Progress in the Analysis of PREDICT Data

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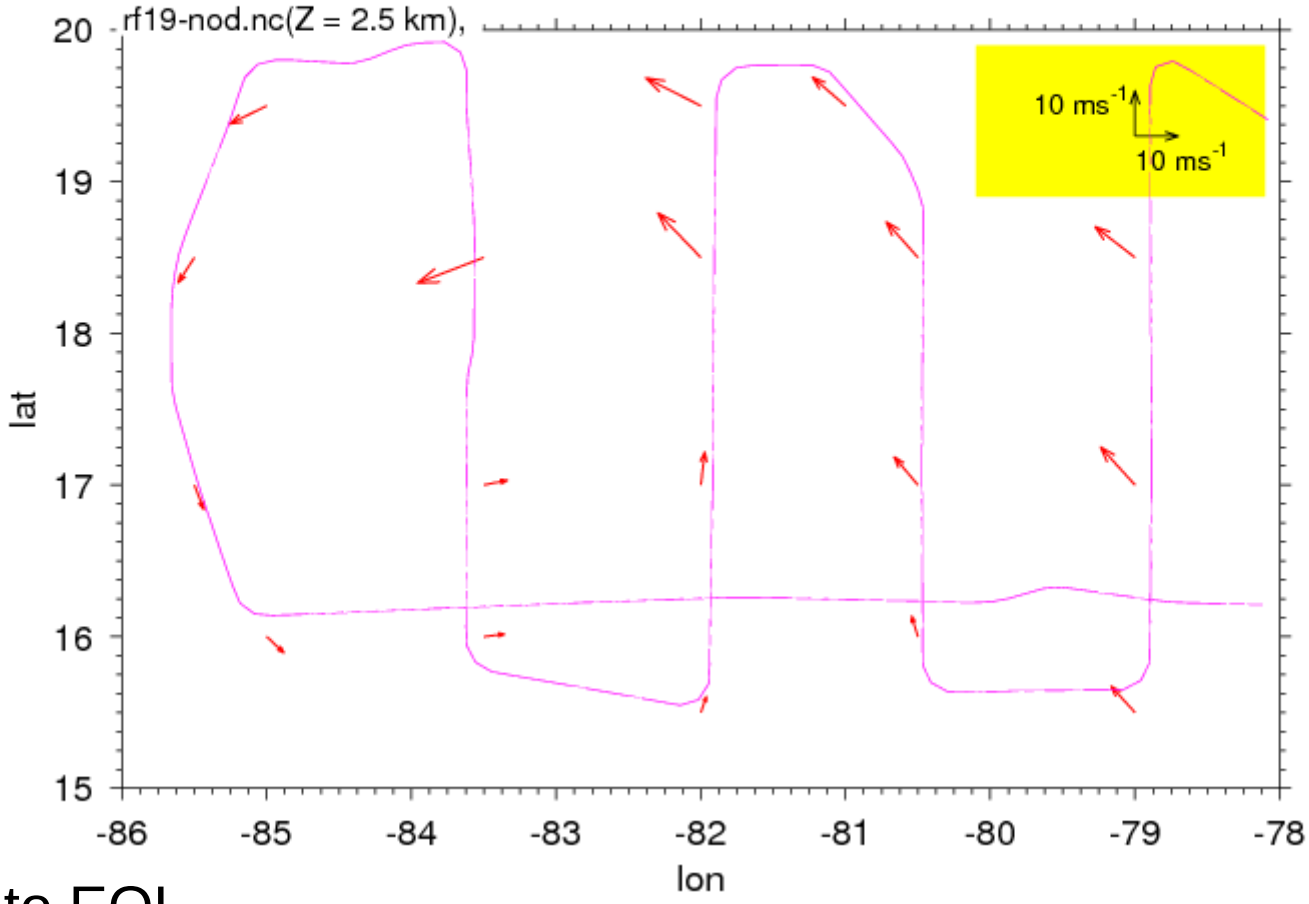
Wind Velocity Field

$$F(\boldsymbol{v}_e)=\sum_{i=1}^{N}(\boldsymbol{n}_i\cdot\boldsymbol{v}_e-v_d)^2/\sigma_i^2$$ Data Gridding

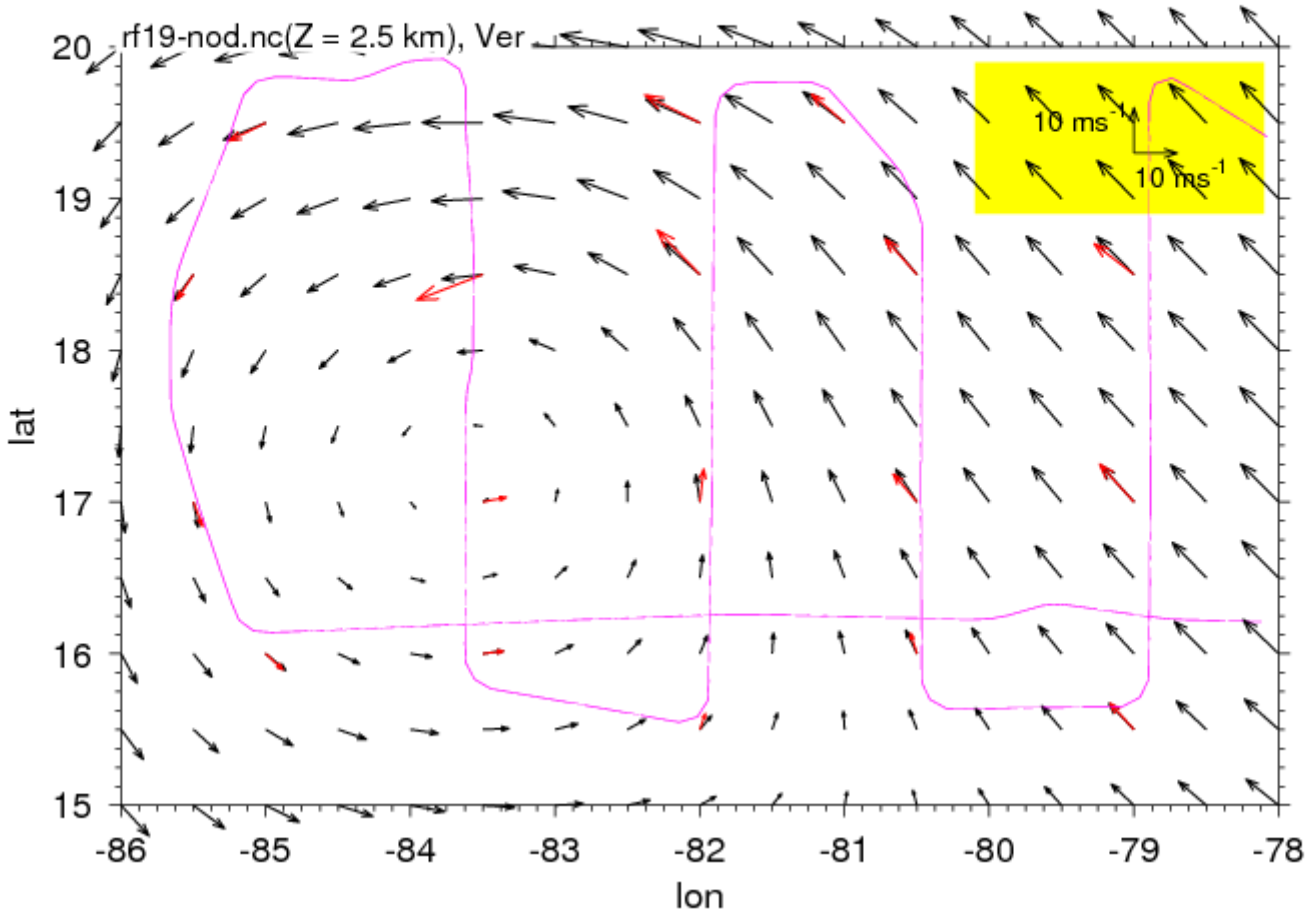
$$D(\boldsymbol{v})=\sum_{\alpha}a_\alpha[\boldsymbol{v}\cdot\boldsymbol{e}_\alpha-v_{e\alpha}]^2$$ Gridded Data Misfit

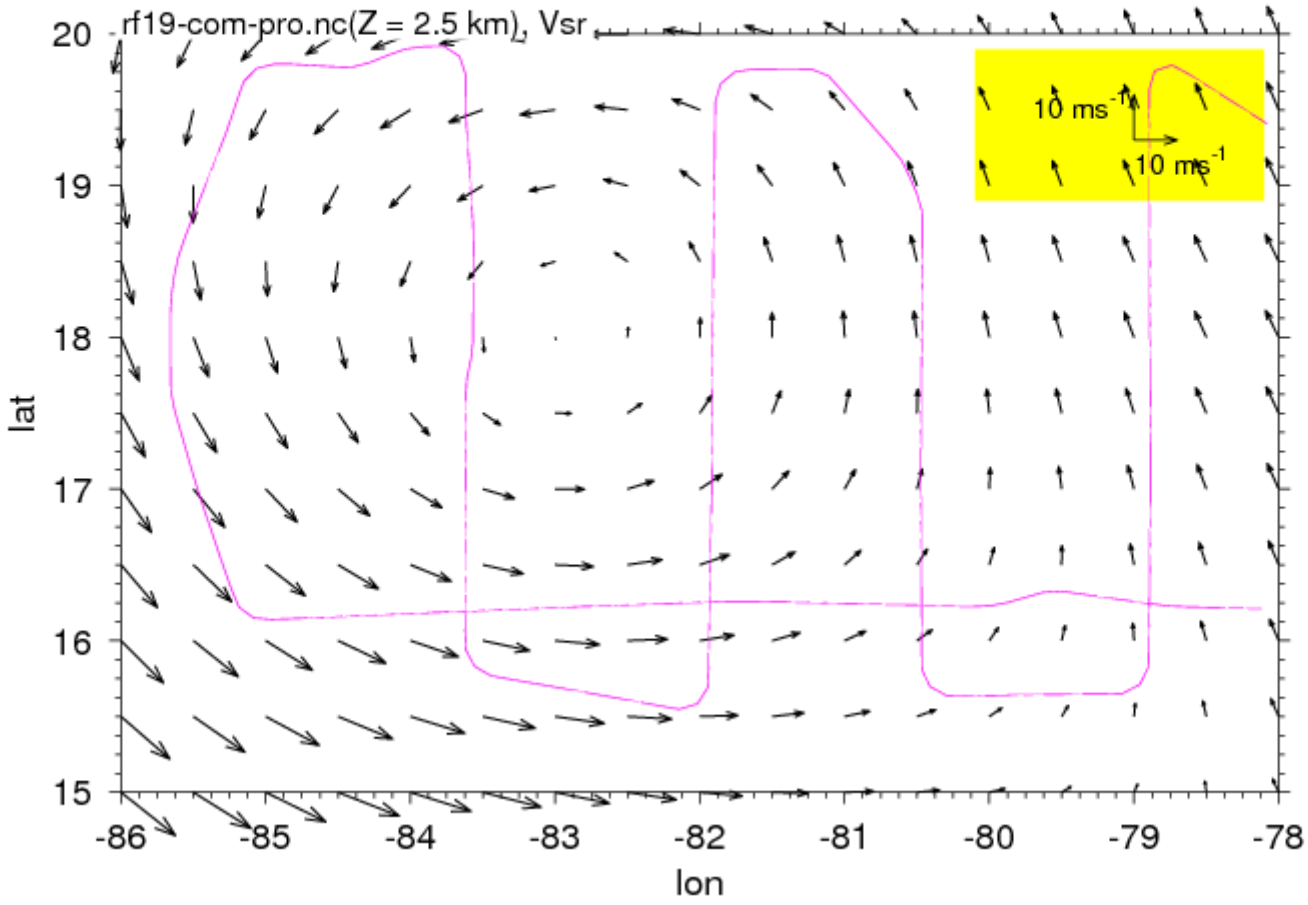
$$T(\boldsymbol{v})=\sum_{G}D(\boldsymbol{v})+W_s[S(\boldsymbol{v})]^2+W_m[\nabla\cdot(\rho\boldsymbol{v})]^2$$ Target

