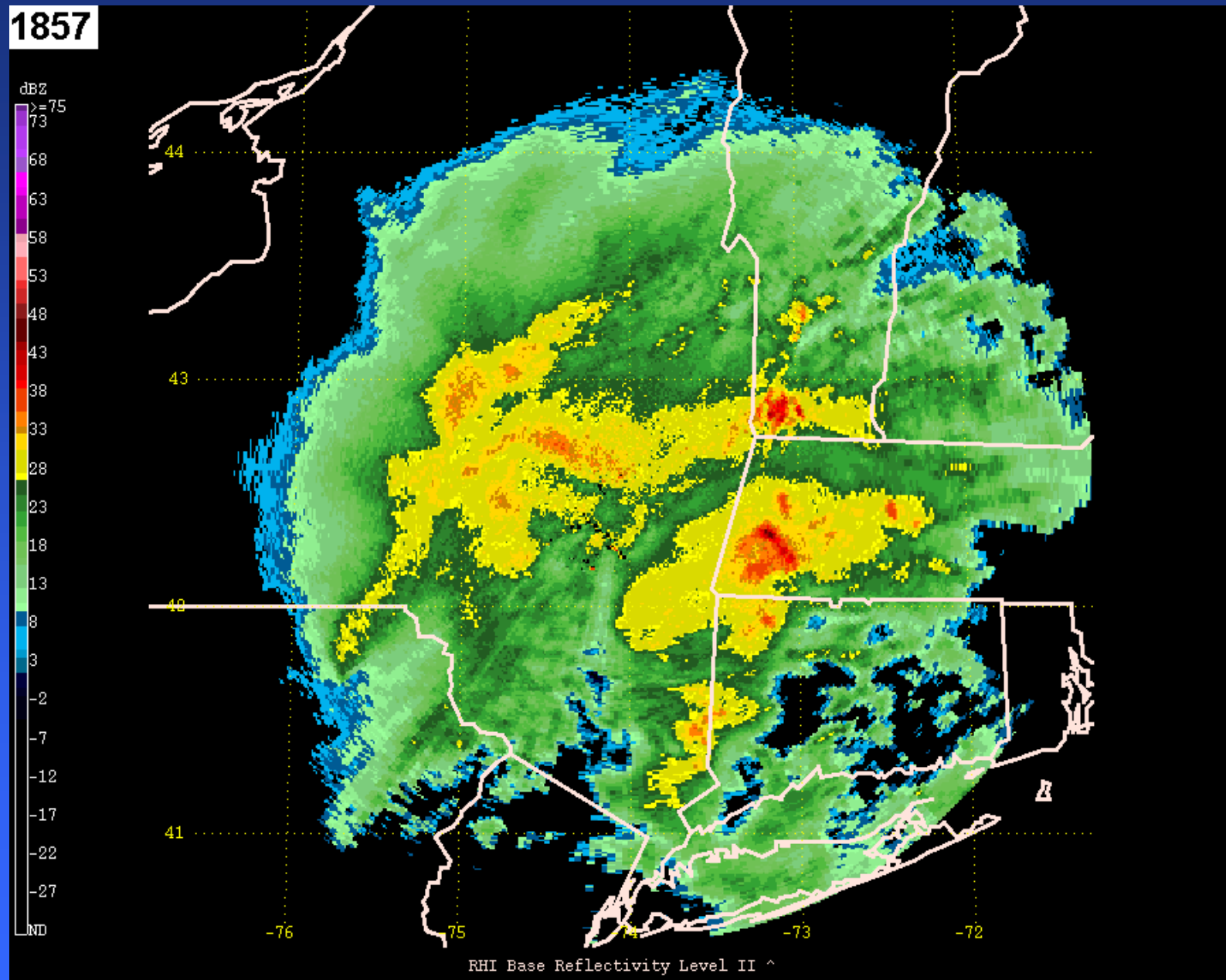
David Novak

Stony Brook University, State University of New York, Stony Brook, New York
NOAA/ NWS Eastern Region Headquarters, Scientific Services Division, Bohemia, New York

Brian Colle

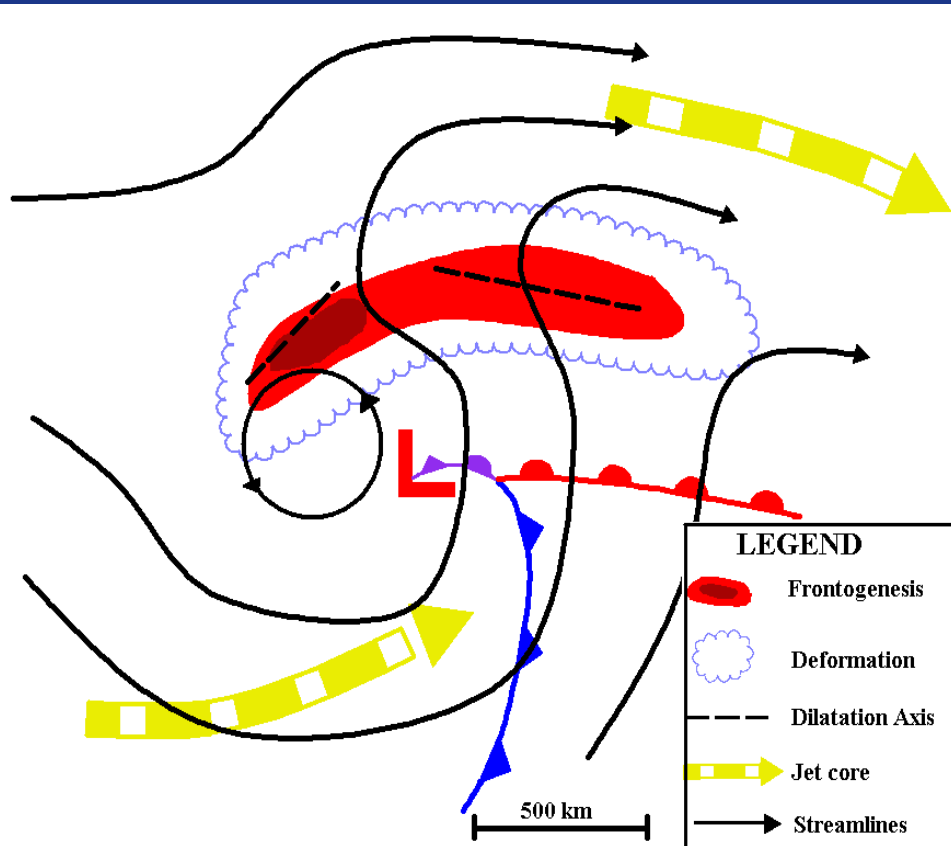
Stony Brook University, State University of New York, Stony Brook, New York

25 December 2002 Snowstorm



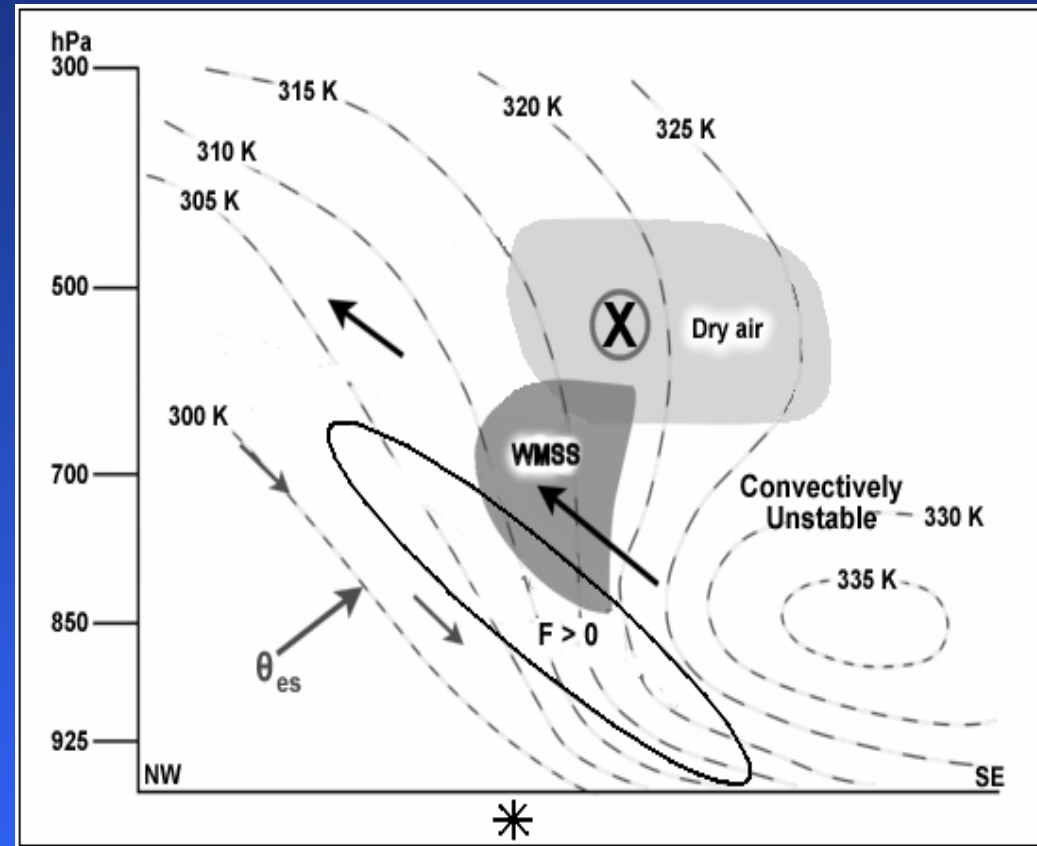
Conceptual Models

Plan-view



Novak et al. 2004

Cross Section

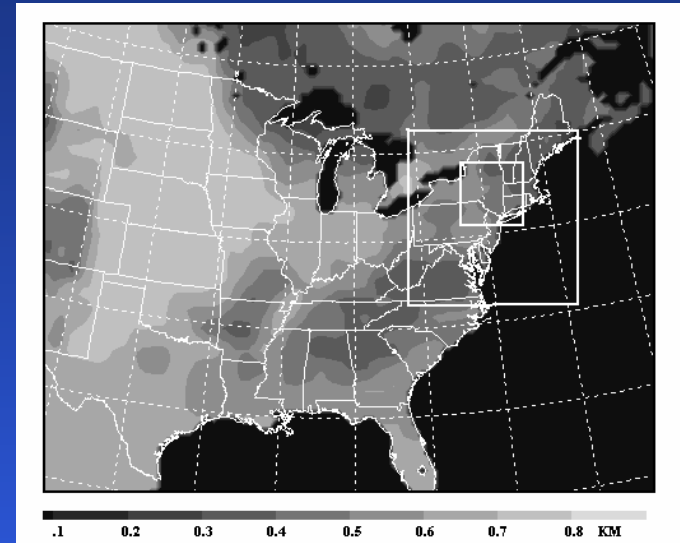


Novak et al. 2005
(adapted from Moore et al. 2004)

Frontogenesis in the presence of weak moist symmetric stability and sufficient moisture

Case Study Design

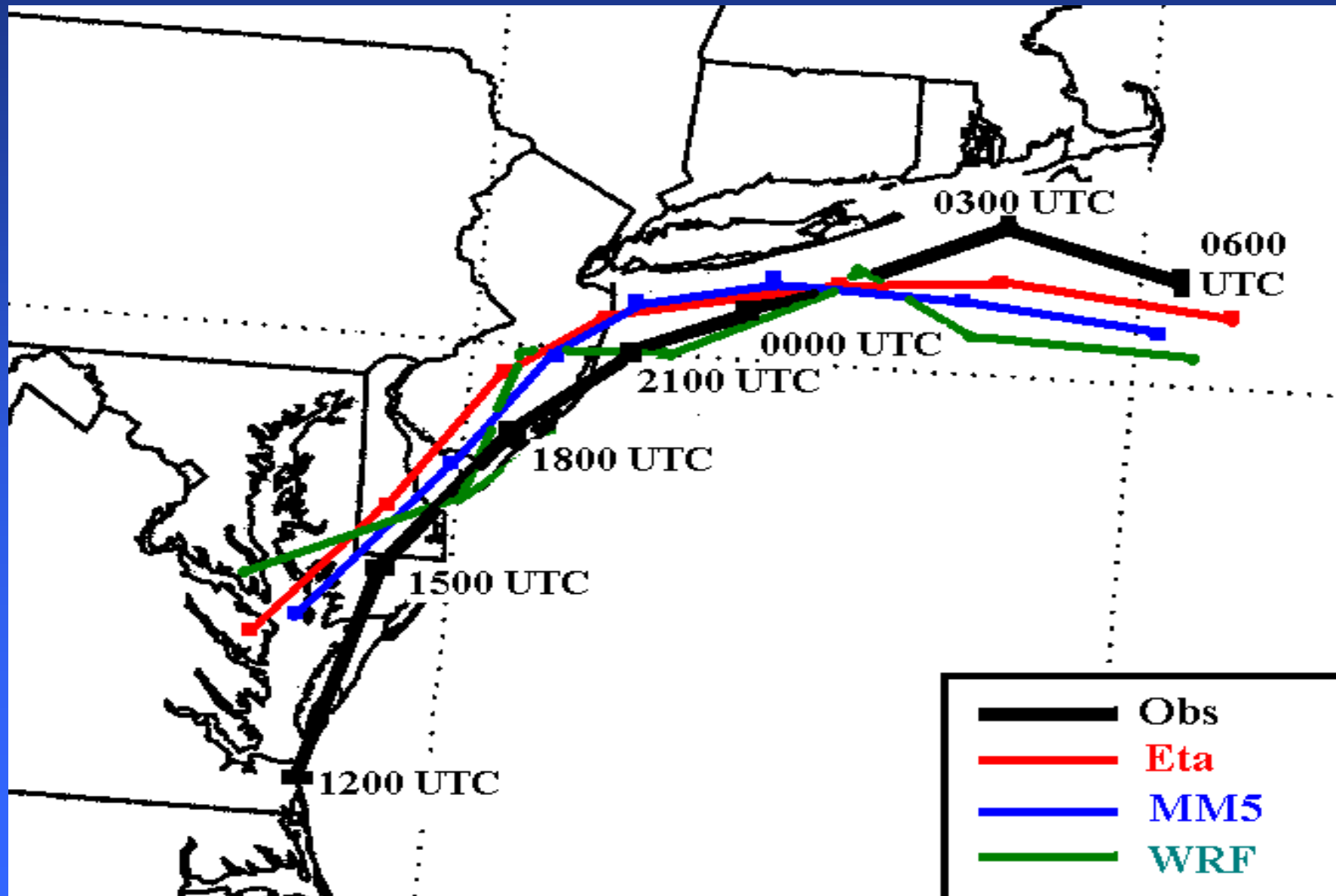
- Compare Eta, MM5, and WRF forecasts to observations
- Models initialized at 0000 UTC 25 Dec 2002
- MM5/WRF one way nest



