Comparing Jicamarca and C/NOFS (PLP, VEFI) Observations of Equatorial Spread F Irregularities

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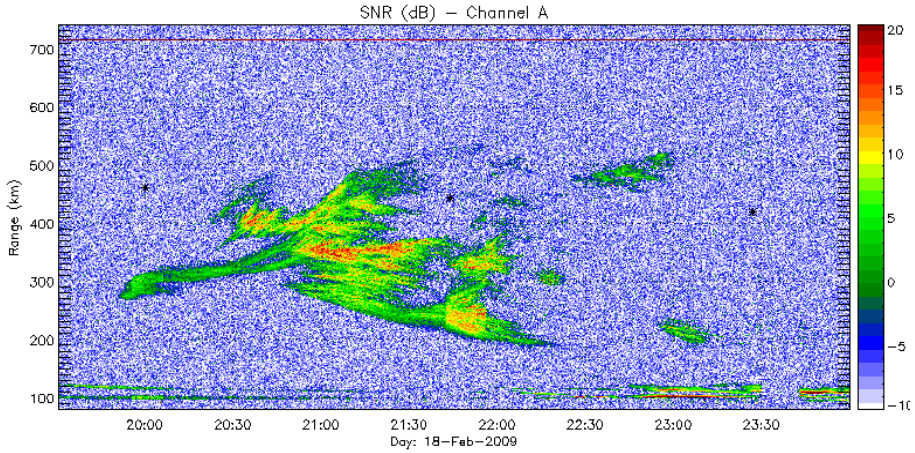
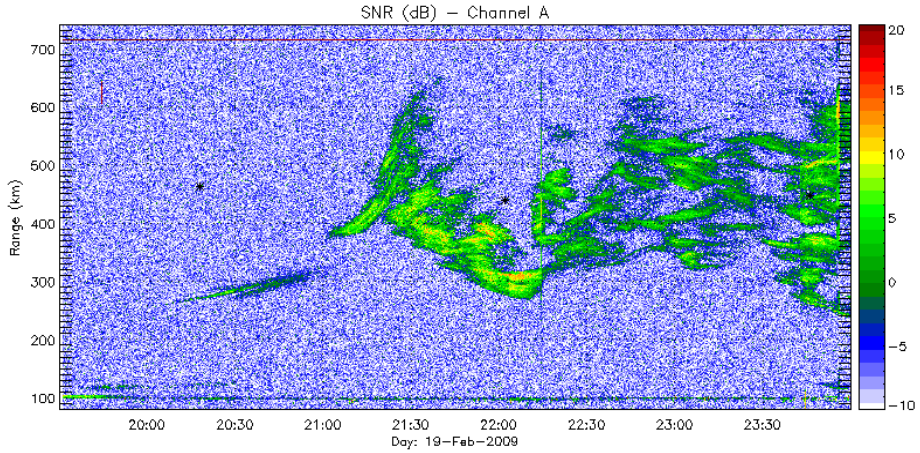
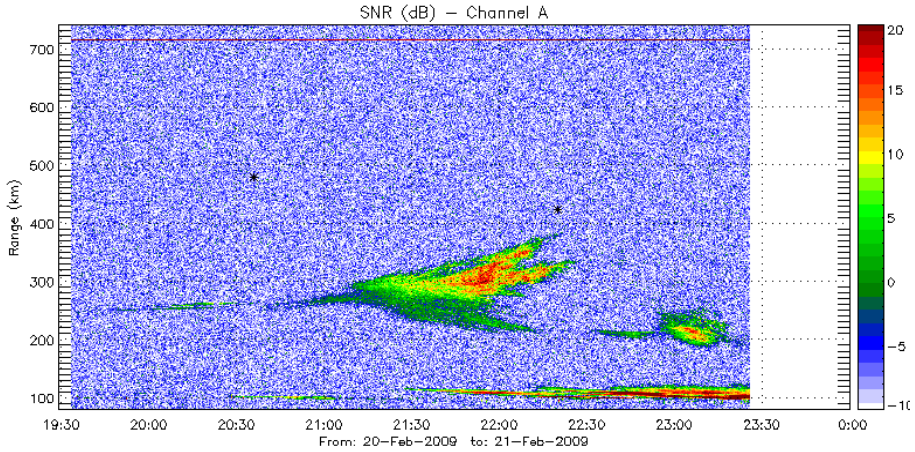
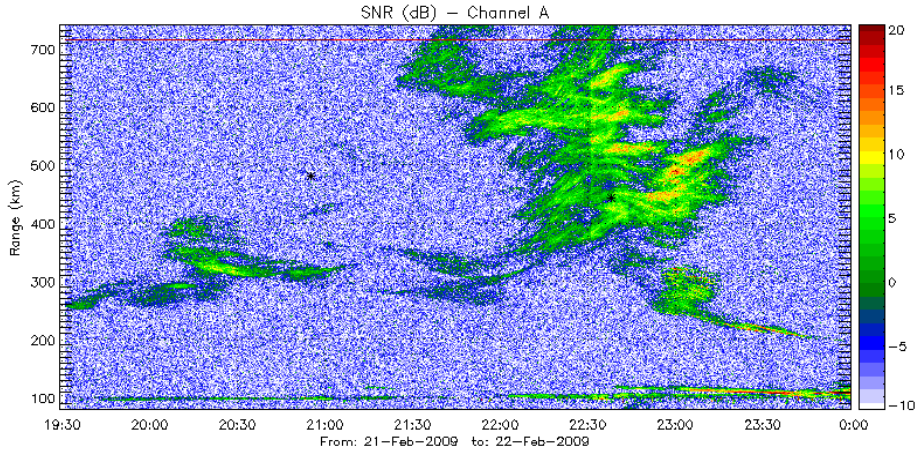
ROJ RTIs