Gridded Data in the co-moving frame

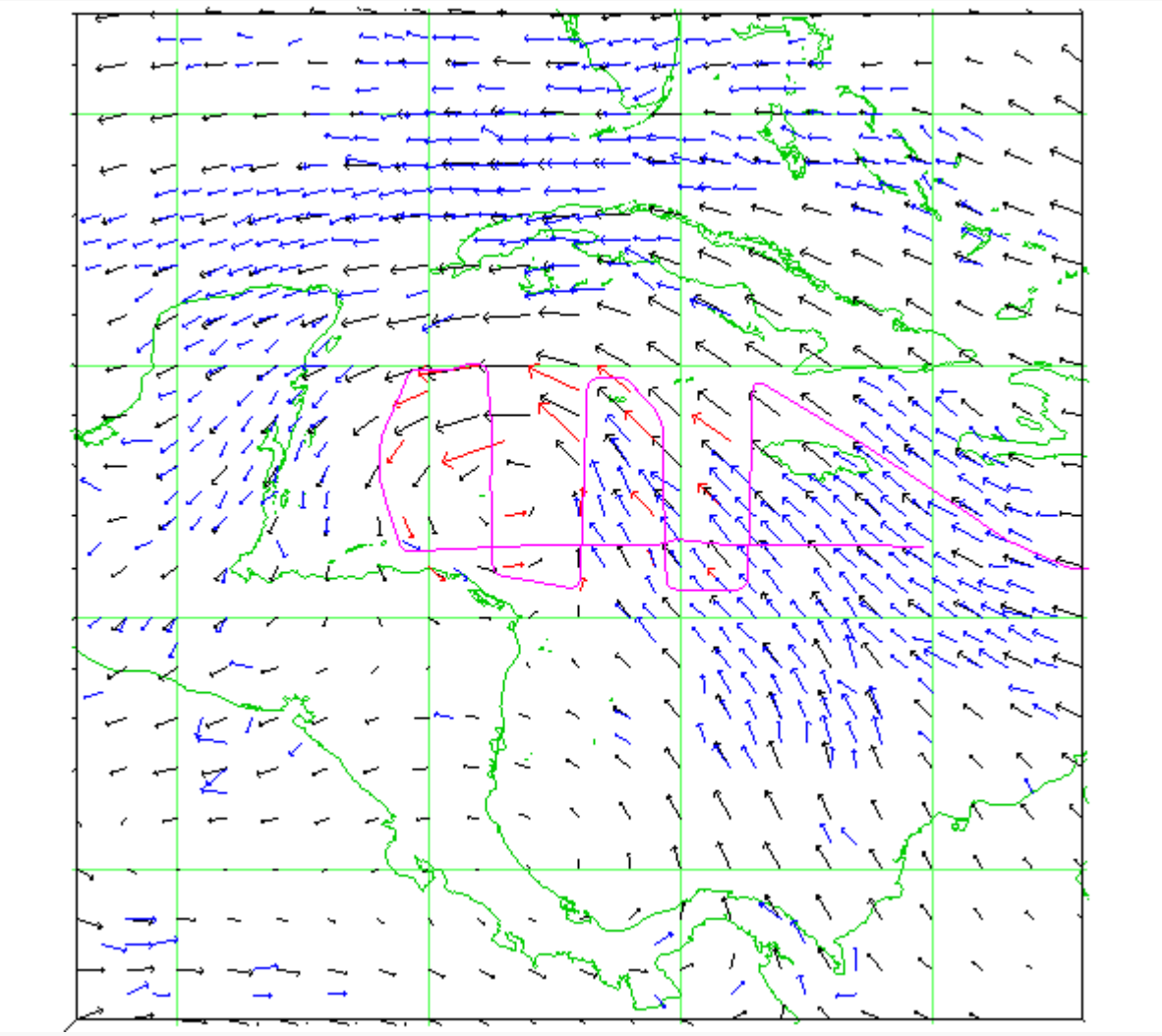


Thanks to EOL


rf19-nod.nc(Z = 2.5 km), Ver
10 ms-1
10 ms-1
lat
lon
20
19
18
17
16
15
-86
-85
-84
-83
-82
-81
-80
-79
-78

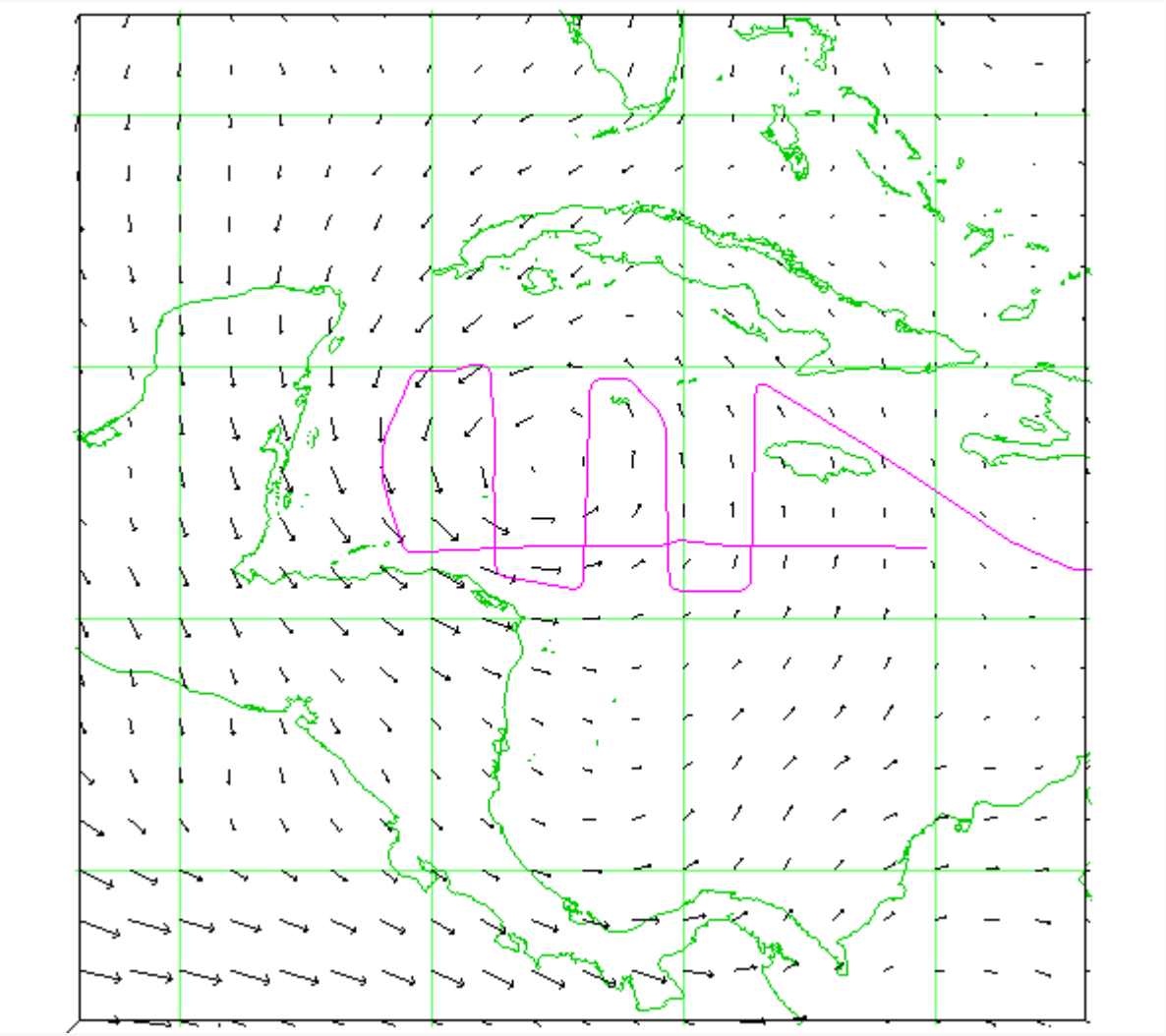

rf19-com-pro.nc(Z = 2.5 km), Vsr
10 ms-1
10 ms-1
lat
lon
20
19
18
17
16
15
-86
-85
-84
-83
-82
-81
-80
-79
-78

RF19: Karl (2.5km, Ver)