Model	SST	Convection	BL	Micro-physics
Eta	Eta	BMJ	MYJ	Ferrier
MM5 v3.4.0	Navy	Grell	MRF	Simple Ice (3 class)
WRF v2.0.3	Navy	Grell–Devenyi	MRF	WSM-3

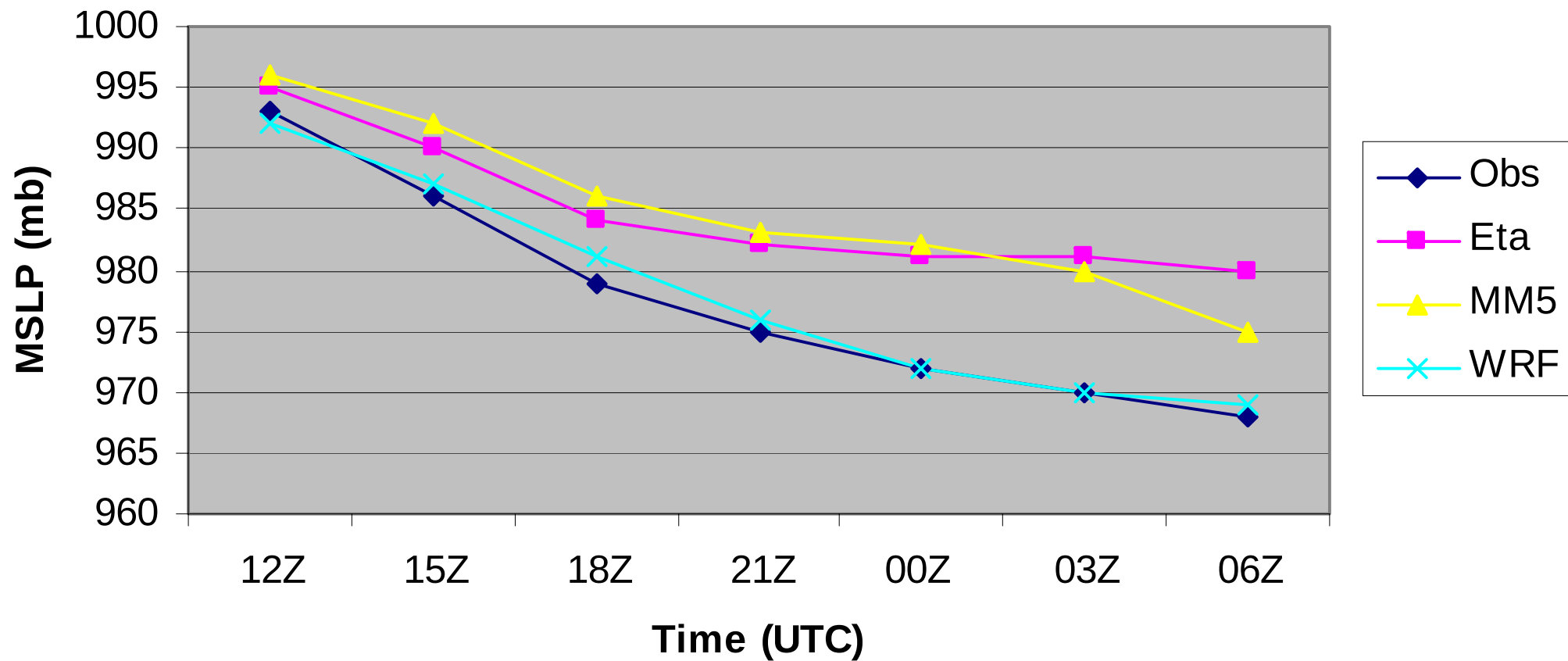
25 December 2002 Snowstorm

Low Track Comparison



25 December 2002 Snowstorm

MSLP Time Series

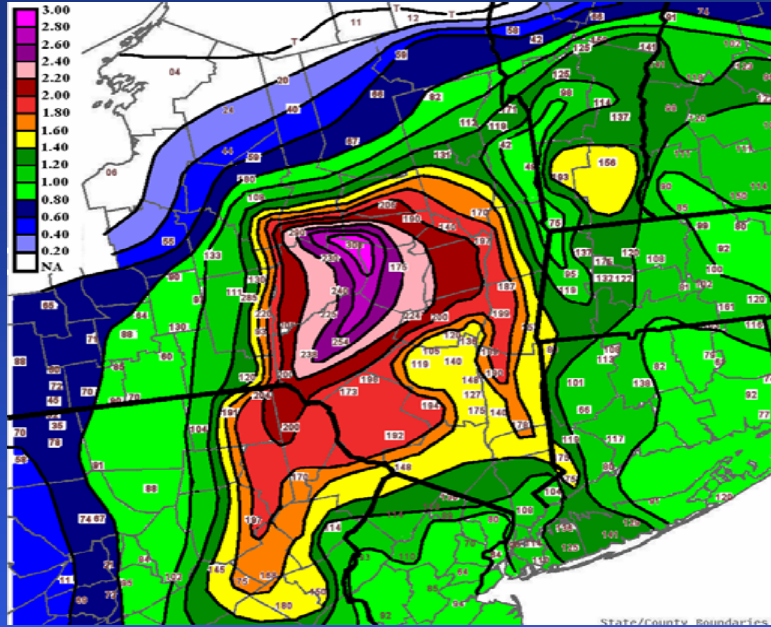


QPF Performance

12 UTC 25 Dec – 12 UTC 26 Dec QPF

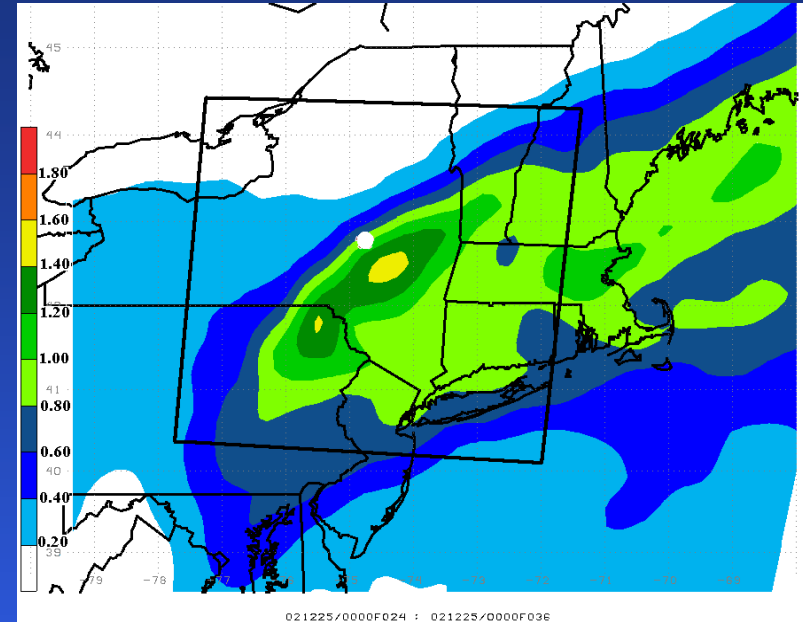
Obs

Max = 3.00 in
(76.2 mm)



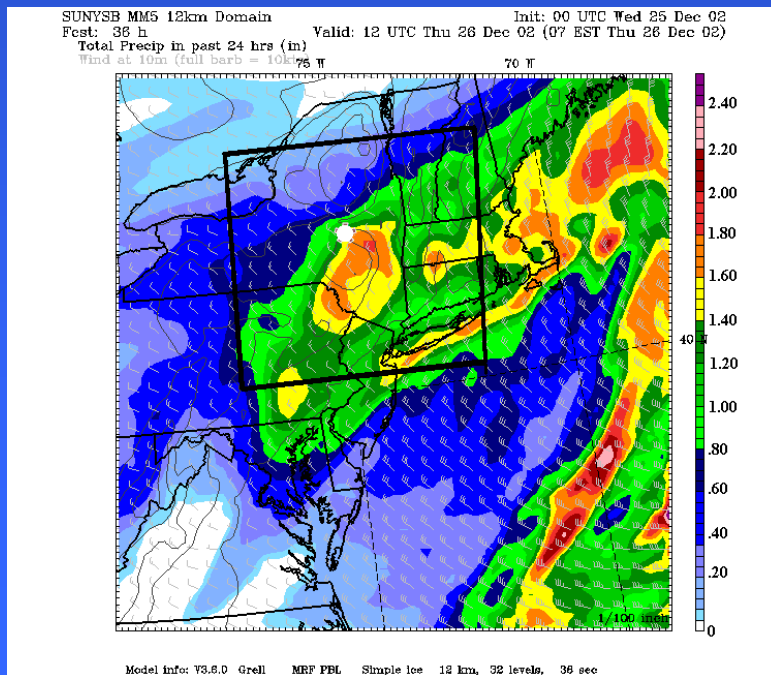
Eta

Max = 1.50 in
(38.1 mm)

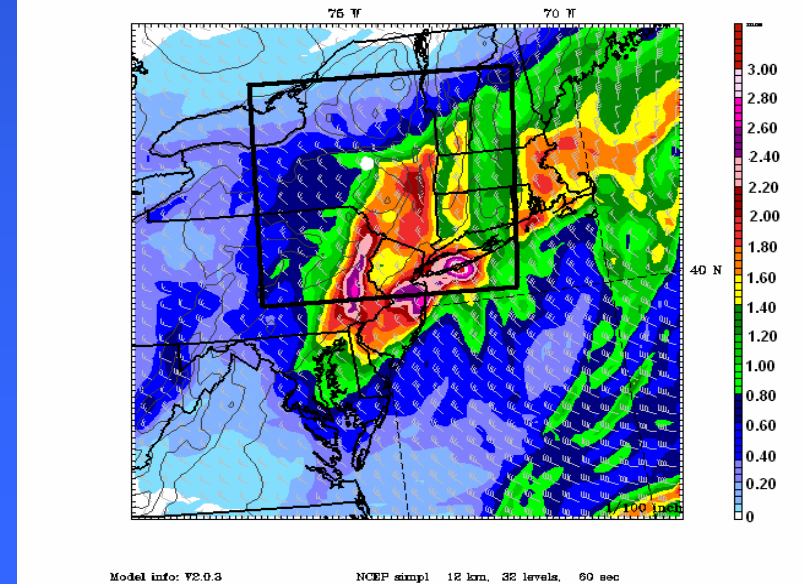


MM5

Max = 1.85 in
(47 mm)



Dataset: 12km Eta221Navy RIP: rip 24hpcp Init: 0000 UTC Wed 25 Dec 02
Fest: 36.00 Valid: 1200 UTC Thu 26 Dec 02 (0500 MST Thu 26 Dec 02)
Total Precip in past 24 hrs (0.1in)
Wind at 30m (full barb = 10kts)



WRF

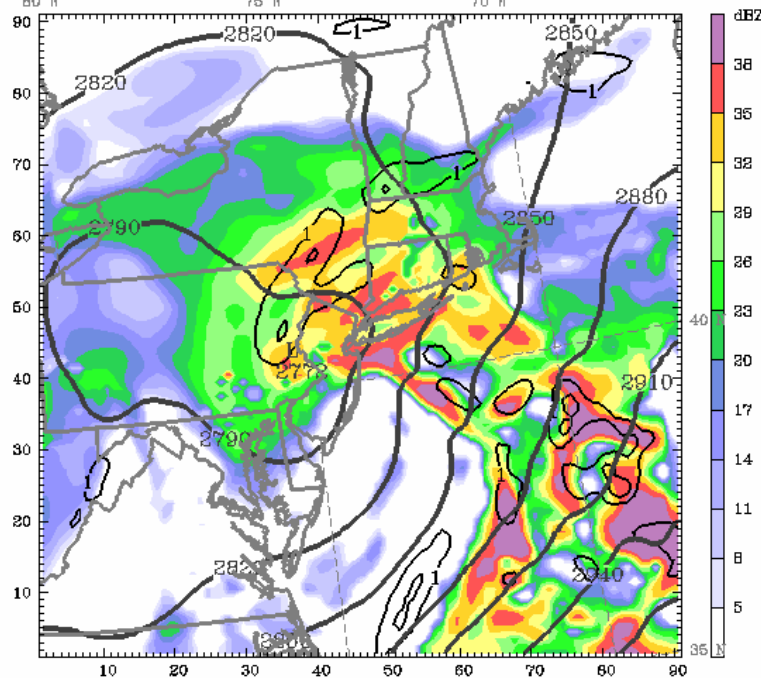
Max = 2.70 in
(68.6 mm)