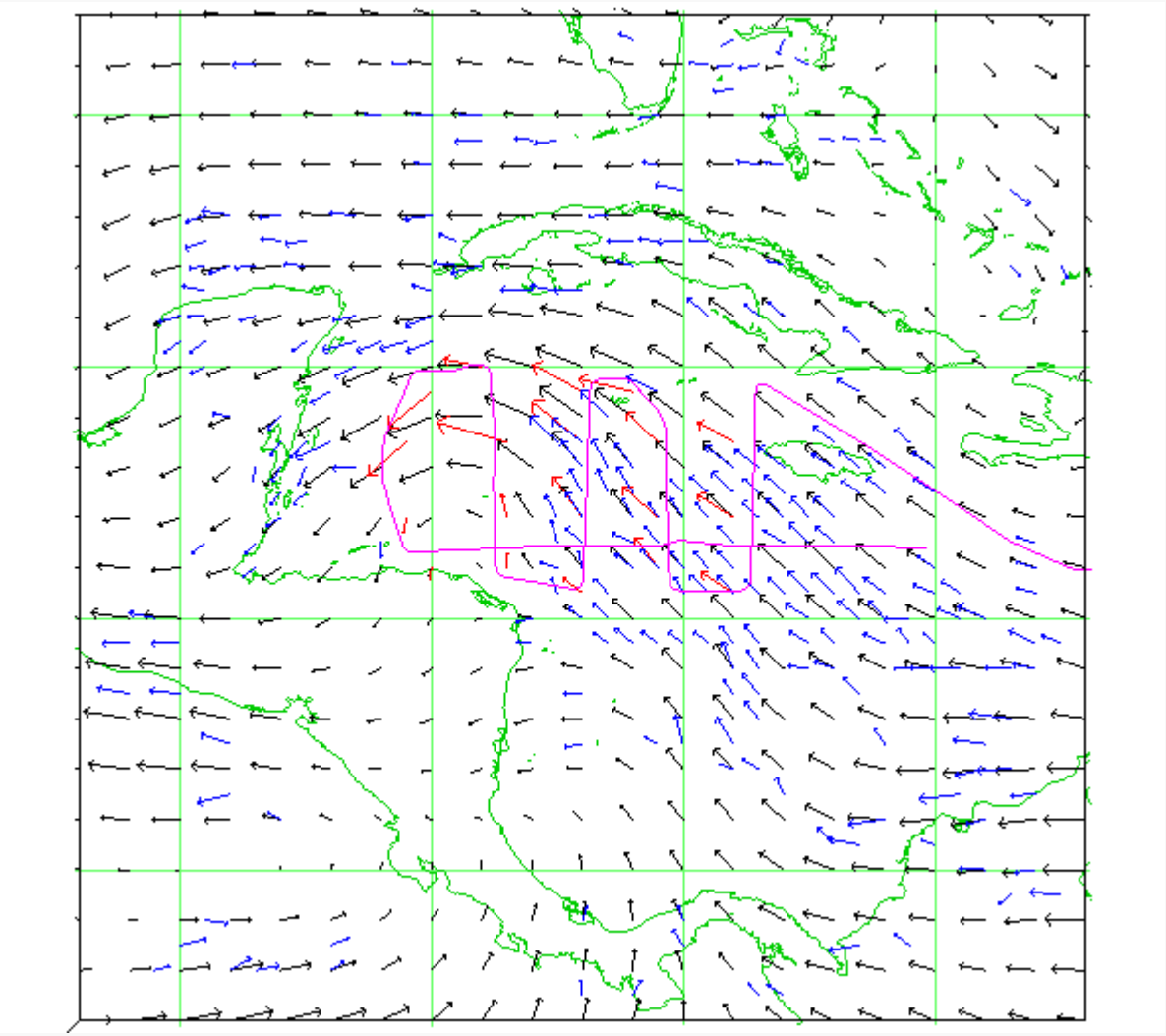


Thanks to Chris Velden, Dave Stettner, Howard Berger

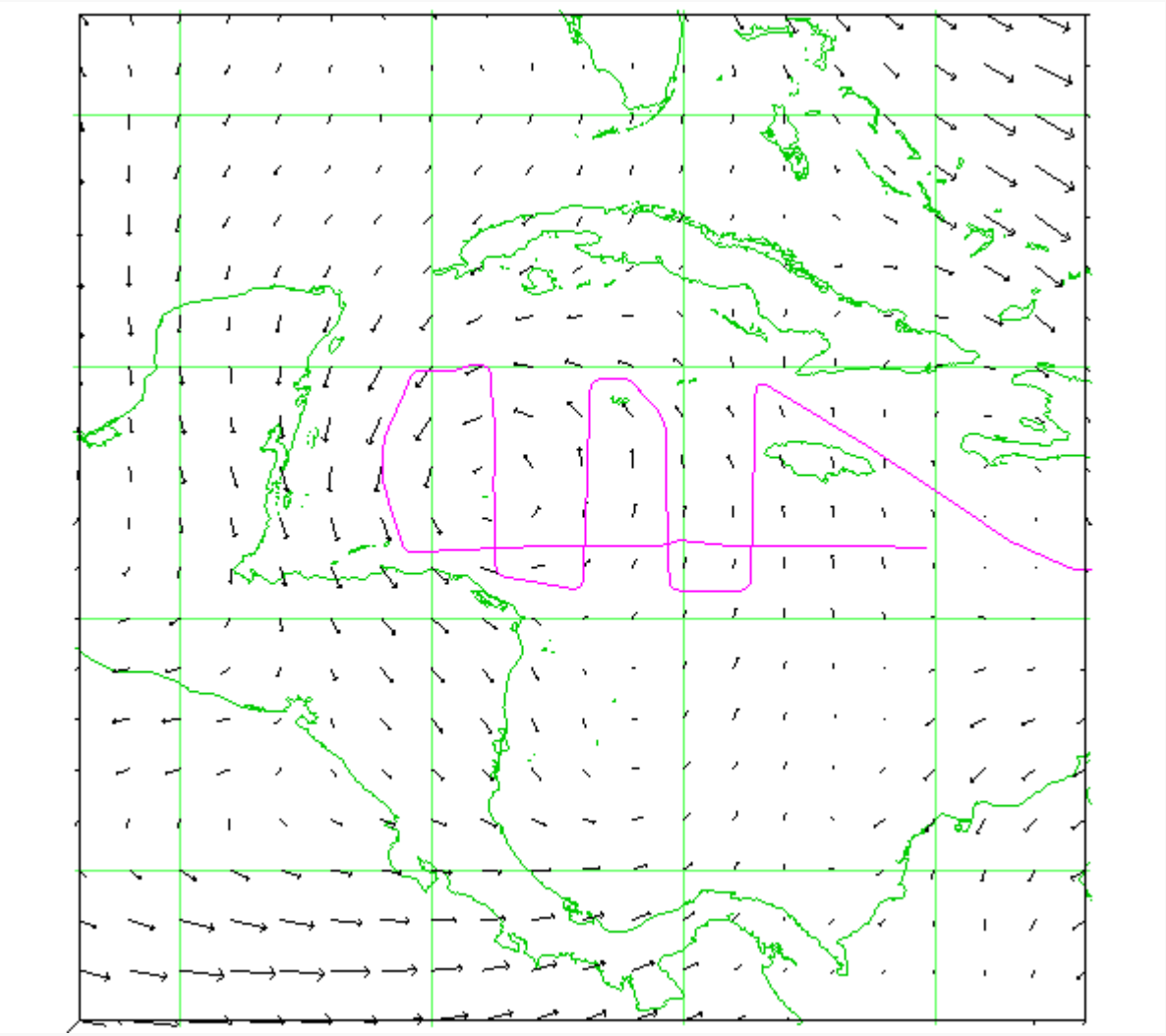
RF19: Karl (2.5km, Vsr)



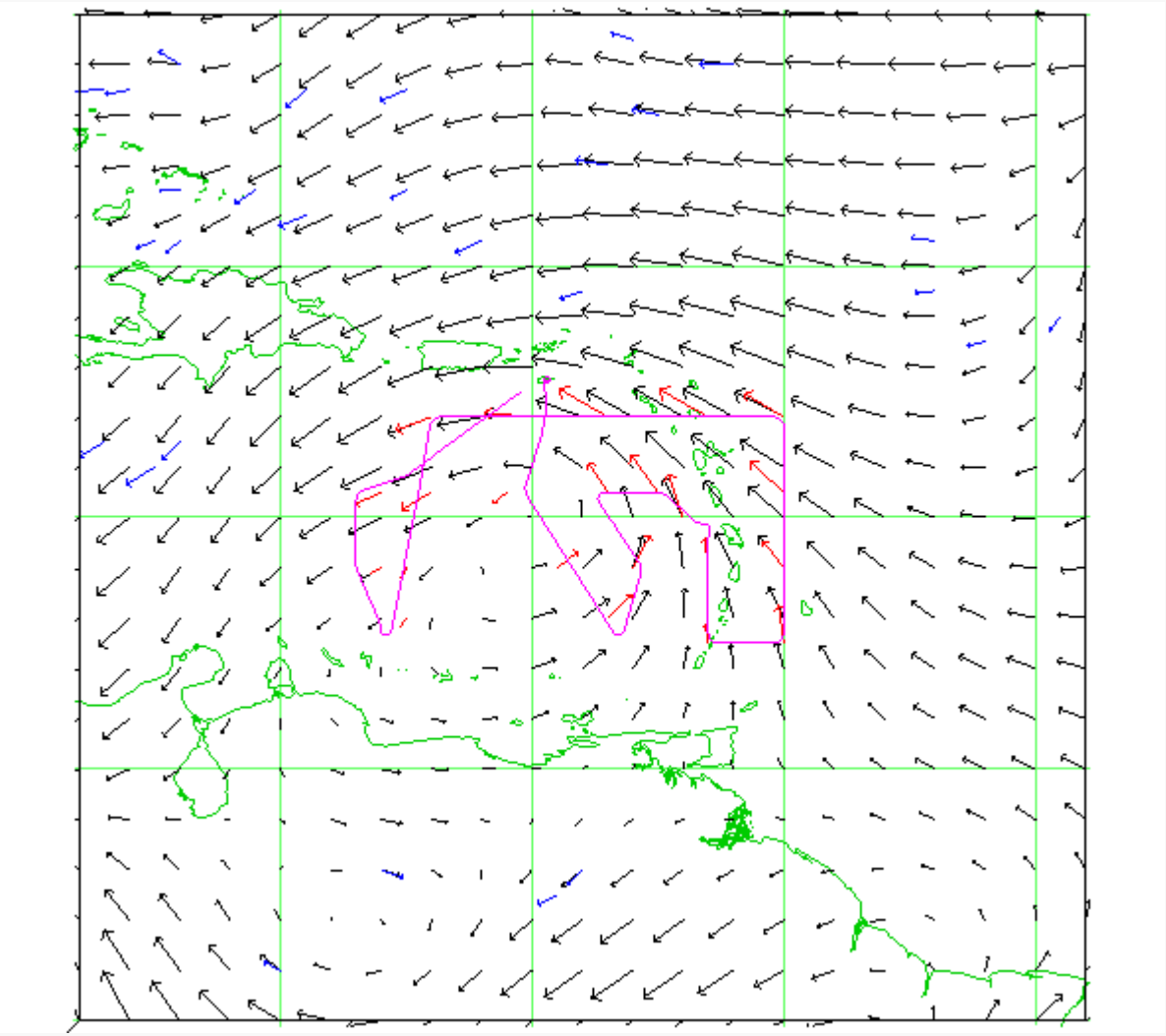
RF19: Karl (6.2km, Ver)



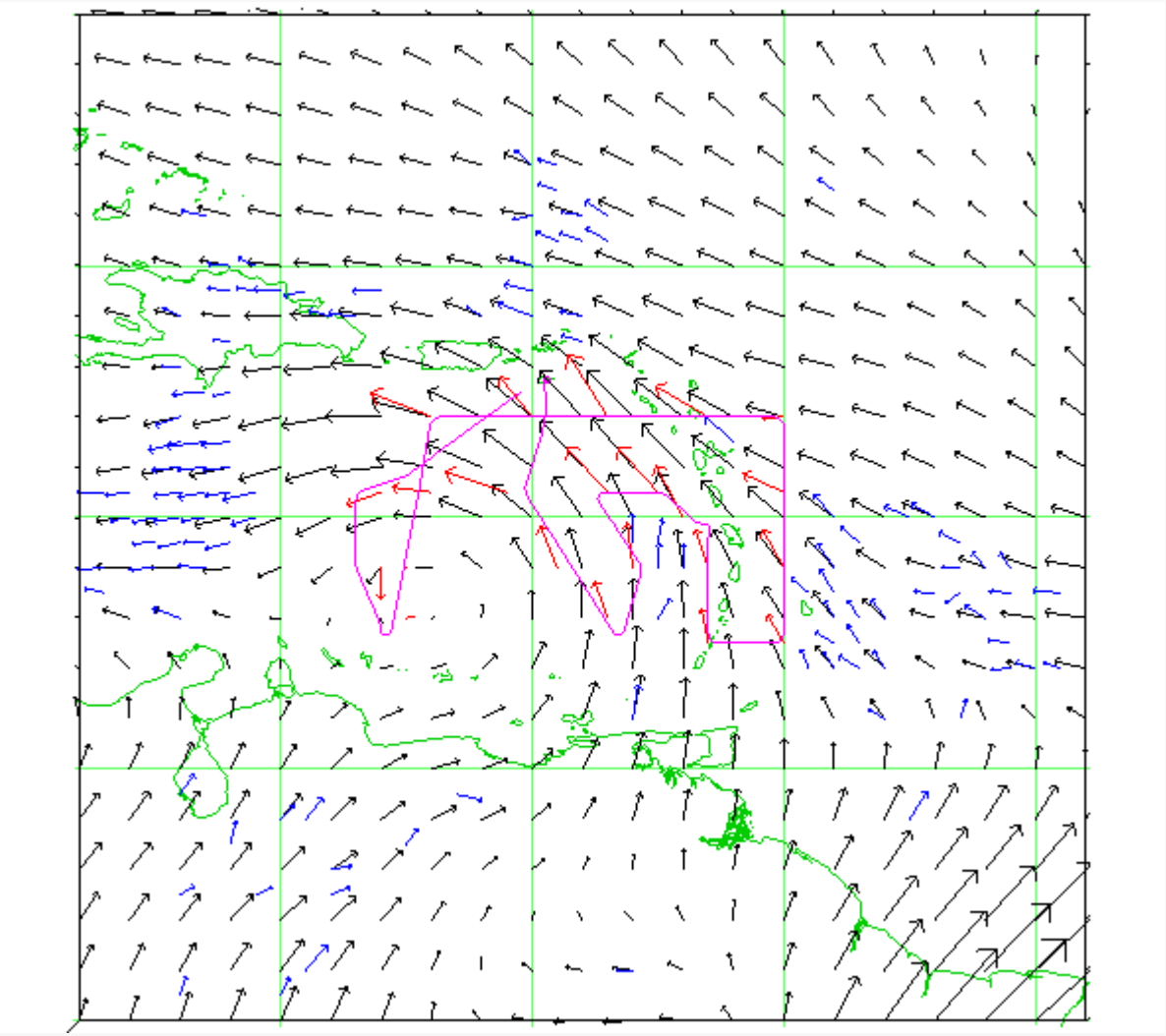
RF19: Karl (6.2km, Vsr)



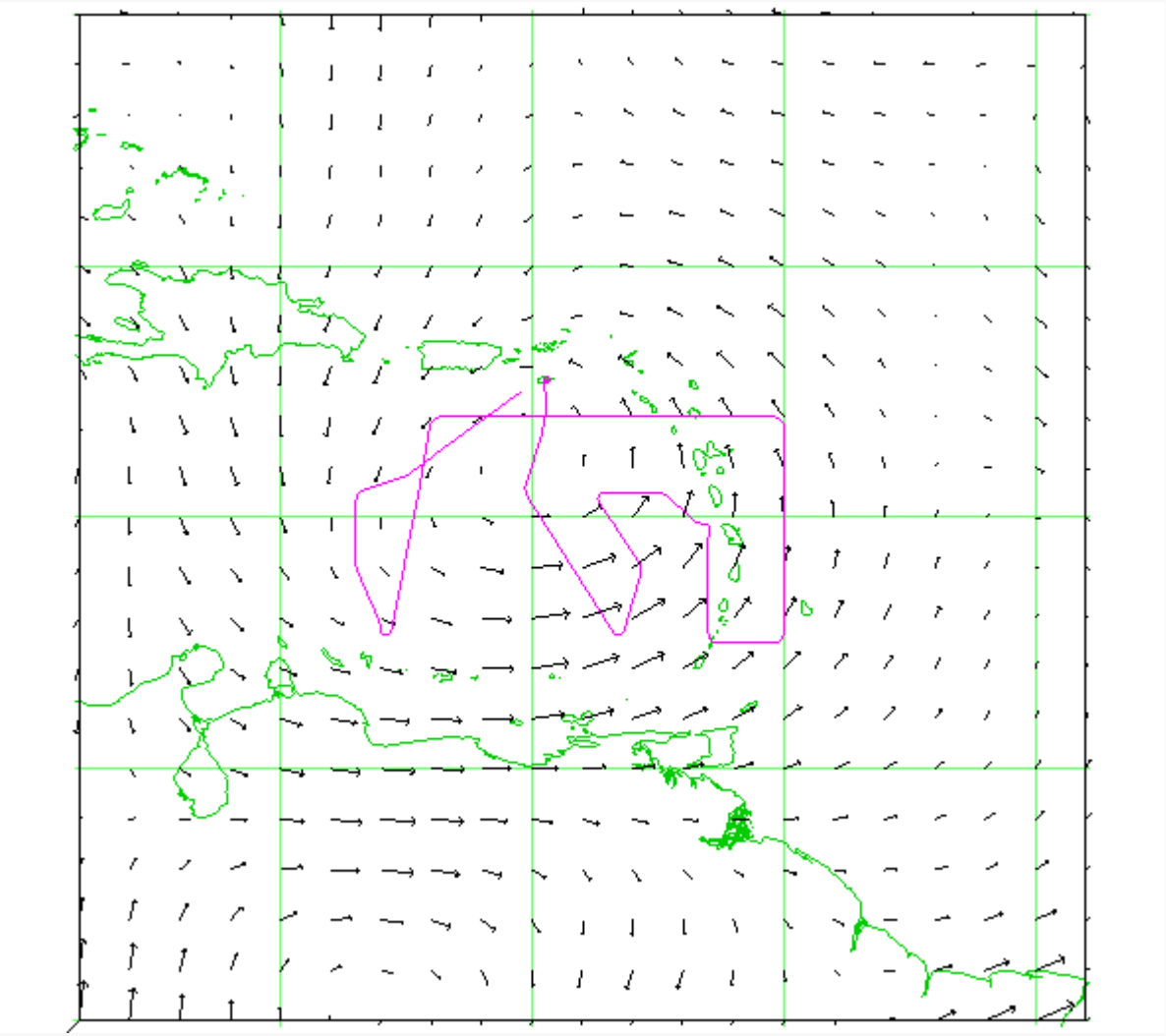
RF16: Karl (0.625km, Ver)



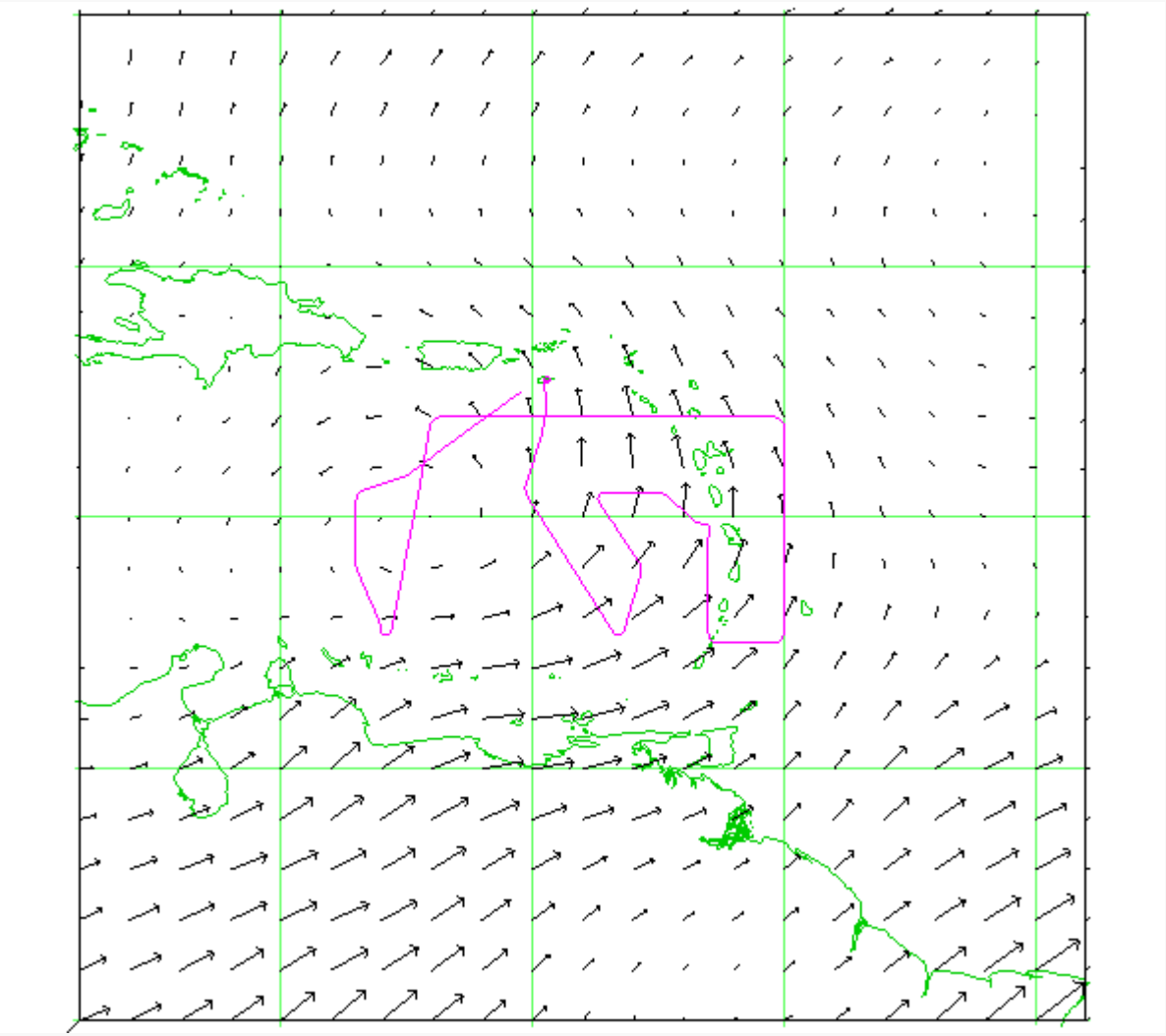
RF16: Karl (3.1km, Ver)