0000 UTC

12 km MM5

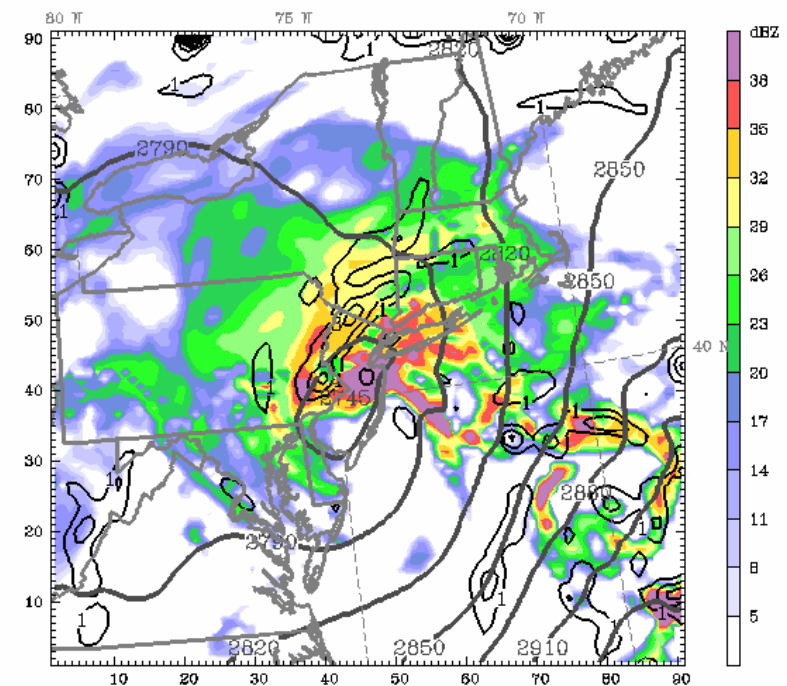
12 km WRF

SUNYSB MM5 12km Domain
Fest: 18 h
Valid: 18 UTC Wed 25 Dec 02 (13 EST Wed 25 Dec 02)
Init: 00 UTC Wed 25 Dec 02
Reflectivity
2-D Miller frontogenesis
Geopotential Height at 700mb (m)
at pressure = 1000 hPa
at pressure = 700 hPa
sm= 2



CONTOURS: UNITS-m LOT- 2790.0 HIGH- 2970.0 INTERVAL- 30.000
CONTOURS: UNITS- $^{\circ}\text{C } (100 \text{ km h})^{-1}$ LOT- 1.0000 HIGH- 8.0000 INTERVAL- 2.0000
Model info: V3.4.0 Grell MRF PBL Simple ice 12 km, 32 levels, 36 sec

Dataset: 12km Eta221Navy RIP: wrfusers
Fest: 18.00
Valid: 1800 UTC Wed 25 Dec 02 (1100 MST Wed 25 Dec 02)
Init: 0000 UTC Wed 25 Dec 02
Reflectivity
2-D Miller frontogenesis
Geopotential Height at 700mb (m)
at pressure = 1000 hPa
at pressure = 700 hPa
sm= 2



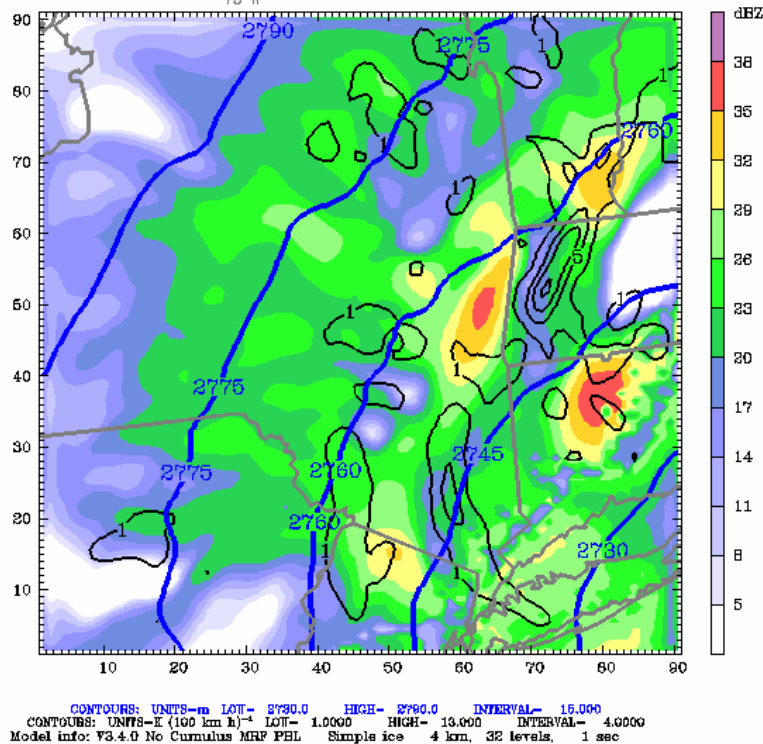
CONTOURS: UNITS-m LOT- 2790.0 HIGH- 2940.0 INTERVAL- 30.000
CONTOURS: UNITS- $^{\circ}\text{C } (100 \text{ km h})^{-1}$ LOT- 1.0000 HIGH- 17.000 INTERVAL- 2.0000
Model info: V2.0.3 NCEP simpl 12 km, 32 levels, 60 sec

- Simulated Radar Reflectivity (shaded, dBZ)
- 700-hPa height (thick solid, m)
- 700-hPa 2D Miller Frontogenesis (thin solid, $^{\circ}\text{C } 100 \text{ km}^{-1} \text{ h}^{-1}$)

0000 UTC

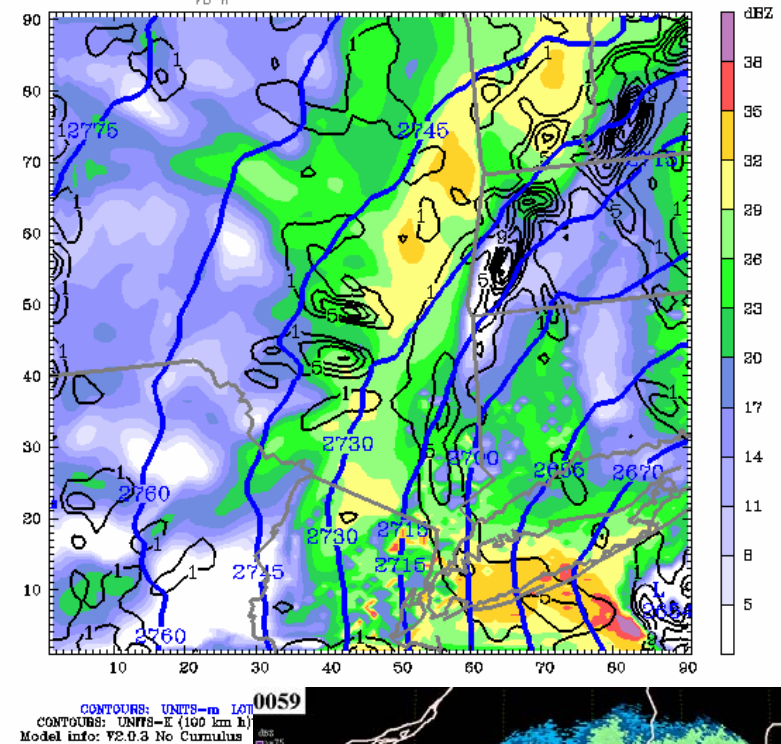
4 km MM5

SUNYSB MM5 12km Domain
 Fcst: 25 h
 Reflectivity
 2-D Miller frontogenesis
 Geopotential Height at 700mb (m)
 Init: 00 UTC Wed 25 Dec 02
 Valid: 01 UTC Thu 26 Dec 02 (20 EST Wed 25 Dec 02)
 at pressure = 1000 hPa
 at pressure = 700 hPa
 sm= 2

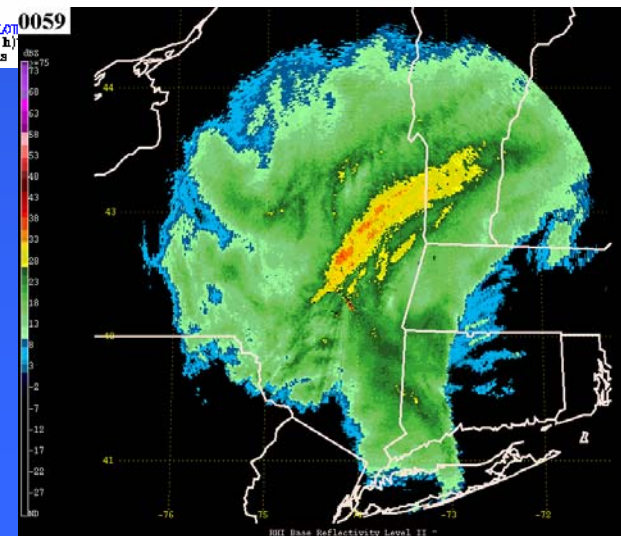


4 km WRF

SUNYSB MM5 12km Domain
 Fcst: 25 h
 Reflectivity
 2-D Miller frontogenesis
 Geopotential Height at 700mb (m)
 Init: 00 UTC Wed 25 Dec 02
 Valid: 01 UTC Thu 26 Dec 02 (20 EST Wed 25 Dec 02)
 at pressure = 1000 hPa
 at pressure = 700 hPa
 sm= 2

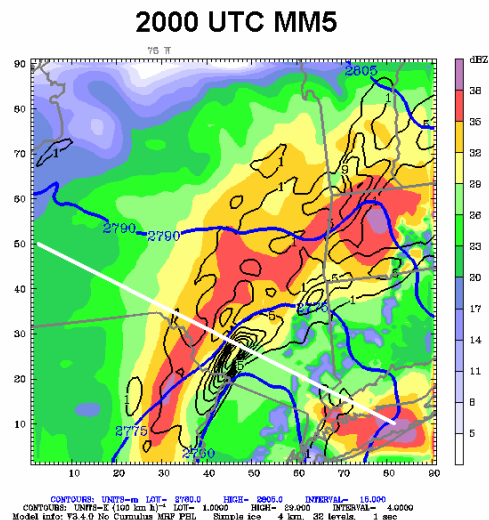


- Simulated Radar Reflectivity (shaded, dBZ)
- 700-hPa height (thick solid, m)
- 700-hPa 2D Miller Frontogenesis (thin solid, $^{\circ}\text{C } 100 \text{ km}^{-1} \text{ h}^{-1}$)

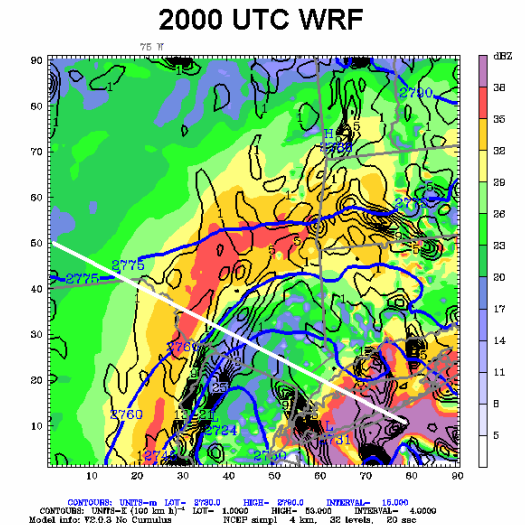


4 km MM5

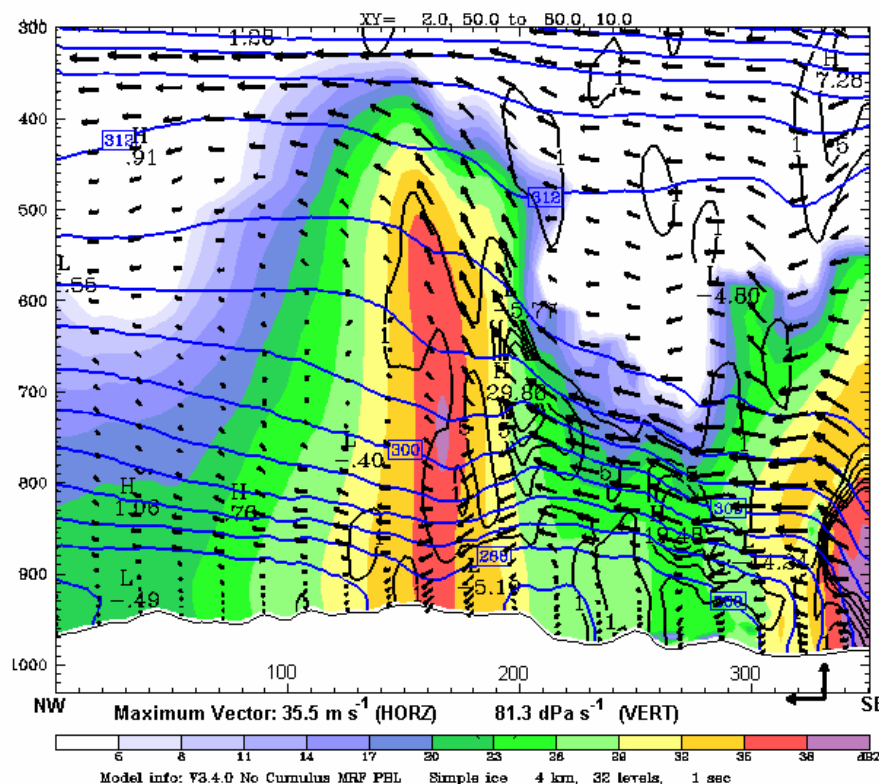
Reflectivity (shaded)
2D Frontogenesis
 Θ_{es} (blue)
Circulation



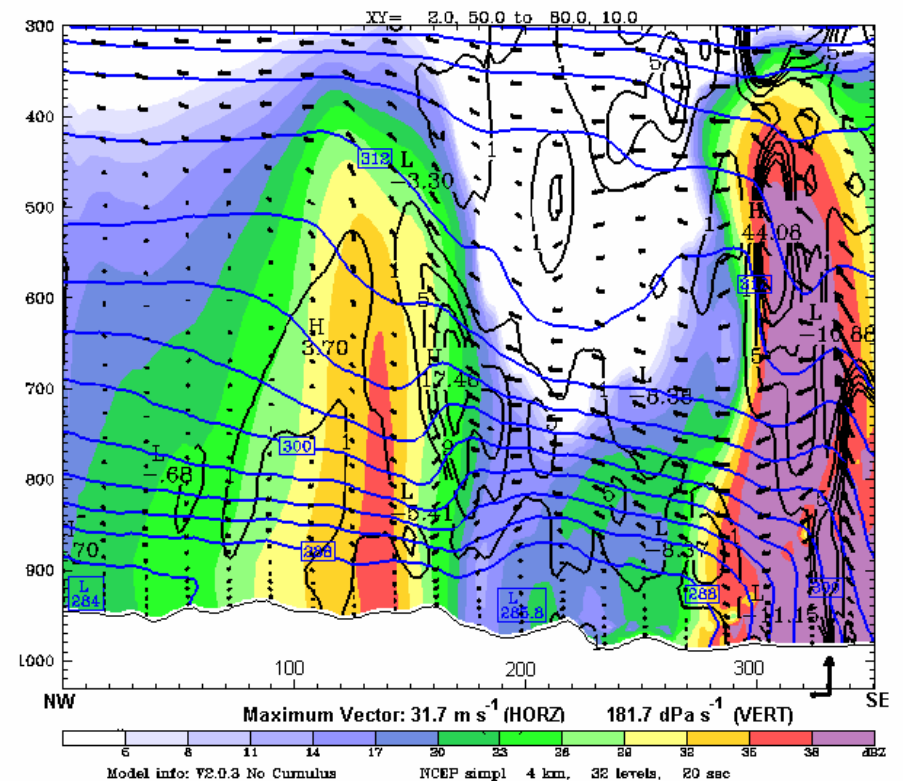
4 km WRF



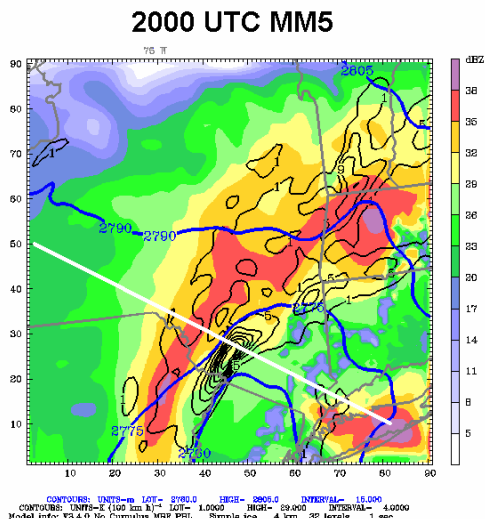
2000 UTC MM5



2000 UTC WRF



4 km MM5



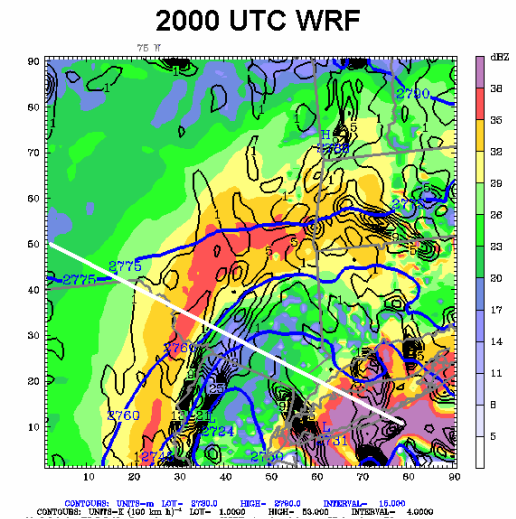
Reflectivity

$MPV_f < 0$ (shaded)

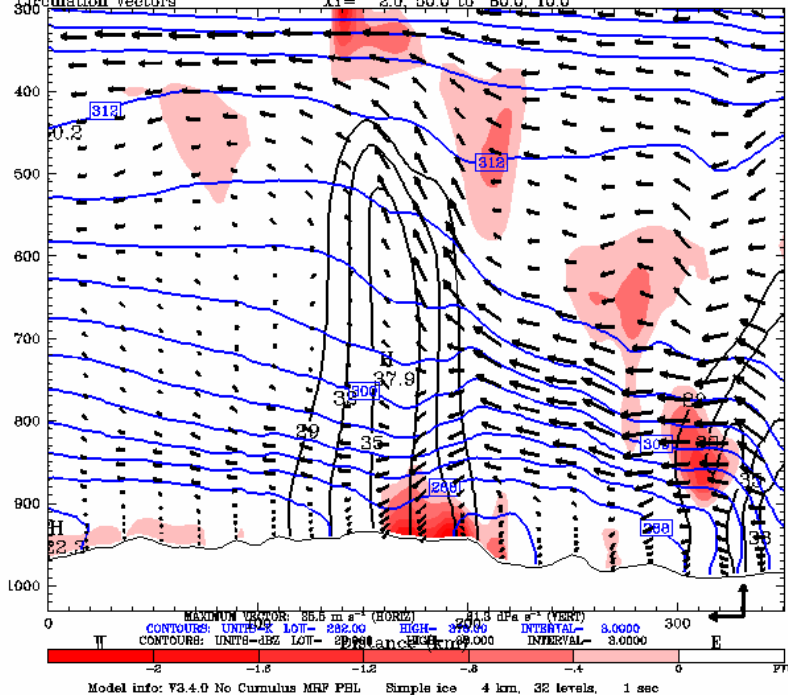
Θ_{es} (blue)

Circulation

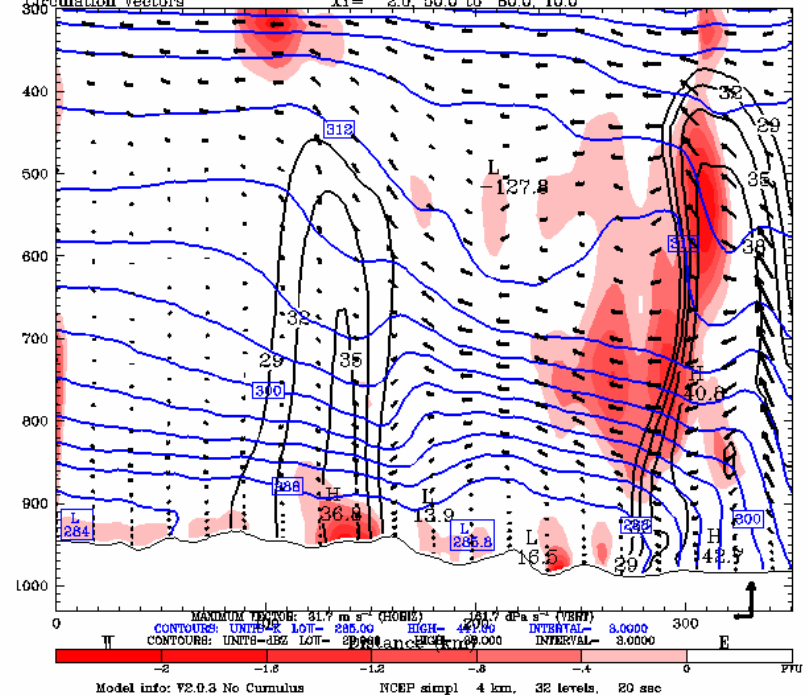
4 km WRF



SUNYSB MM5 12km Domain
 Init: 00 UTC Wed 25 Dec 02
 Valid: 20 UTC Wed 25 Dec 02 (15 EST Wed 25 Dec 02)
 Fast: 20 h
 Moist potential vorticity
 Reflectivity
 Saturated equiv. pot. temperature
 Circulation vectors
 XY= 2.0, 50.0 to 80.0, 10.0 sm= 3
 XY= 2.0, 50.0 to 80.0, 10.0 sm= 2
 XY= 2.0, 50.0 to 80.0, 10.0 sm= 5
 XY= 2.0, 50.0 to 80.0, 10.0

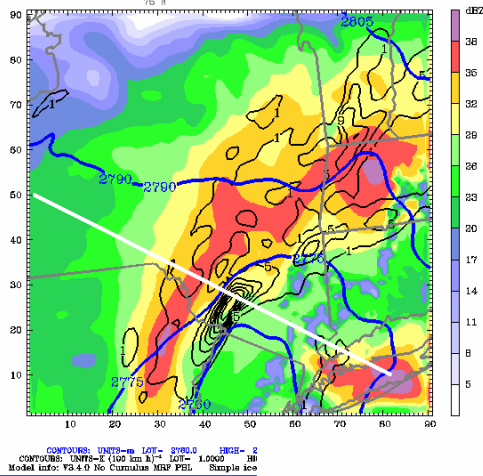


SUNYSB MM5 12km Domain
 Init: 00 UTC Wed 25 Dec 02
 Valid: 20 UTC Wed 25 Dec 02 (15 EST Wed 25 Dec 02)
 Fast: 20 h
 Moist potential vorticity
 Reflectivity
 Saturated equiv. pot. temperature
 Circulation vectors
 XY= 2.0, 50.0 to 80.0, 10.0 sm= 3
 XY= 2.0, 50.0 to 80.0, 10.0 sm= 2
 XY= 2.0, 50.0 to 80.0, 10.0 sm= 5
 XY= 2.0, 50.0 to 80.0, 10.0

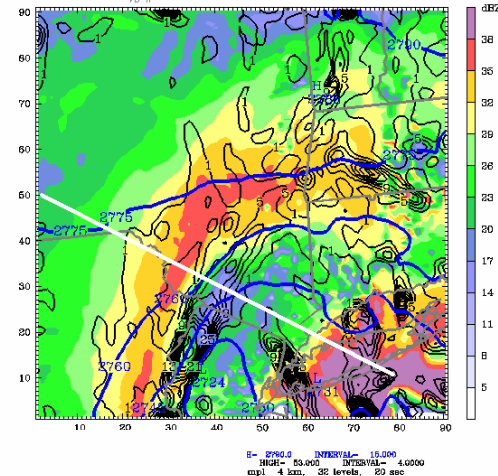


Relationship between the Band, Frontogenesis, WSS, Moisture and Ascent

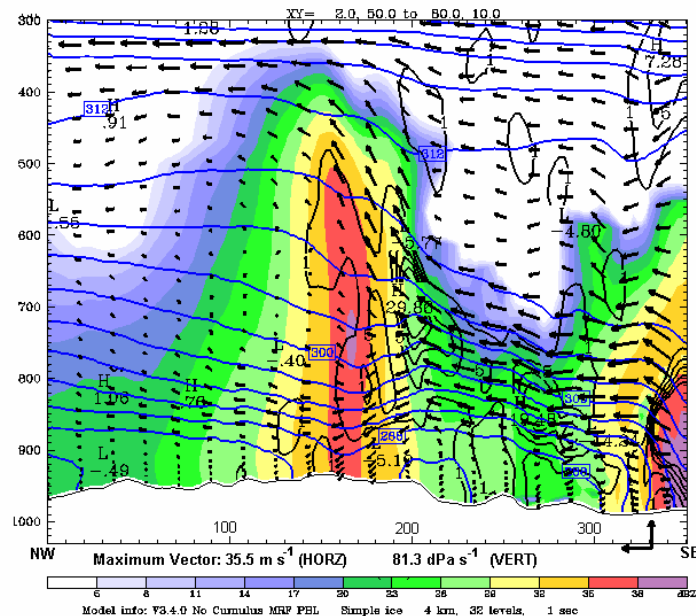
2000 UTC MM5



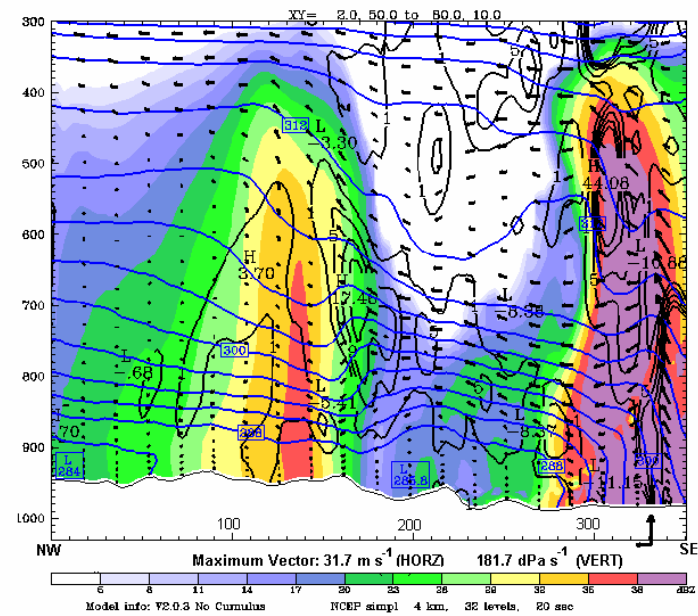
2000 UTC WRF



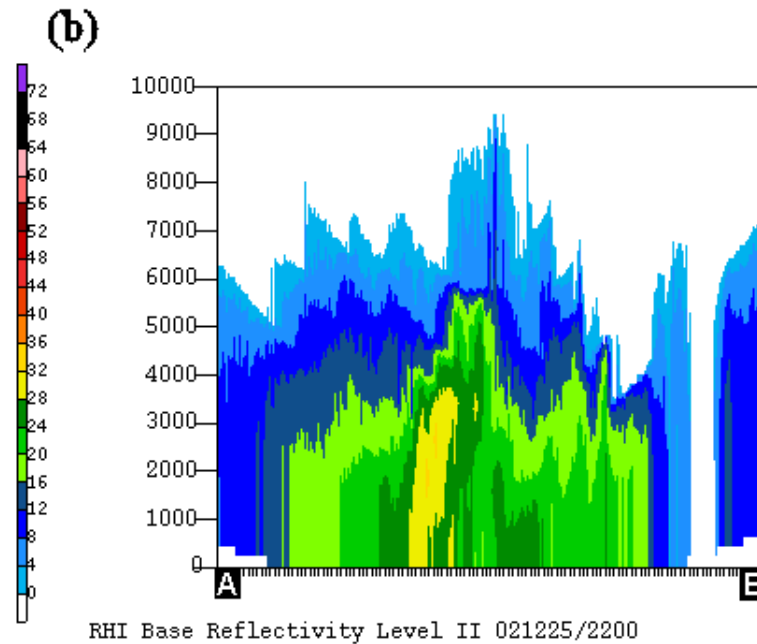
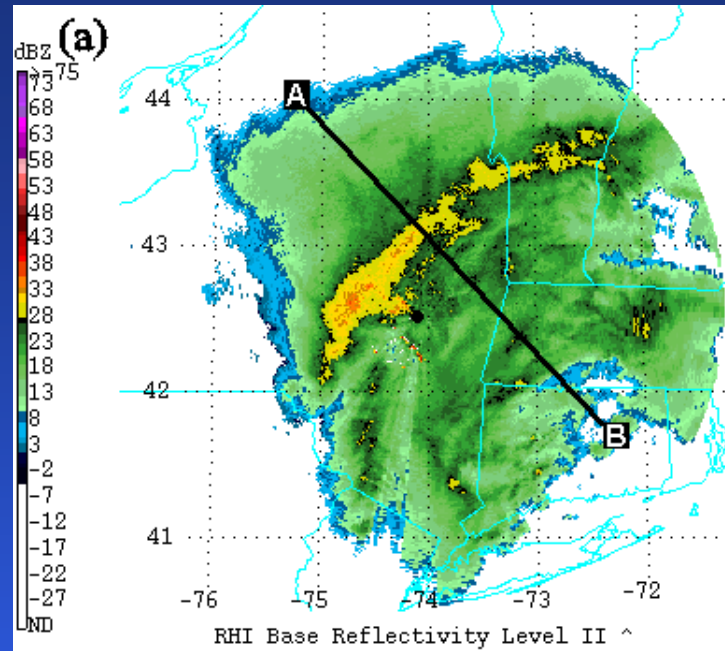
2000 UTC MM5