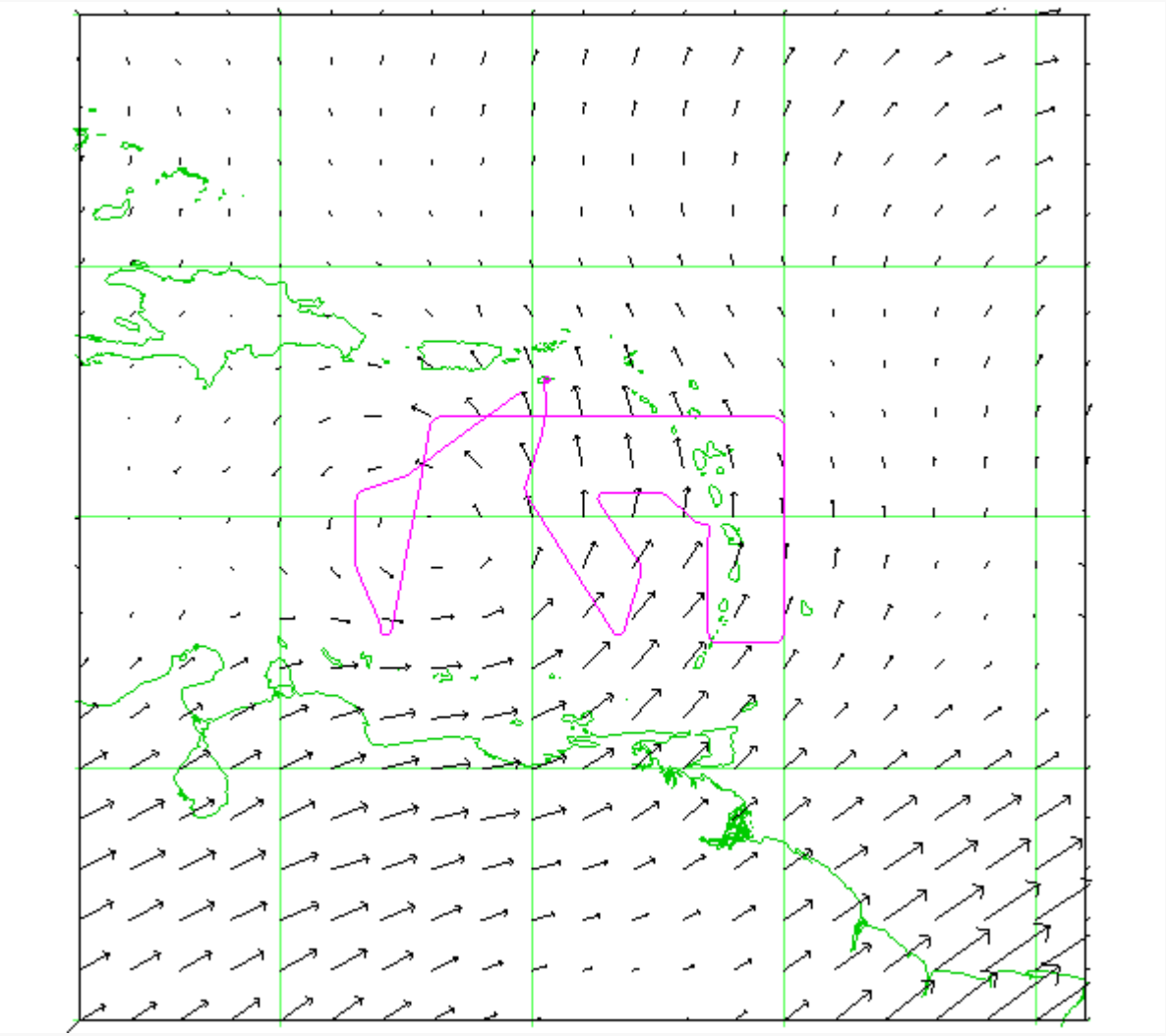
RF16: Karl (0.625km, Vsr)



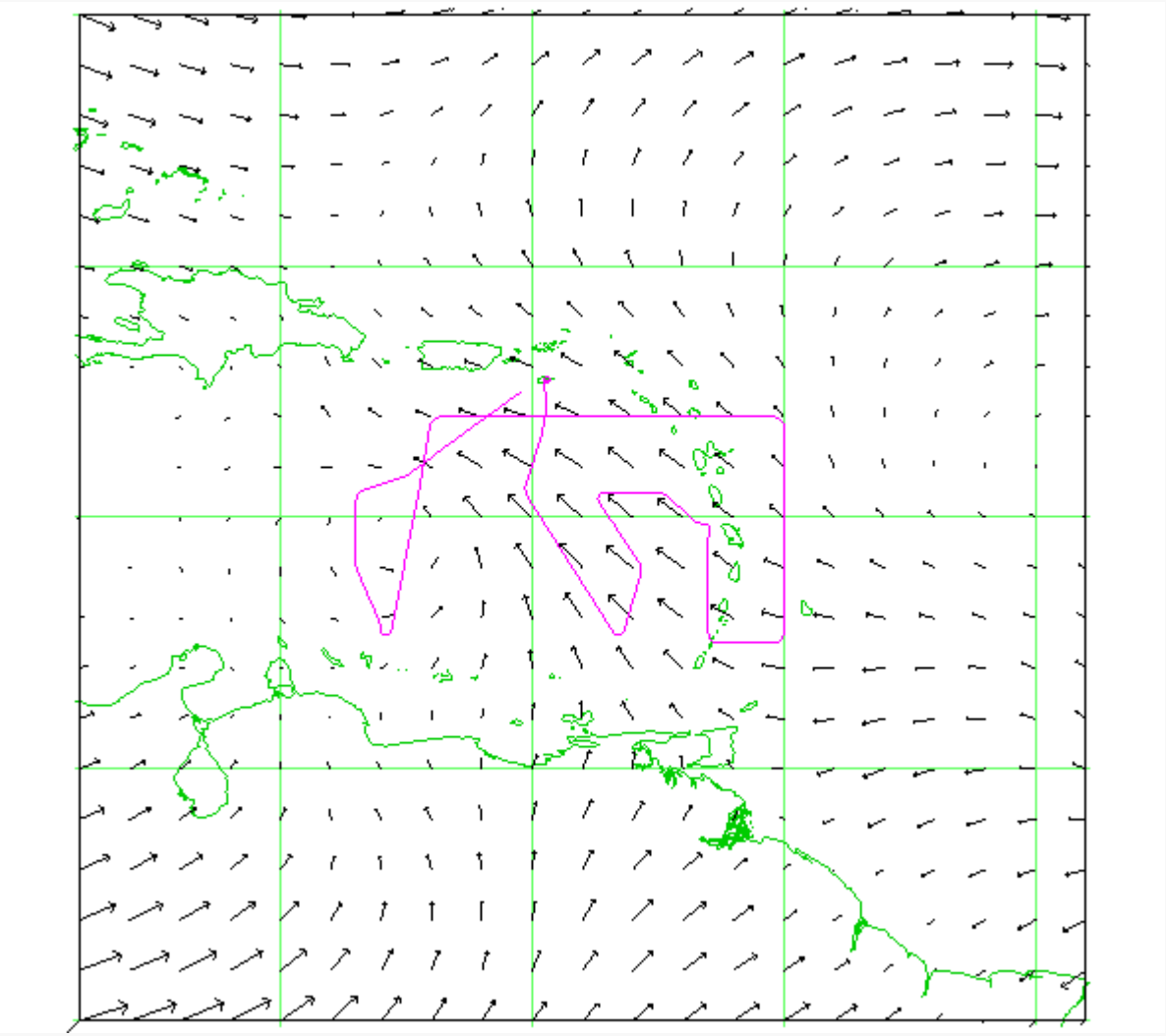
RF16: Karl (2.5km, Vsr)



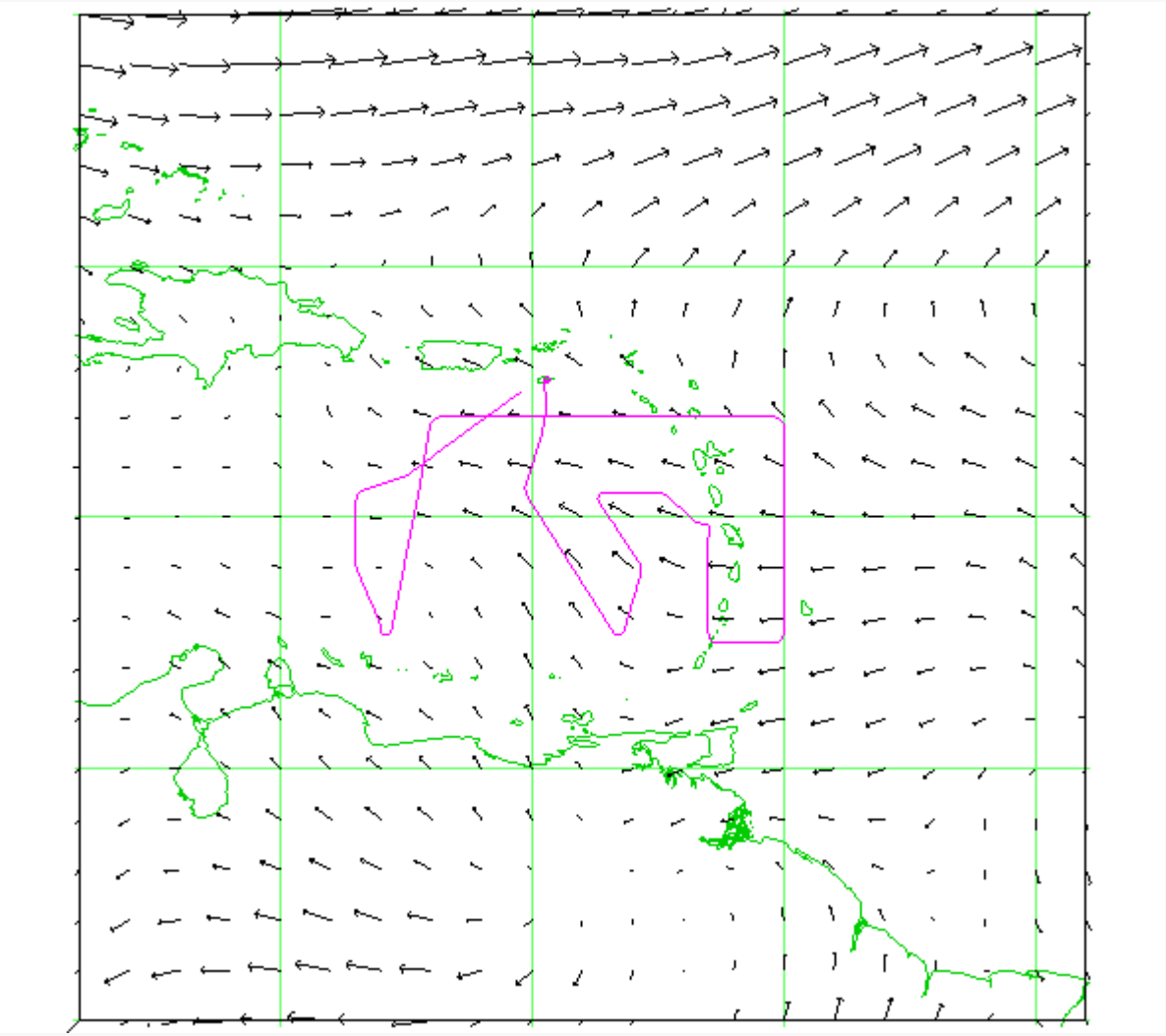
RF16: Karl (3.1km, Vsr)



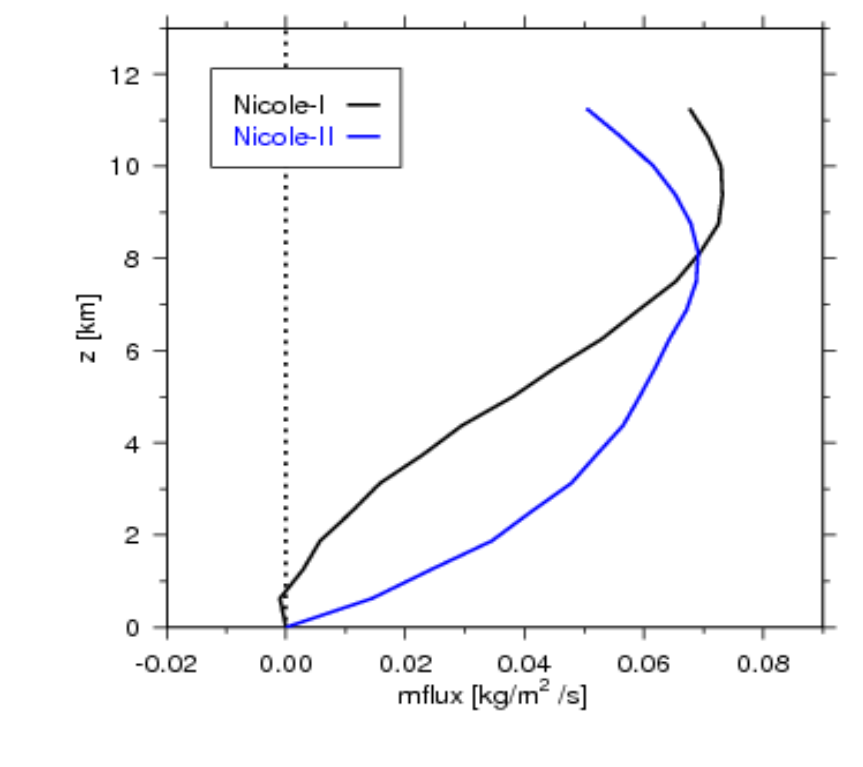
RF16: Karl (6.2km, Vsr)

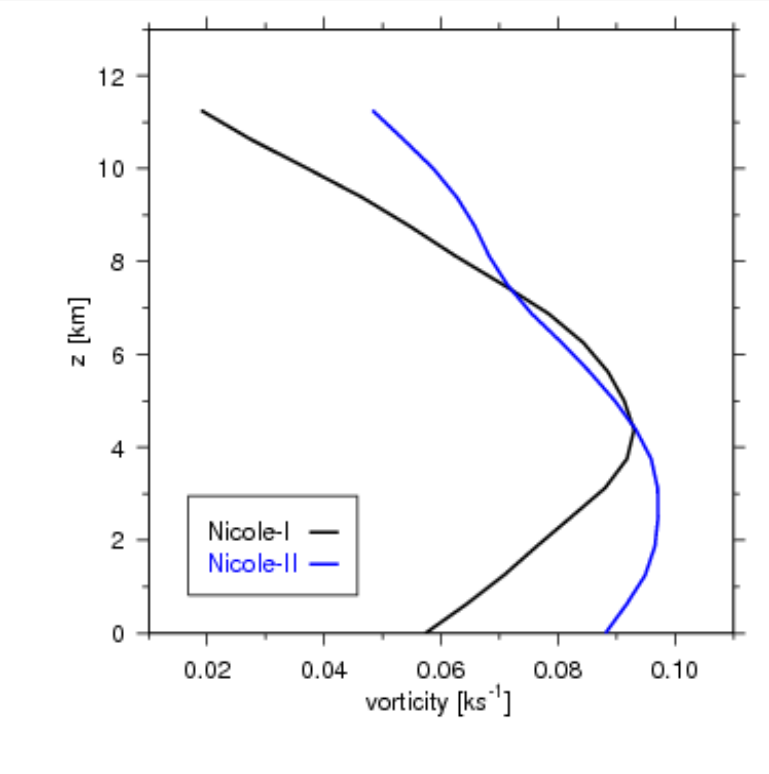


RF16: Karl (8.1km, Vsr)

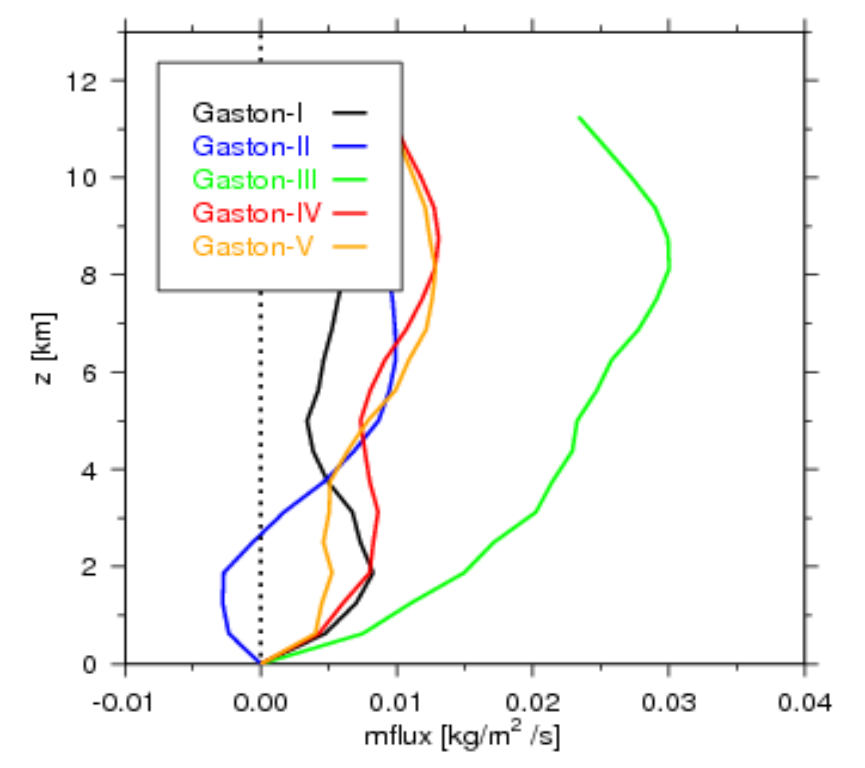


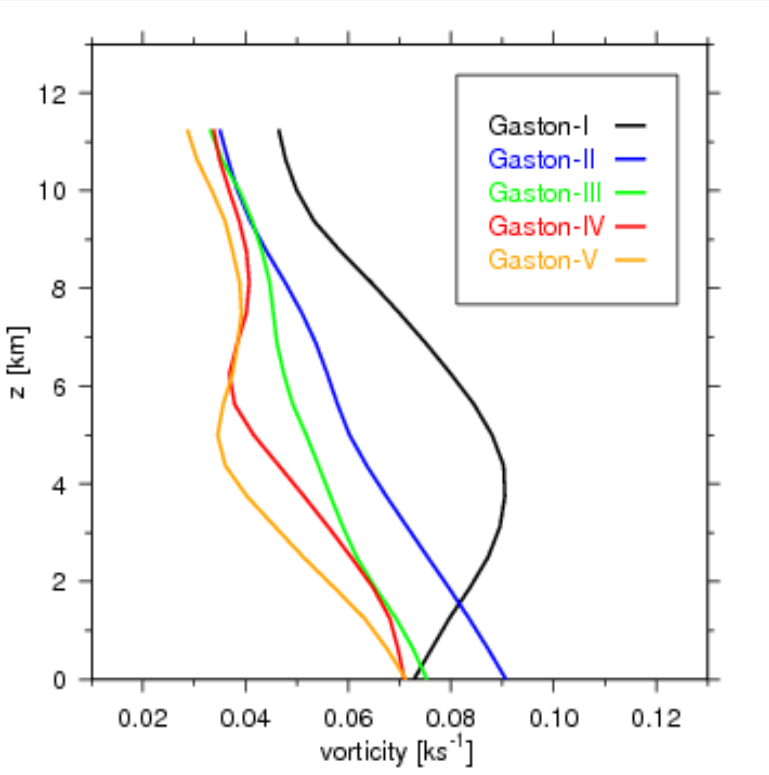
Nicole


Nicole-I
Nicole-II
z [km]
mflux [kg/m^2 /s]
0
2
4
6
8
10
12
-0.02
0.00
0.02
0.04
0.06
0.08


Nicole-I
Nicole-II
z [km]
vorticity [ks^{-1}]
0
2
4
6
8
10
12
0.02
0.04
0.06
0.08
0.10

Gaston


Gaston-I
Gaston-II
Gaston-III
Gaston-IV
Gaston-V
z [km]
mflux [kg/m^2 /s]
0
2
4
6
8
10
12
-0.01
0.00
0.01
0.02
0.03
0.04


Gaston-I
Gaston-II
Gaston-III
Gaston-IV
Gaston-V
z [km]
vorticity [ks^{-1}]
0
2
4
6
8
10
12
0.02
0.04
0.06
0.08
0.10
0.12