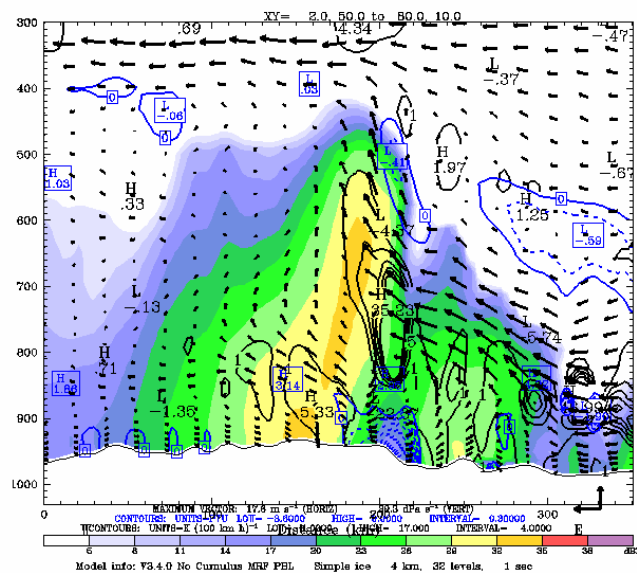
2000 UTC WRF



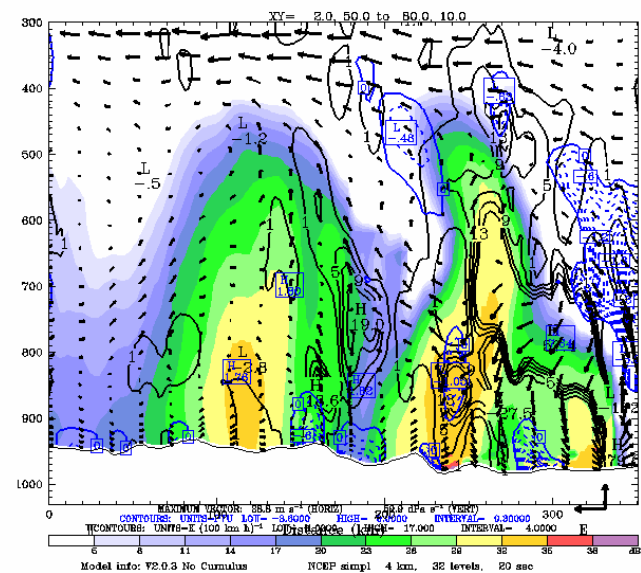
Precipitation Drift?



2200 UTC MM5

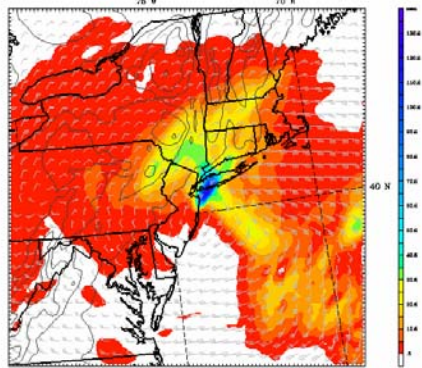


2200 UTC WRF



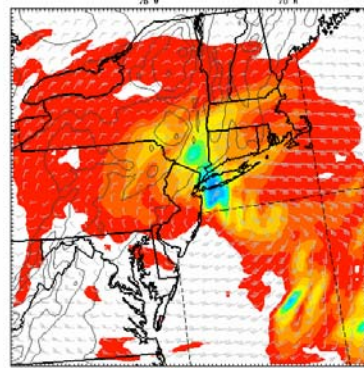
Ensemble Members (1 h precip ending 19 UTC)

Dataset: Lin YSU KF RRP pop 1h
Post: 19:00 Valid: 1600 UTC Wed 25 Dec 02 (1400 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Based on 0000 UTC Surface (0.0in)



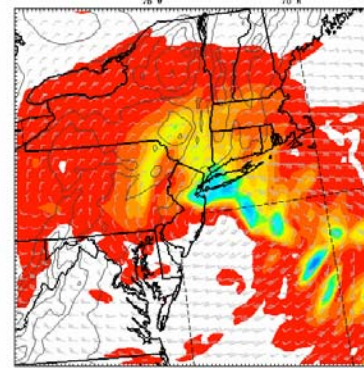
Model info: V20.0.0 Rain-P-2km THU PBL Lin et al 12 km, 32 levels, 60 sec

Dataset: wps5 YSU KF RRP pop 1h
Post: 19:00 Valid: 1600 UTC Wed 25 Dec 02 (1400 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Based on 0000 UTC Surface (0.0in)

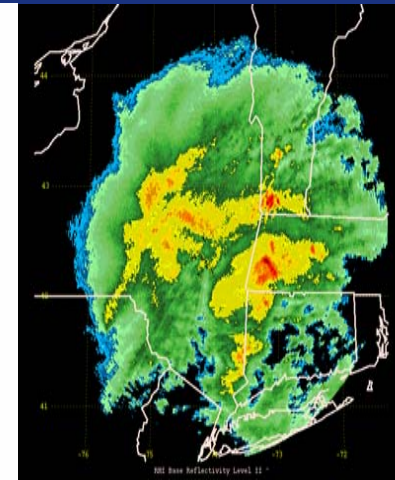


Model info: V20.0.0 Rain-P-2km THU PBL RUCP smag1 12 km, 32 levels, 60 sec

Dataset: wps4 MRF Grell RRP pop 1h
Post: 19:00 Valid: 1600 UTC Wed 25 Dec 02 (1400 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Based on 0000 UTC Surface (0.0in)



Model info: V20.0.0 Rain-P-2km MRF RUCP smag1 12 km, 32 levels, 60 sec



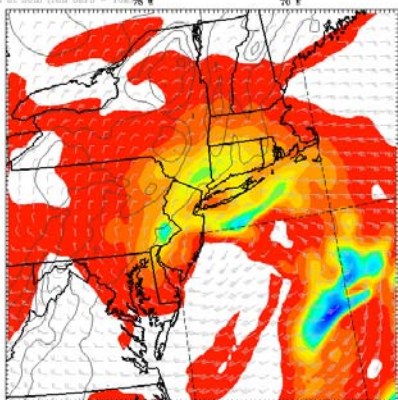
WRF Eta init
KF / YSU
Lin

WRF Eta Init
KF/ YSU
WSM-3

WRF Eta Init Grell-
Devenyi / MRF
WSM-5

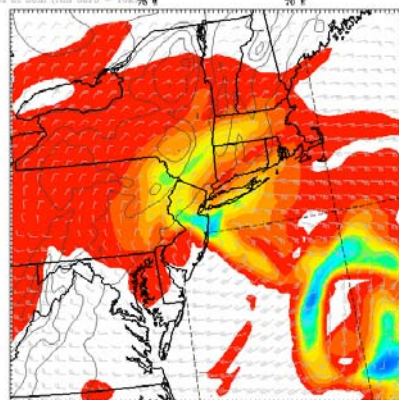
19 UTC
Radar

SUNYSH MMS 12km Domain
Post: 19 h Valid: 19 UTC Wed 25 Dec 02 (14 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Based on 0000 UTC Surface (0.0in)



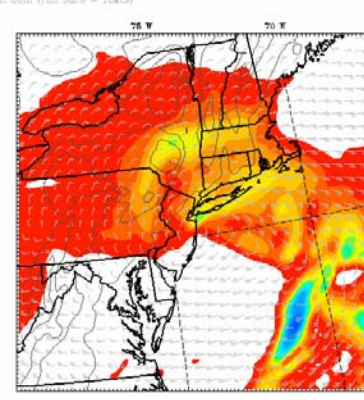
Model info: V3.5.3 Grell MRF PBL Simple Ice 12 km, 32 levels, 30 sec

SUNYSH MMS 12km Domain
Post: 19 h Valid: 19 UTC Wed 25 Dec 02 (14 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Based on 0000 UTC Surface (0.0in)



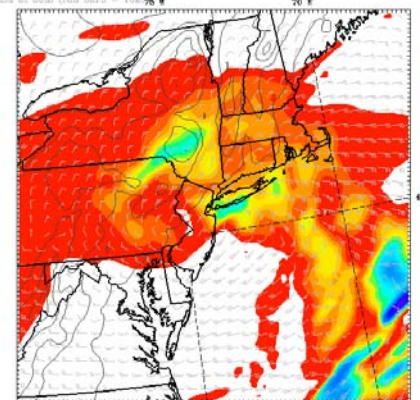
Model info: V3.5.3 MRF PBL Simple Ice 12 km, 32 levels, 30 sec

Dataset: RRP RRP pop 1h
Post: 18:00 Valid: 1859 UTC Wed 25 Dec 02 (1159 MST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Based on 0000 UTC Surface (0.0in)



Model info: V3.5.3 Grell MRF PBL Reisner 2 12 km, 32 levels, 30 sec

SUNYSH MMS 12km Domain
Post: 19 h Valid: 19 UTC Wed 25 Dec 02 (14 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Based on 0000 UTC Surface (0.0in)



Model info: V3.5.3 Grell Simple Ice 12 km, 32 levels, 30 sec

MM5 GFS init
Grell / MRF
Simple Ice

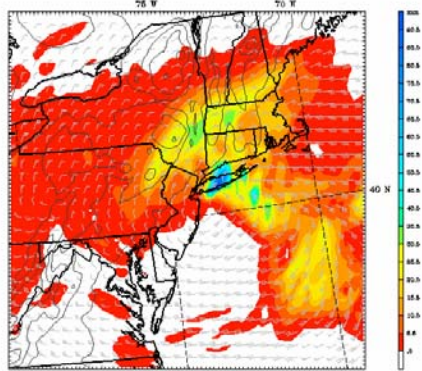
MM5 Eta init
KF / MRF
Simple Ice

MM5 Eta init
Grell / MRF
Reisner 2

MM5 Eta init
Grell / GS
Simple Ice

Ensemble Members (1 h precip ending 20 UTC)

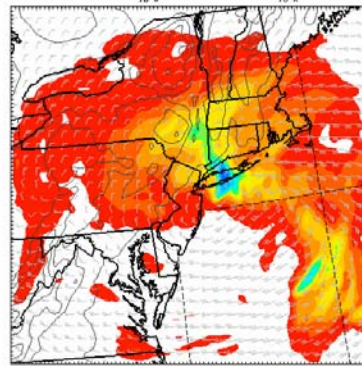
Dataset: Lin YSU KF RFP pop 1h
Post: 20:00 Valid: 2000 UTC Wed 25 Dec 02 (1500 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 2000 UTC Wed 25 Dec 02



Model info: V20.0.0 Rain-P-2km THS PBL Lin et al 12 km, 32 levels, 60 sec

WRF Eta init
KF / YSU
Lin

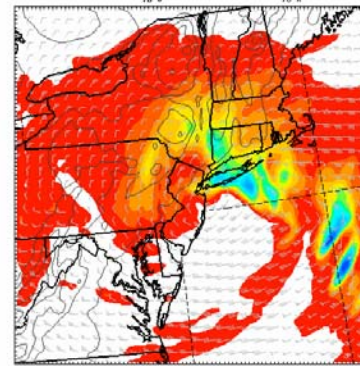
Dataset: wps5 YSU KF RFP pop 1h
Post: 20:00 Valid: 2000 UTC Wed 25 Dec 02 (1500 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 2000 UTC Wed 25 Dec 02



Model info: V20.0.0 Rain-P-2km THS PBL RWP et al 12 km, 32 levels, 60 sec

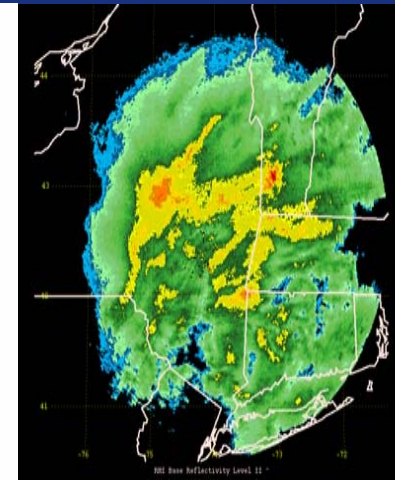
WRF Eta Init
KF/ YSU
WSM-3

Dataset: wps4 MRF Grell RFP pop 1h
Post: 20:00 Valid: 2000 UTC Wed 25 Dec 02 (1500 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 2000 UTC Wed 25 Dec 02



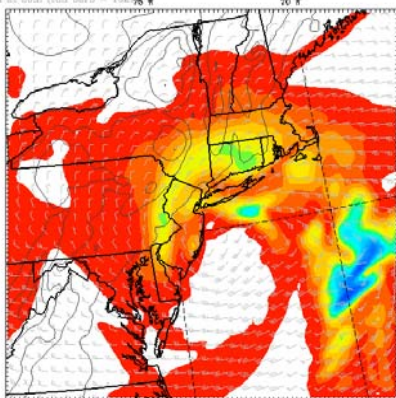
Model info: V20.0.0 Rain-P-2km THS PBL RWP et al 12 km, 32 levels, 60 sec