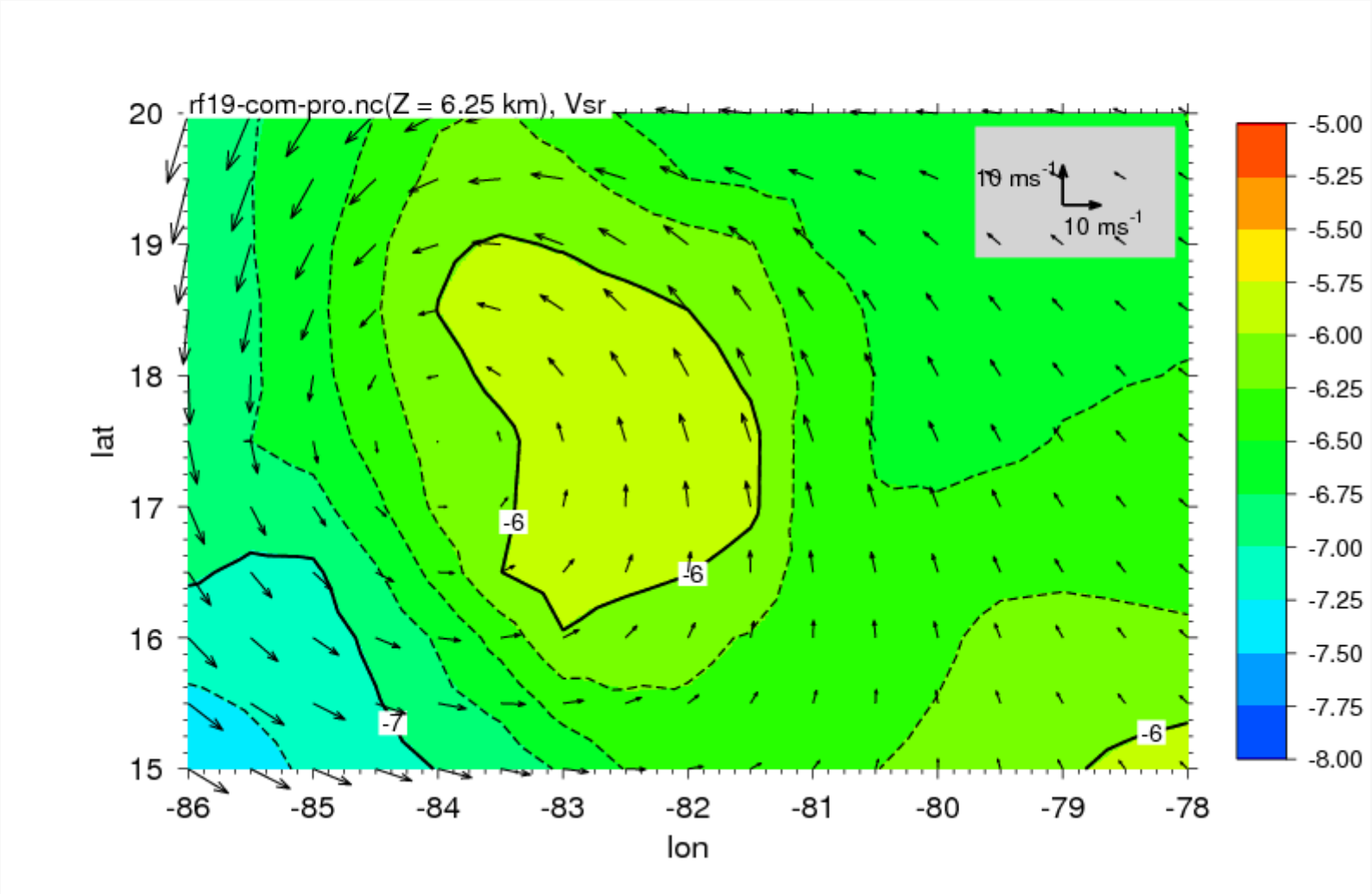
Thermodynamic Fields

$$F_g = \sum_{i=1}^{N} w(k) F_d(k) / \sum_{i=1}^{N} w(k)$$ Data Gridding

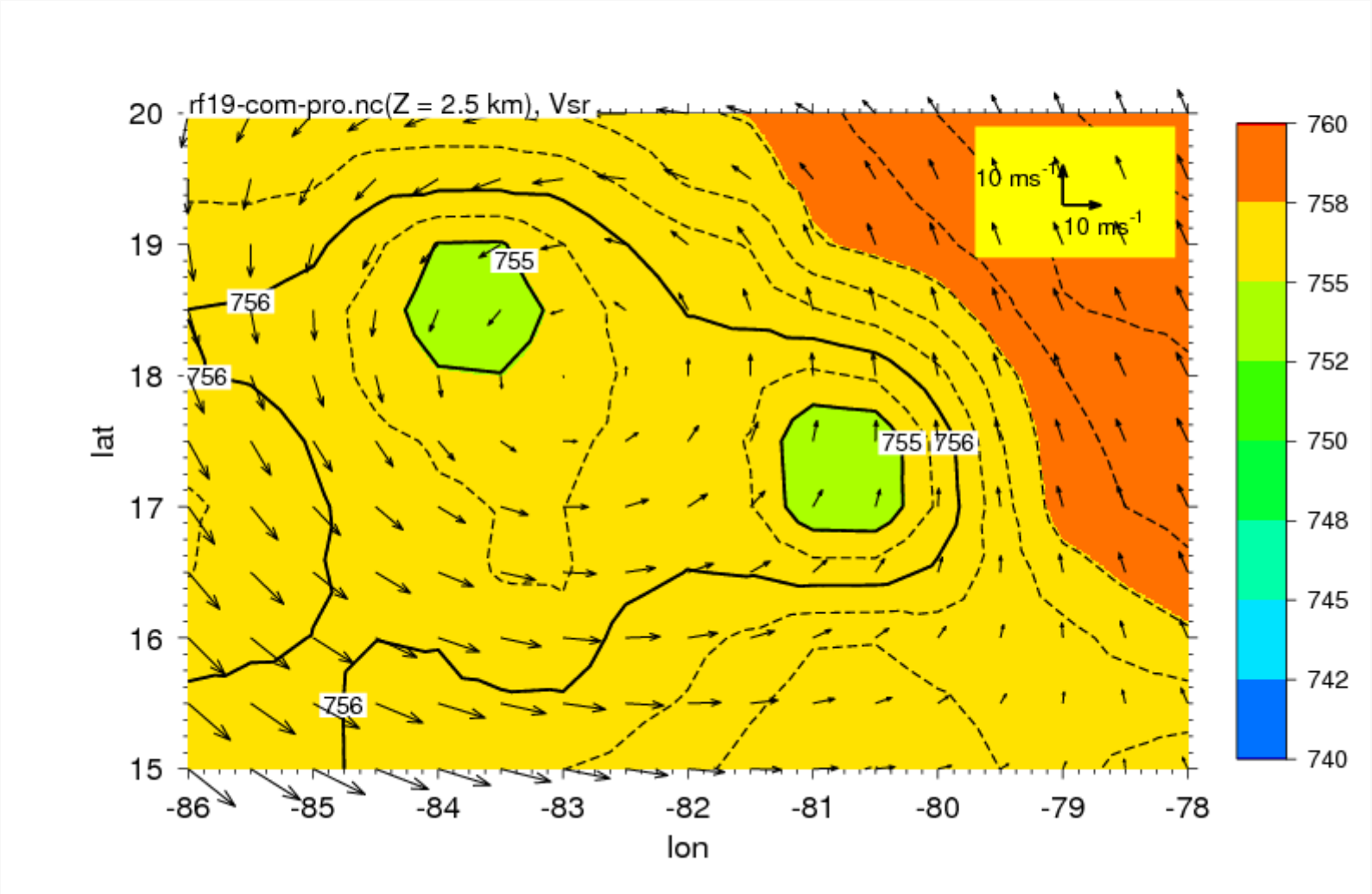
$$D(F) = (F - F_g)^2$$ Gridded Data Misfit

$$T(F) = \sum_G D(\boldsymbol{v}) + W_s [S(\boldsymbol{v})]^2$$ Target

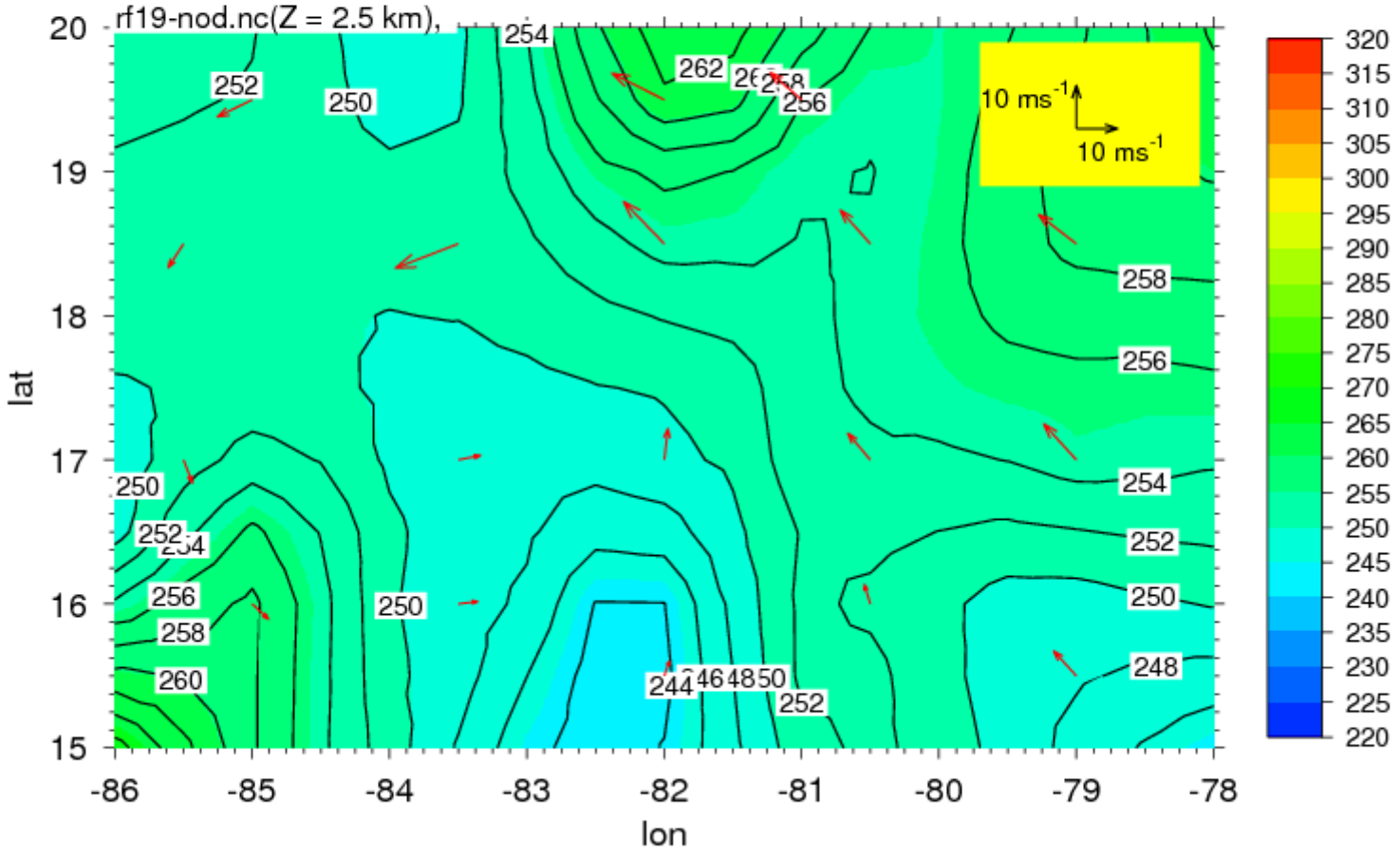
Temperature Distribution: 6.25 km



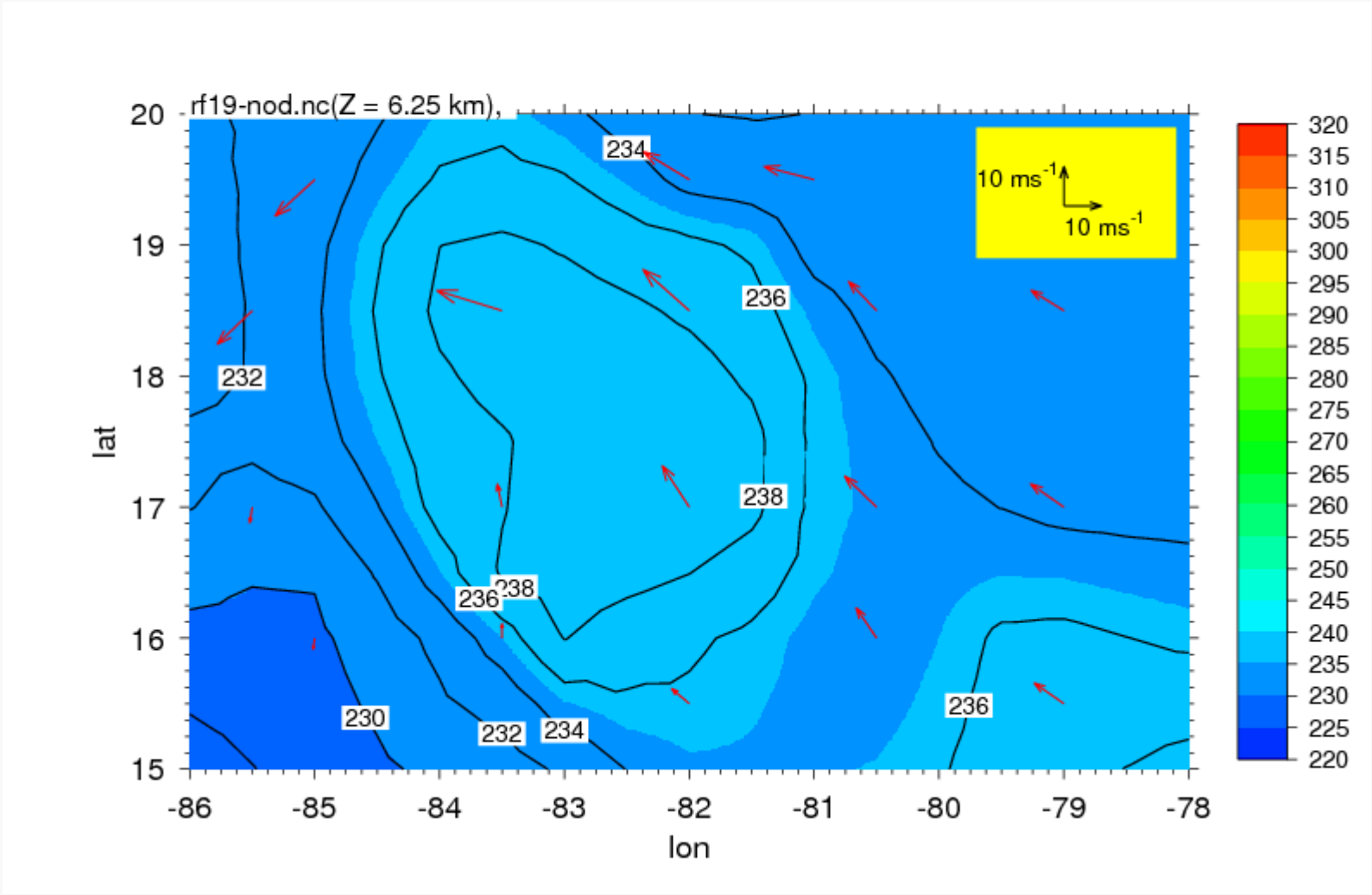
Pressure Distribution:2.5 km

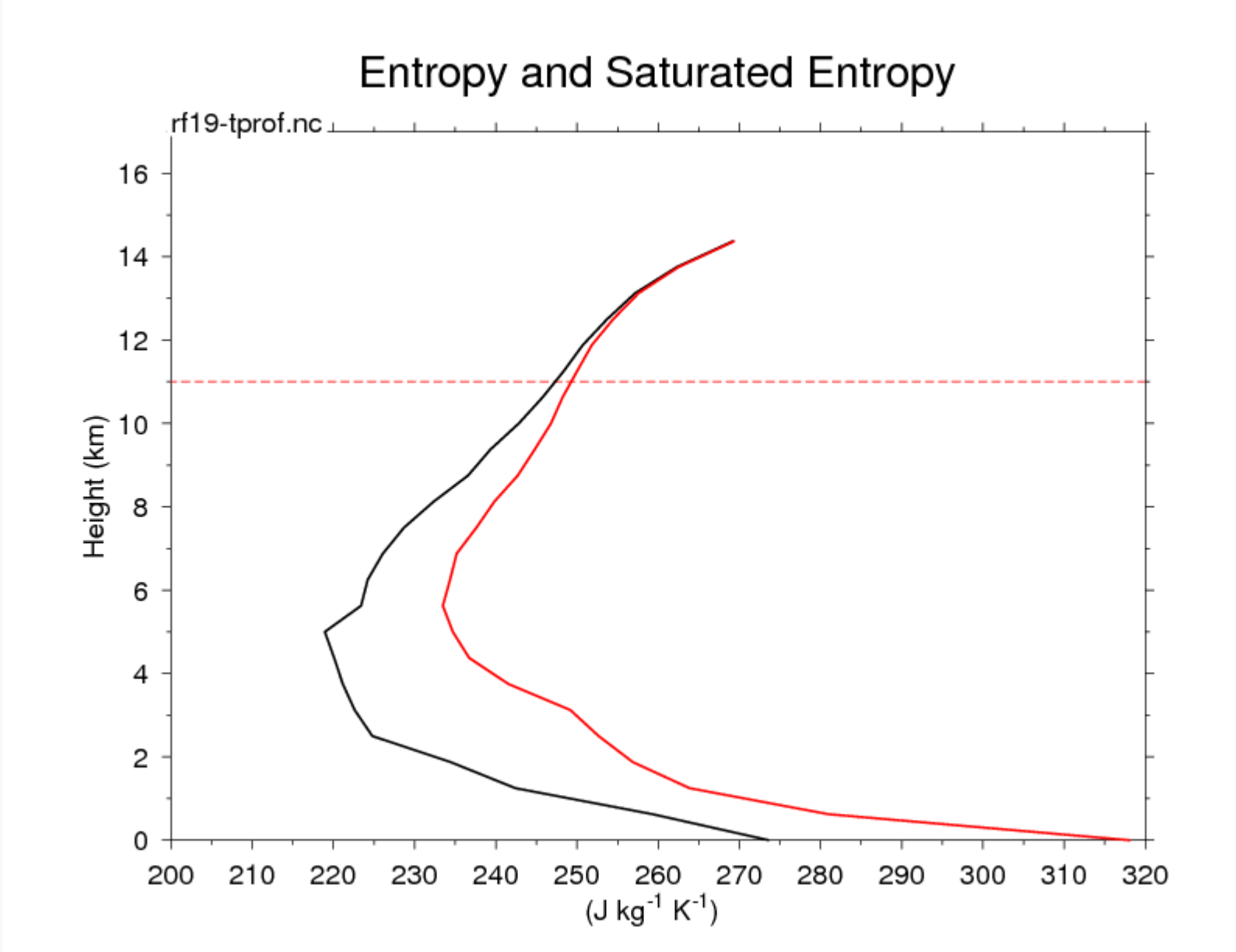


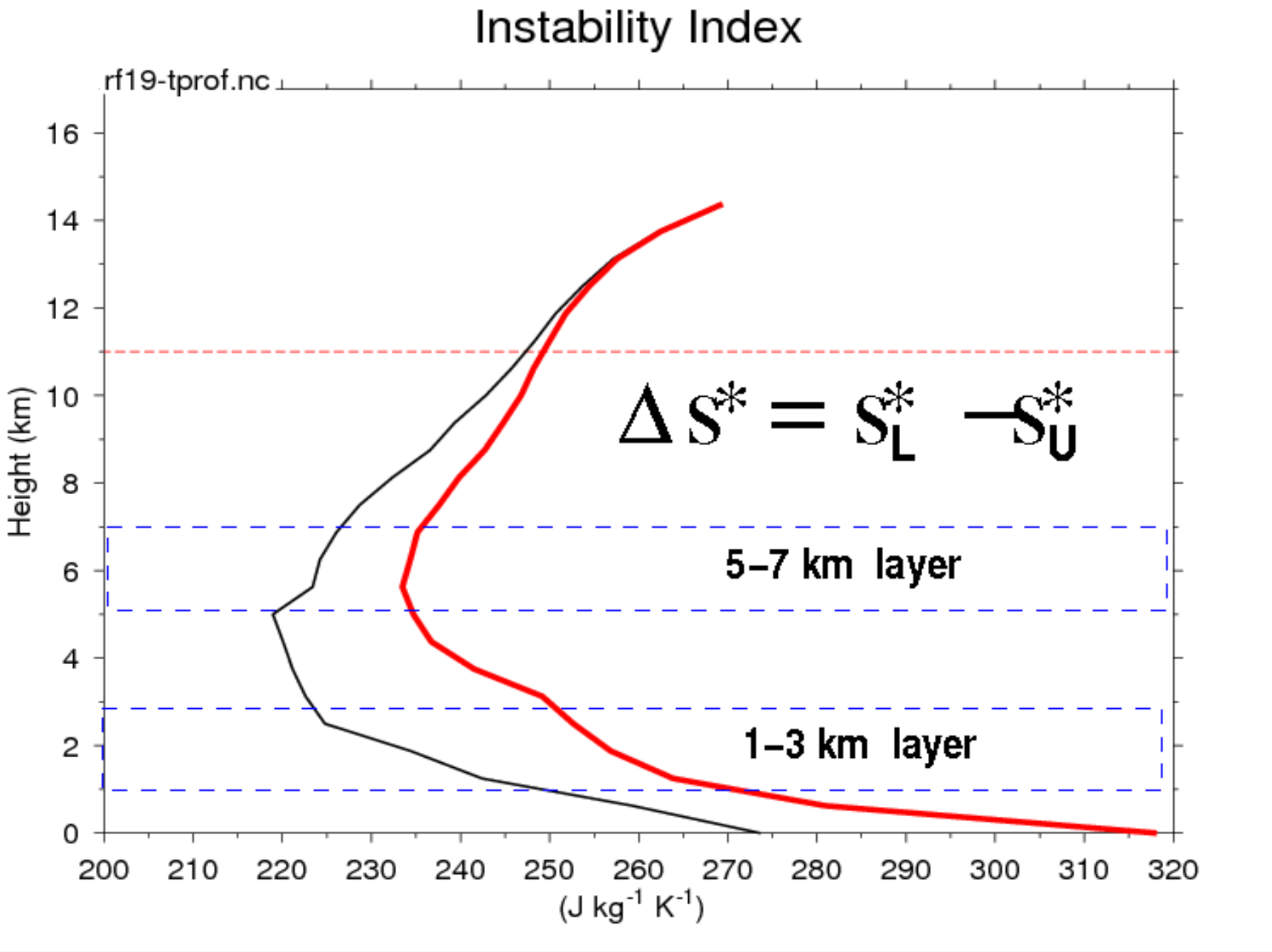
Saturated Entropy: 2.5 km



Saturated Entropy: 6.25km




Entropy and Saturated Entropy
rf19-tprof.nc
Height (km)
0
2
4
6
8
10
12
14
16
200
210
220
230
240
250
260
270
280
290
300
310
320
(J kg-1 K-1)


Instability Index
rf19-tprof.nc
Height (km)
0
2
4
6
8
10
12
14
16
200
210
220
230
240
250
260
270
280
290
300
310
320
(J kg-1 K-1)
ΔS* = S*L − S*U
5–7 km layer
1–3 km layer

Status

- Analysis and Synthesis of Dropsonde Data:
  - Recovery of mesoscale winds via 3Dvar analysis.
  - Recovery of mesoscale thermodynamic features via extension of the 3Dvar analysis.
  - Extension of the 3Dvar analysis to integrate satellite winds.

- Analysis of Results

  We're on it.