WRF Eta Init Grell-
Devenyi / MRF
WSM-5



20 UTC
Radar

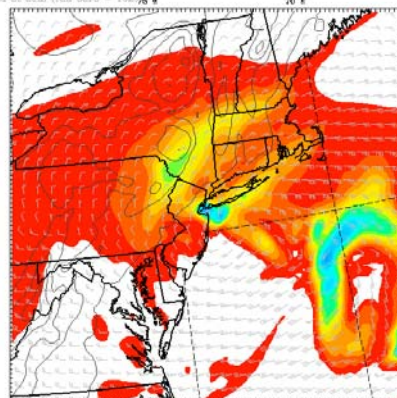
SUN38 MMS 12km Domain
Post: 20:00 Valid: 20 UTC Wed 25 Dec 02 (15 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 2000 UTC Wed 25 Dec 02



Model info: V3.5.3 Grell MRF PBL Simple Ice 12 km, 32 levels, 30 sec

MM5 GFS init
Grell / MRF
Simple Ice

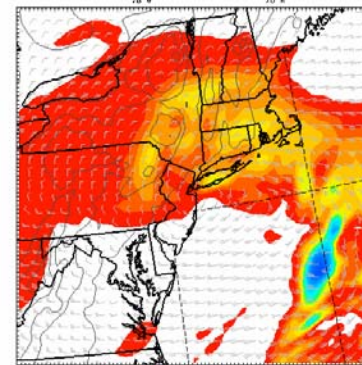
SUN38 MMS 12km Domain
Post: 20:00 Valid: 20 UTC Wed 25 Dec 02 (15 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 2000 UTC Wed 25 Dec 02



Model info: V3.5.3 MRF PBL Simple Ice 12 km, 32 levels, 30 sec

MM5 Eta init
KF / MRF
Simple Ice

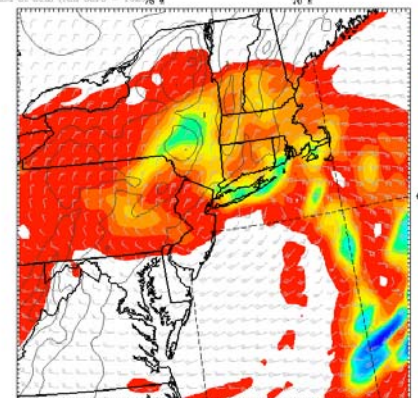
Dataset: RFP RFP pop 1h
Post: 20:00 Valid: 2000 UTC Wed 25 Dec 02 (1500 MST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 2000 UTC Wed 25 Dec 02



Model info: V3.5.3 Grell MRF PBL Reisner 2 12 km, 32 levels, 30 sec

MM5 Eta init
Grell / MRF
Reisner 2

SUN38 MMS 12km Domain
Post: 20:00 Valid: 20 UTC Wed 25 Dec 02 (15 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 2000 UTC Wed 25 Dec 02

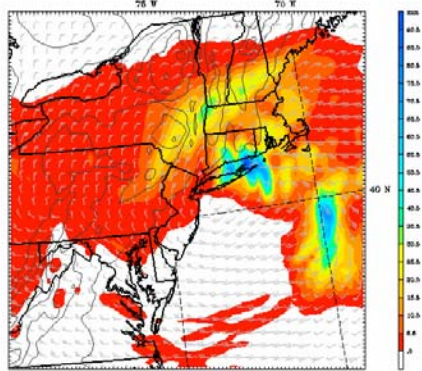


Model info: V3.5.3 Grell GS PBL Simple Ice 12 km, 32 levels, 30 sec

MM5 Eta init
Grell / GS
Simple Ice

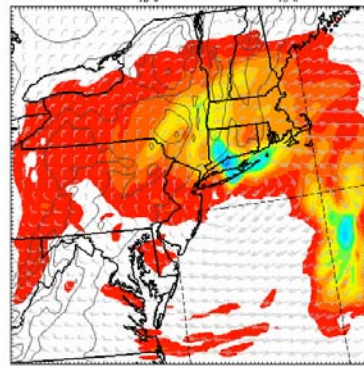
Ensemble Members (1 h precip ending 21 UTC)

Dataset: Lin YSU KF RFP pop 1h
Post: 21.00 Valid: 2100 UTC Wed 25 Dec 02
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



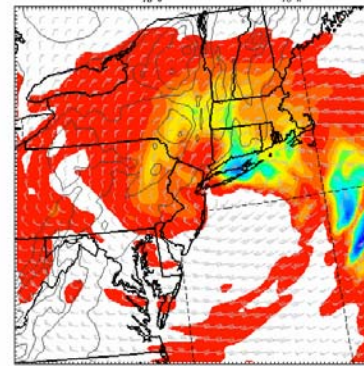
Model info: V20.0.0 Rain-P-2km THU PBL Lin et al 12 km, 32 levels, 60 sec

Dataset: wps4 YSU KF RFP pop 1h
Post: 21.00 Valid: 2100 UTC Wed 25 Dec 02
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02

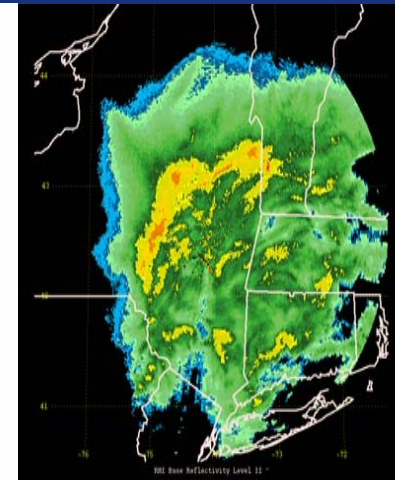


Model info: V20.0.0 Rain-P-2km THU PBL RUCP et al 12 km, 32 levels, 60 sec

Dataset: wps4 MRF Grell RFP pop 1h
Post: 21.00 Valid: 2100 UTC Wed 25 Dec 02
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V20.0.0 Rain-P-2km MRF RUCP et al 12 km, 32 levels, 60 sec



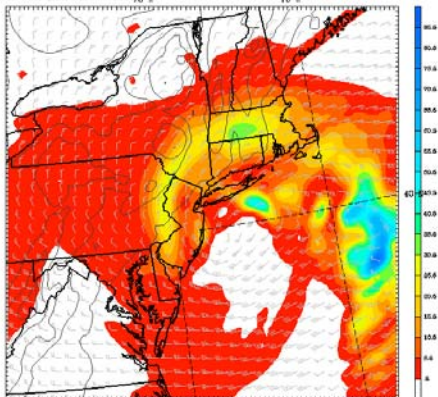
21 UTC
Radar

WRF Eta init
KF / YSU
Lin

WRF Eta Init
KF/ YSU
WSM-3

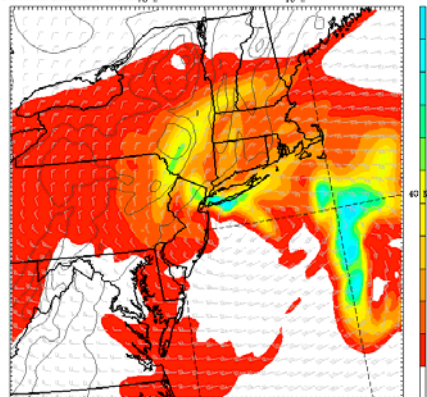
WRF Eta Init Grell-
Devenyi / MRF
WSM-5

SUNYSB MMS 12km Domain
Post: 21.00 Valid: 21 UTC Wed 25 Dec 02
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



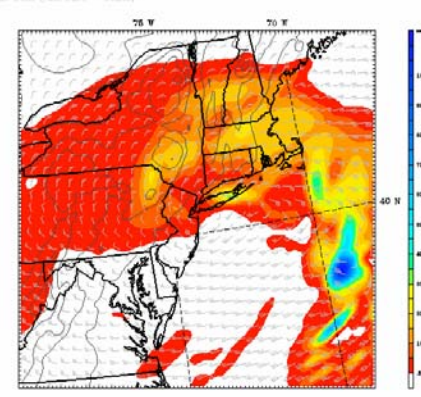
Model info: V3.5.3 Grell MRF PBL Simple Ice 12 km, 32 levels, 30 sec

SUNYSB MMS 12km Domain
Post: 21.00 Valid: 21 UTC Wed 25 Dec 02
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



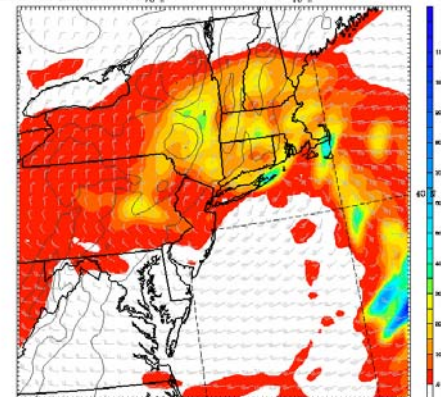
Model info: V3.5.3 MRF PBL Simple Ice 12 km, 32 levels, 30 sec

Dataset: RFP RFP pop 1h
Post: 21.00 Valid: 2100 UTC Wed 25 Dec 02
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V3.5.3 Grell MRF PBL Reisner 2 12 km, 32 levels, 30 sec

SUNYSB MMS 12km Domain
Post: 21.00 Valid: 21 UTC Wed 25 Dec 02
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V3.5.3 Grell Simple Ice 12 km, 32 levels, 30 sec

MM5 GFS init
Grell / MRF
Simple Ice

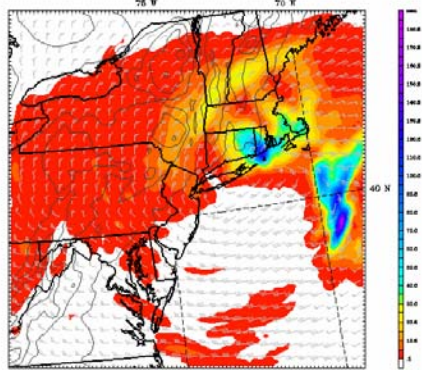
MM5 Eta init
KF / MRF
Simple Ice

MM5 Eta init
Grell / MRF
Reisner 2

MM5 Eta init
Grell / GS
Simple Ice

Ensemble Members (1 h precip ending 22 UTC)

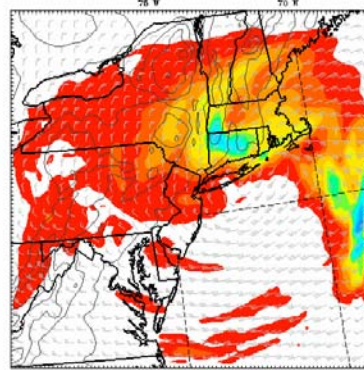
Dataset: Lin YSU KF RFP pop 1h
Post: 22:00 Valid: 2200 UTC Wed 25 Dec 02 (1700 EST Wed 25 Dec 02)
Total Precip in past hour (.01in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V20.0.0 Kain-P-3Sta YSU PBL Lin et al 12 km, 32 levels, 60 sec

WRF Eta init
KF / YSU
Lin

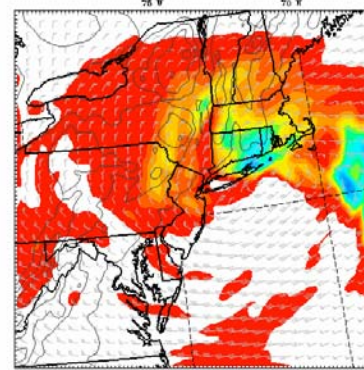
Dataset: wps5 YSU KF RFP pop 1h
Post: 22:00 Valid: 2200 UTC Wed 25 Dec 02 (1700 EST Wed 25 Dec 02)
Total Precip in past hour (.01in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V20.0.0 Kain-P-3Sta YSU PBL RUCP smagp 12 km, 32 levels, 60 sec

WRF Eta Init
KF/ YSU
WSM-3

Dataset: wps4 MRF Grell RFP pop 1h
Post: 22:00 Valid: 2200 UTC Wed 25 Dec 02 (1700 EST Wed 25 Dec 02)
Total Precip in past hour (.01in)
Valid at 0000 UTC Wed 25 Dec 02



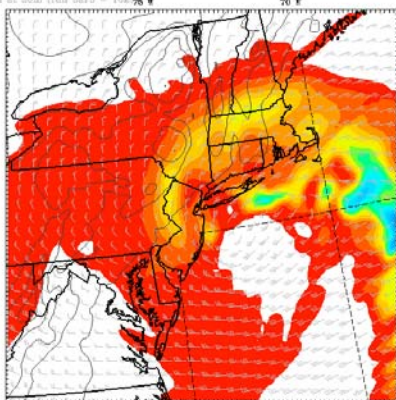
Model info: V20.0.0 New-Grell MRF RUCP smagp 12 km, 32 levels, 60 sec

WRF Eta Init Grell-
Devenyi / MRF
WSM-5



22 UTC
Radar

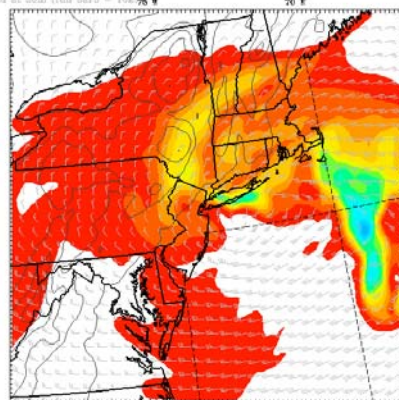
SUN38 MMS 12km Domain
Post: 22 h Valid: 22 UTC Wed 25 Dec 02 (17 EST Wed 25 Dec 02)
Total Precip in past hour (.01in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V3.5.3 Grell MRF PBL Simple Ice 12 km, 32 levels, 36 sec

MM5 GFS init
Grell / MRF
Simple Ice

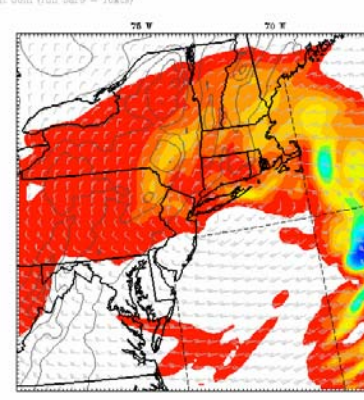
SUN38 MMS 12km Domain
Post: 22 h Valid: 22 UTC Wed 25 Dec 02 (17 EST Wed 25 Dec 02)
Total Precip in past hour (.01in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V3.5.3 MRF PBL Simple Ice 12 km, 32 levels, 36 sec

MM5 Eta init
KF / MRF
Simple Ice

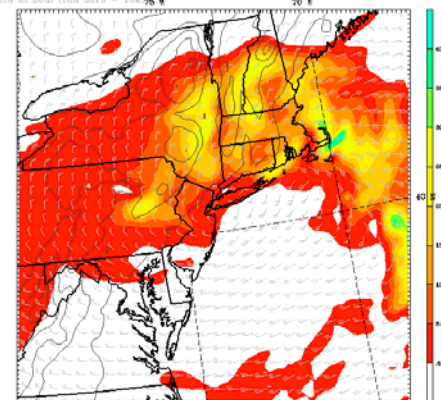
Dataset: RFP RFP pop 1h
Post: 21:00 Valid: 2159 UTC Wed 25 Dec 02 (1659 MST Wed 25 Dec 02)
Total Precip in past hour (.01in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V3.5.3 Grell MRF PBL Reisner 2 12 km, 32 levels, 36 sec

MM5 Eta init
Grell / MRF
Reisner 2

SUN38 MMS 12km Domain
Post: 22 h Valid: 22 UTC Wed 25 Dec 02 (17 EST Wed 25 Dec 02)
Total Precip in past hour (.01in)
Valid at 0000 UTC Wed 25 Dec 02

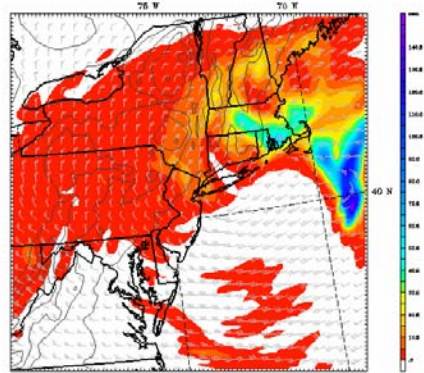


Model info: V3.5.3 Grell Simple Ice 12 km, 32 levels, 36 sec

MM5 Eta init
Grell / GS
Simple Ice

Ensemble Members (1 h precip ending 23 UTC)

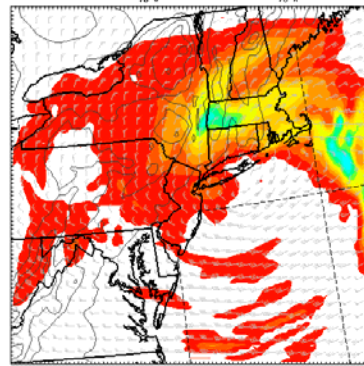
Dataset: Lin YSU KF RFP pop 1h
Post: 23.00 Valid: 2300 UTC Wed 25 Dec 02 (1800 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V20.0.0 Kain-P-3Sta THP PBL 12s at 41 12 km, 32 levels, 60 sec

WRF Eta init
KF / YSU
Lin

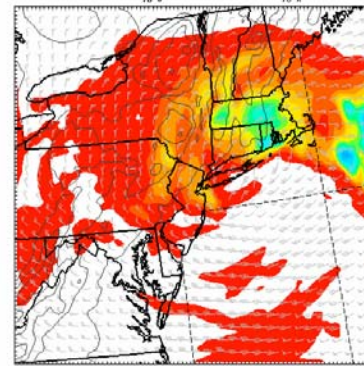
Dataset: wps5 YSU KF RFP pop 1h
Post: 23.00 Valid: 2300 UTC Wed 25 Dec 02 (1800 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V20.0.0 Kain-P-3Sta THP PBL RWP 12s at 41 12 km, 32 levels, 60 sec

WRF Eta Init
KF/ YSU
WSM-3

Dataset: wps4 MRF Grell RFP pop 1h
Post: 23.00 Valid: 2300 UTC Wed 25 Dec 02 (1800 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



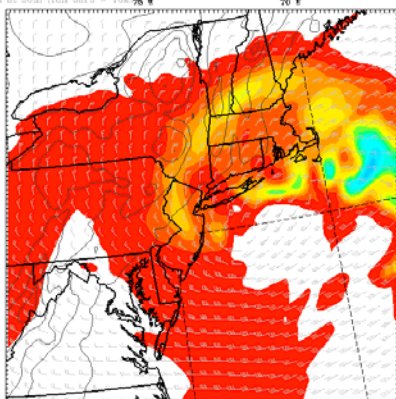
Model info: V20.0.0 New-Grell MRF RWP 12s at 41 12 km, 32 levels, 60 sec

WRF Eta Init Grell-
Devenyi / MRF
WSM-5



23 UTC
Radar

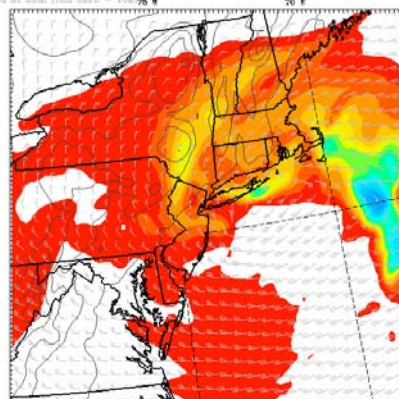
SUNYSH MMS 12km Domain
Post: 23.00 Valid: 23 UTC Wed 25 Dec 02 (18 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V3.5.3 Grell MRF PBL Simple Ice 12 km, 32 levels, 36 sec

MM5 GFS init
Grell / MRF
Simple Ice

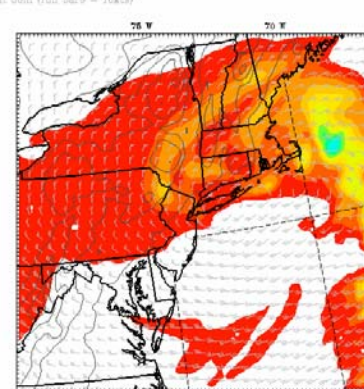
SUNYSH MMS 12km Domain
Post: 23.00 Valid: 23 UTC Wed 25 Dec 02 (18 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V3.5.3 MRF PBL Simple Ice 12 km, 32 levels, 36 sec

MM5 Eta init
KF / MRF
Simple Ice

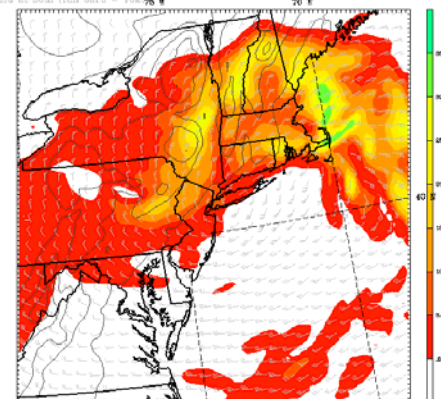
Dataset: RFP RFP pop 12km
Post: 23.01 Valid: 2300 UTC Wed 25 Dec 02 (1800 MST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02



Model info: V3.5.3 Grell MRF PBL Reisner 2 12 km, 32 levels, 36 sec

MM5 Eta init
Grell / MRF
Reisner 2

SUNYSH MMS 12km Domain
Post: 23.00 Valid: 23 UTC Wed 25 Dec 02 (18 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Wed 25 Dec 02

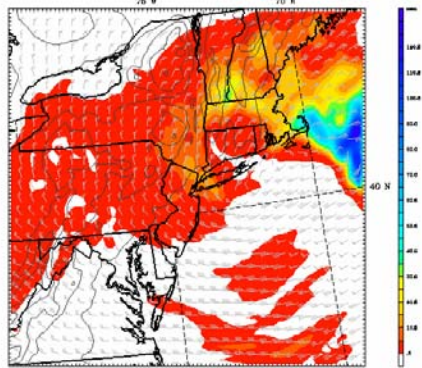


Model info: V3.5.3 Grell MRF PBL Simple Ice 12 km, 32 levels, 36 sec

MM5 Eta init
Grell / GS
Simple Ice

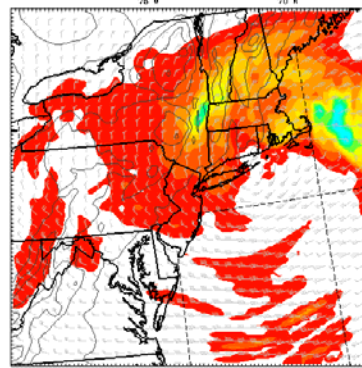
Ensemble Members (1 h precip ending 00 UTC)

Dataset: Lin YSU KF RFP pop 1h
Post: 24.00 Valid: 0000 UTC Thu 26 Dec 02
Total Precip in past hour (0.1in)
Valid at 0000 UTC Thu 26 Dec 02



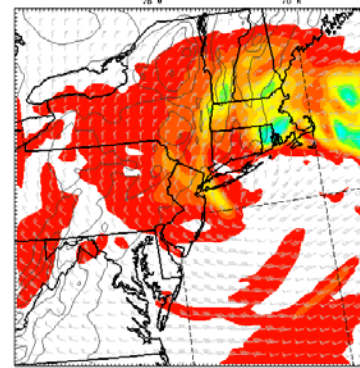
Model info: V20.0.0 Rain-P-2km YSU PBL Lin et al 12 km, 32 levels, 60 sec

Dataset: wps5 YSU KF RFP pop 1h
Post: 24.00 Valid: 0000 UTC Thu 26 Dec 02 (1600 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Thu 26 Dec 02

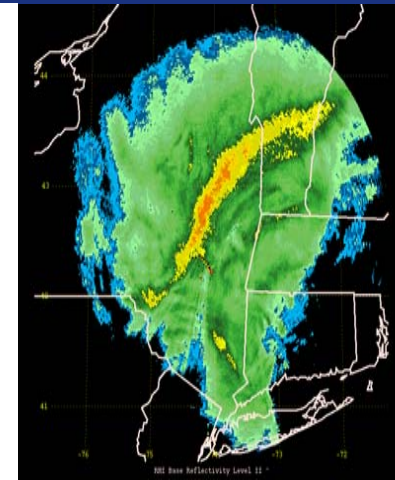


Model info: V20.0.0 Rain-P-2km YSU PBL RWP et al 12 km, 32 levels, 60 sec

Dataset: wps4 MRF Grell RFP pop 1h
Post: 24.00 Valid: 0000 UTC Thu 26 Dec 02 (1600 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Thu 26 Dec 02



Model info: V20.0.0 Rain-P-2km MRF RWP et al 12 km, 32 levels, 60 sec



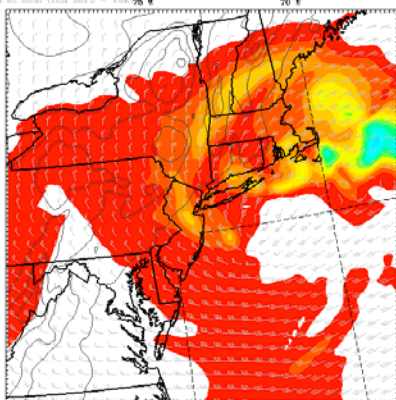
WRF Eta init
KF / YSU
Lin

WRF Eta Init
KF/ YSU
WSM-3

WRF Eta Init Grell–
Devenyi / MRF
WSM-5

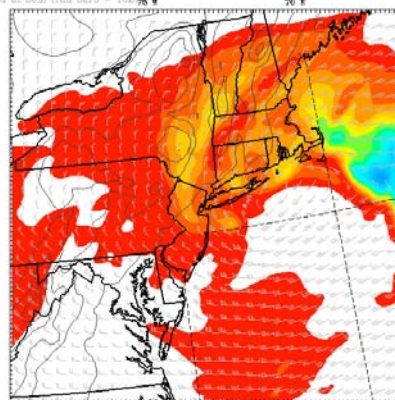
00 UTC
Radar

SUN3SR MMS 12km Domain
Post: 24.00 Valid: 00 UTC Thu 26 Dec 02 (19 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Thu 26 Dec 02



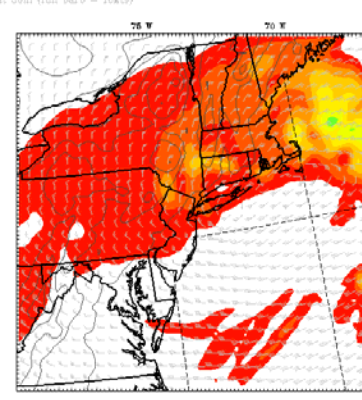
Model info: V3.5.3 Grell MRF PBL Simple Ice 12 km, 32 levels, 36 sec

SUN3SR MMS 12km Domain
Post: 24.00 Valid: 00 UTC Thu 26 Dec 02 (19 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Thu 26 Dec 02



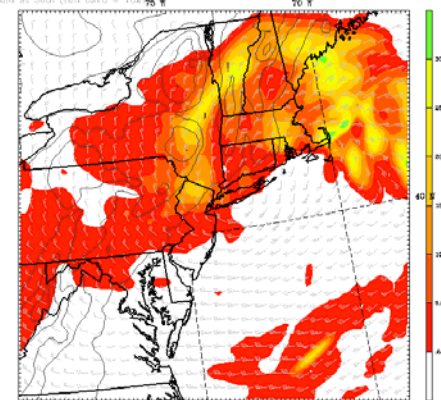
Model info: V3.5.3 MRF PBL Simple Ice 12 km, 32 levels, 36 sec

Dataset: RFP RFP pop 1h
Post: 24.00 Valid: 0000 UTC Thu 26 Dec 02 (1700 MST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Thu 26 Dec 02



Model info: V3.5.3 Grell MRF PBL Reisner 2 12 km, 32 levels, 36 sec

SUN3SR MMS 12km Domain
Post: 24.00 Valid: 00 UTC Thu 26 Dec 02 (19 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0000 UTC Thu 26 Dec 02



Model info: V3.5.3 Grell Simple Ice 12 km, 32 levels, 36 sec

MM5 GFS init
Grell / MRF
Simple Ice

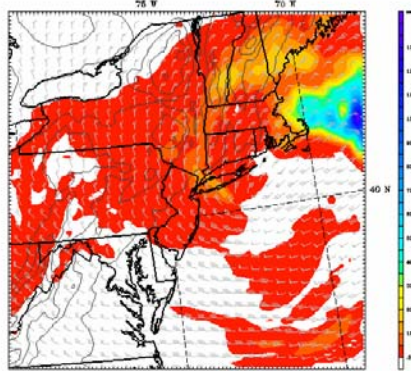
MM5 Eta init
KF / MRF
Simple Ice

MM5 Eta init
Grell / MRF
Reisner 2

MM5 Eta init
Grell / GS
Simple Ice

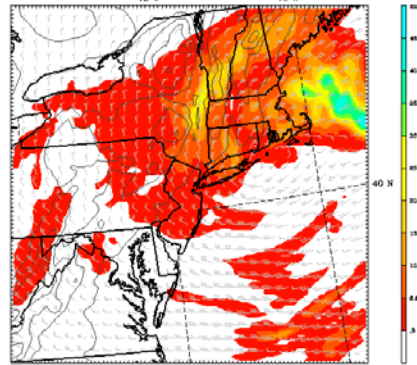
Ensemble Members (1 h precip ending 01 UTC)

Dataset: Lin YSU KF RFP pop 1h
Post: 25.00 Valid: 0100 UTC Thu 26 Dec 02 (2000 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Wind at 0.00m (1000 hPa) (JJA)



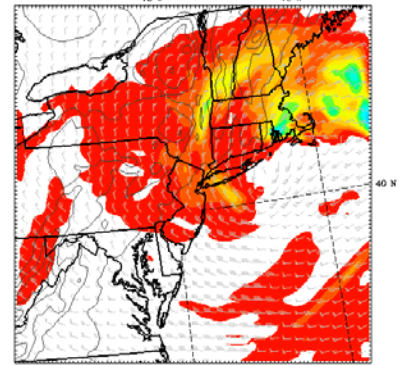
Model info: V20.0.0 Rain-P-25a THU PBL Lin et al 12 km, 32 levels, 60 sec

Dataset: wps5 YSU KF RFP pop 1h
Post: 25.00 Valid: 0100 UTC Thu 26 Dec 02 (2000 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Wind at 0.00m (1000 hPa) (JJA)

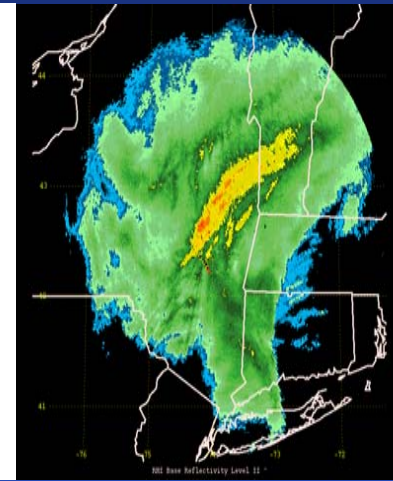


Model info: V20.0.0 Rain-P-25a THU PBL WSM-3 et al 12 km, 32 levels, 60 sec

Dataset: wps4 MRF Grell RFP pop 1h
Post: 25.00 Valid: 0100 UTC Thu 26 Dec 02 (2000 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Wind at 0.00m (1000 hPa) (JJA)



Model info: V20.0.0 Rain-P-25a THU PBL MRF WSM-5 et al 12 km, 32 levels, 60 sec



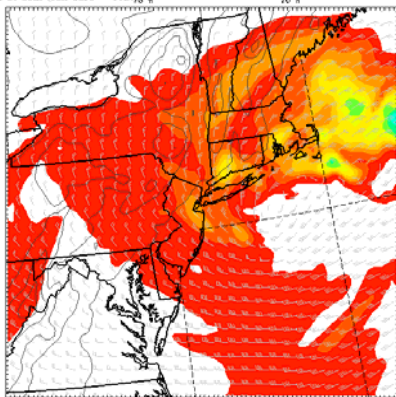
01 UTC
Radar

WRF Eta init
KF / YSU
Lin

WRF Eta Init
KF/ YSU
WSM-3

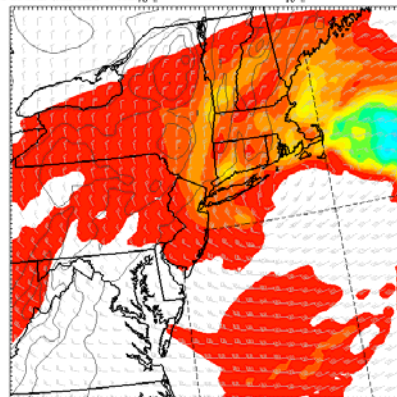
WRF Eta Init Grell-
Devenyi / MRF
WSM-5

SUN38 MMS 12km Domain
Post: 25.00 Valid: 01 UTC Thu 26 Dec 02 (20 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Wind at 0.00m (1000 hPa) (JJA)



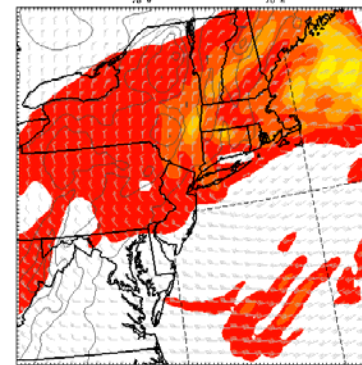
Model info: V3.5.3 Grell MRF PBL Simple Ice 12 km, 32 levels, 30 sec

SUN38 MMS 12km Domain
Post: 25.00 Valid: 01 UTC Thu 26 Dec 02 (20 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Wind at 0.00m (1000 hPa) (JJA)



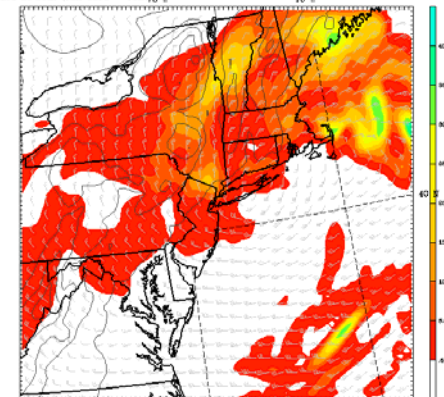
Model info: V3.5.3 MRF PBL Simple Ice 12 km, 32 levels, 30 sec

Dataset: RFP RFP: rip master12km
Post: 24.99 Valid: 0050 UTC Thu 26 Dec 02 (1759 MST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Wind at 0.00m (1000 hPa) (JJA)



Model info: V3.6.3 Grell MRF PBL Reisner 2 12 km, 32 levels, 30 sec

SUN38 MMS 12km Domain
Post: 25.00 Valid: 01 UTC Thu 26 Dec 02 (20 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Wind at 0.00m (1000 hPa) (JJA)



Model info: V3.5.3 Grell Simple Ice 12 km, 32 levels, 30 sec

MM5 GFS init
Grell / MRF
Simple Ice

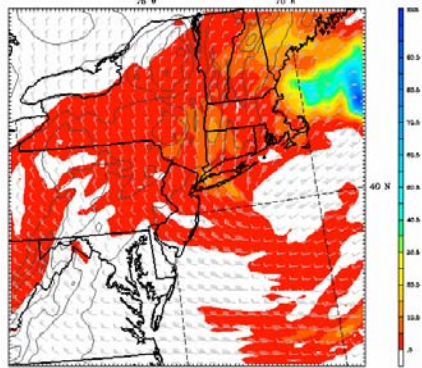
MM5 Eta init
KF / MRF
Simple Ice

MM5 Eta init
Grell / MRF
Reisner 2

MM5 Eta init
Grell / GS
Simple Ice

Ensemble Members (1 h precip ending 02 UTC)

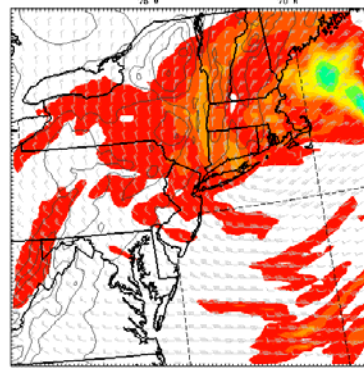
Dataset: Lin YSU KF RFP pop 1h
Post: 26.00 Valid: 0200 UTC Thu 26 Dec 02 (2100 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0200 UTC Thu 26 Dec 02



Model info: V20.0.0 Kain-Fritsch PBL, Lin et al 12 km, 32 levels, 60 sec

WRF Eta init
KF / YSU
Lin

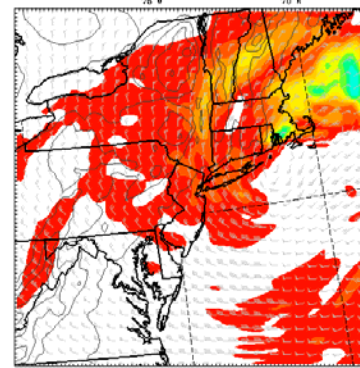
Dataset: wps5 YSU KF RFP pop 1h
Post: 26.00 Valid: 0200 UTC Thu 26 Dec 02 (2100 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0200 UTC Thu 26 Dec 02



Model info: V20.0.0 Kain-Fritsch PBL, RWP simpl 12 km, 32 levels, 60 sec

WRF Eta Init
KF/ YSU
WSM-3

Dataset: wps4 MRF Grell RFP pop 1h
Post: 26.00 Valid: 0200 UTC Thu 26 Dec 02 (2100 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0200 UTC Thu 26 Dec 02



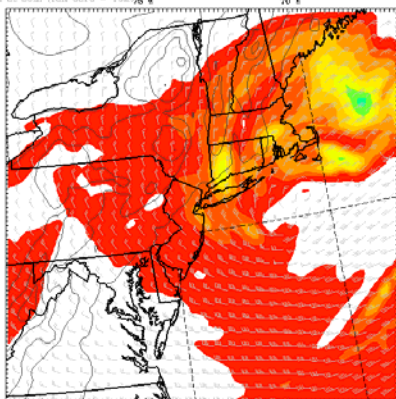
Model info: V20.0.0 New-Grell MRF, RWP simpl 12 km, 32 levels, 60 sec

WRF Eta Init Grell–
Devenyi / MRF
WSM-5



02 UTC
Radar

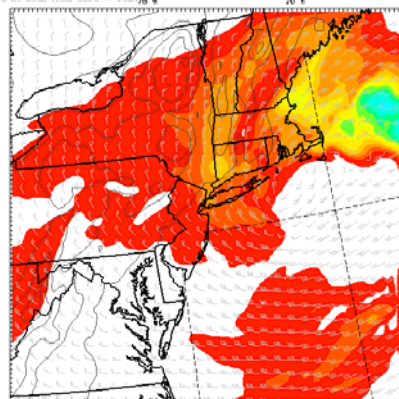
SUN38 MMS 12km Domain
Post: 26.00 Valid: 02 UTC Thu 26 Dec 02 (21 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0200 UTC Thu 26 Dec 02



Model info: V3.5.3 Grell, MRF PBL, Simple Ice 12 km, 32 levels, 36 sec

MM5 GFS init
Grell / MRF
Simple Ice

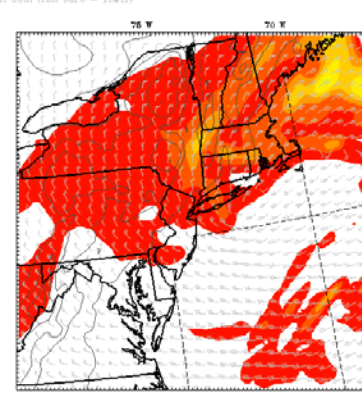
SUN38 MMS 12km Domain
Post: 26.00 Valid: 02 UTC Thu 26 Dec 02 (21 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0200 UTC Thu 26 Dec 02



Model info: V3.5.3 MRF PBL, Simple Ice 12 km, 32 levels, 36 sec

MM5 Eta init
KF / MRF
Simple Ice

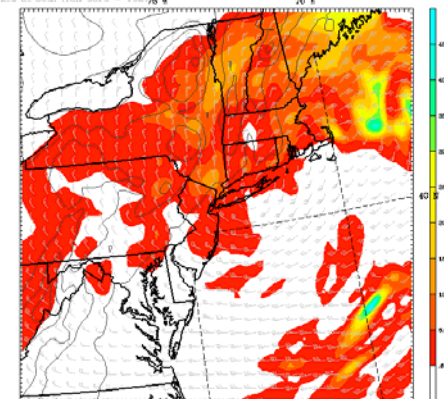
Dataset: RFP RFP pop 1h
Post: 26.00 Valid: 0200 UTC Thu 26 Dec 02 (1900 MST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0200 UTC Thu 26 Dec 02



Model info: V3.6.3 Grell, MRF PBL, Reisner 2 12 km, 32 levels, 36 sec

MM5 Eta init
Grell / MRF
Reisner 2

SUN38 MMS 12km Domain
Post: 26.00 Valid: 02 UTC Thu 26 Dec 02 (21 EST Wed 25 Dec 02)
Total Precip in past hour (0.1in)
Valid at 0200 UTC Thu 26 Dec 02



Model info: V3.5.3 Grell, Simple Ice 12 km, 32 levels, 36 sec

MM5 Eta init
Grell / GS
Simple Ice

Findings

- WRF and MM5 capable of simulating mesoscale band formation and dissipation
- WRF more accurate in cyclone strength and precipitation amount than MM5
- MM5 more accurate in initial band formation timing and location
- Both model forecasts showed a narrow sloping ascent maxima associated with strong midlevel frontogenesis and weak moist symmetric stability
- Small ensemble suggests some predictability in this case

Future Work

- Diagnose 3D hydrometeor trajectories across the band
- Explore role of diabatic heating on MPV destruction
- Use more diverse ensemble system to explore model sensitivities in this case