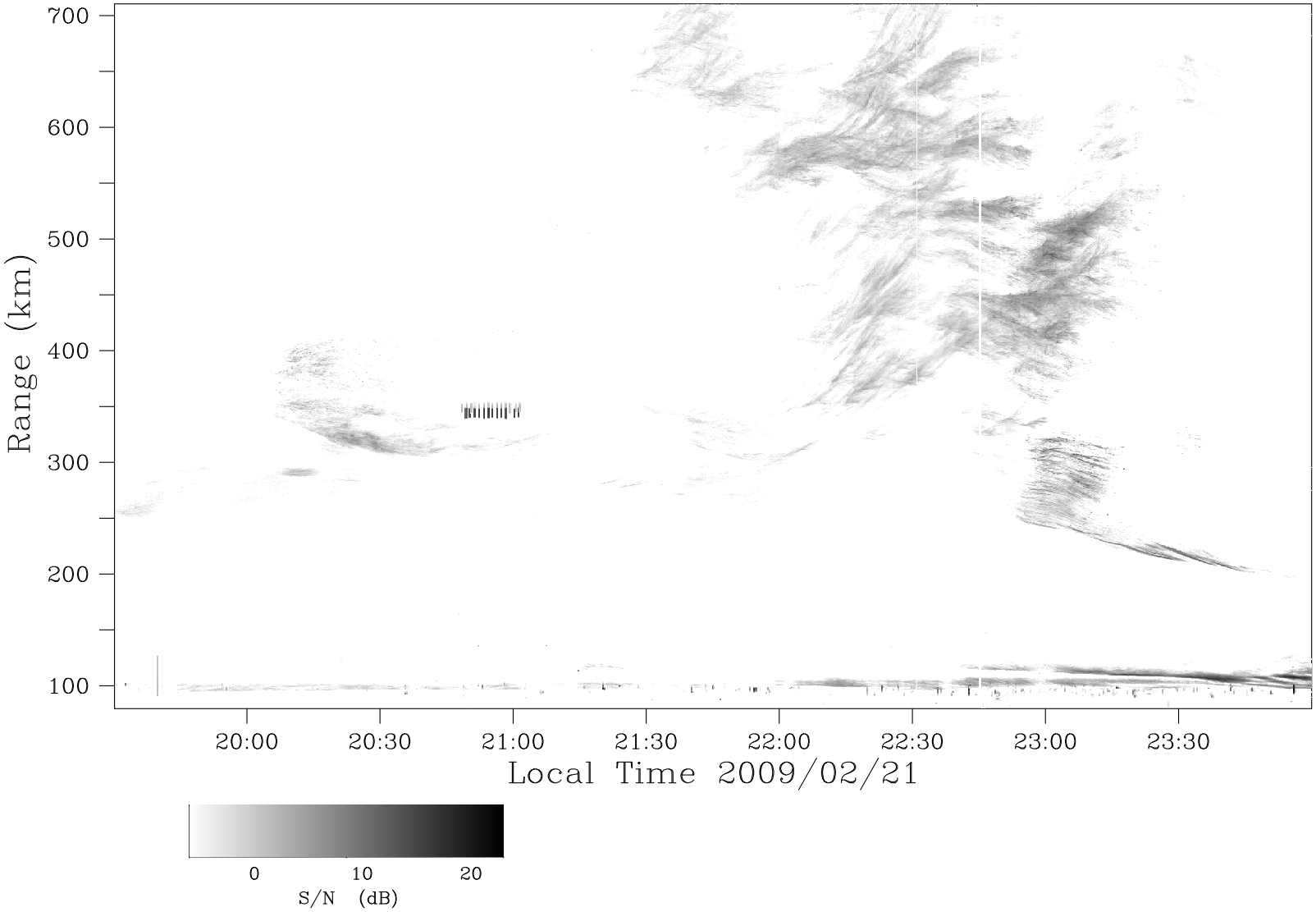

SNR (dB) – Channel A
Range (km)
Day: 18–Feb–2009


SNR (dB) – Channel A
Range (km)
Day: 19–Feb–2009

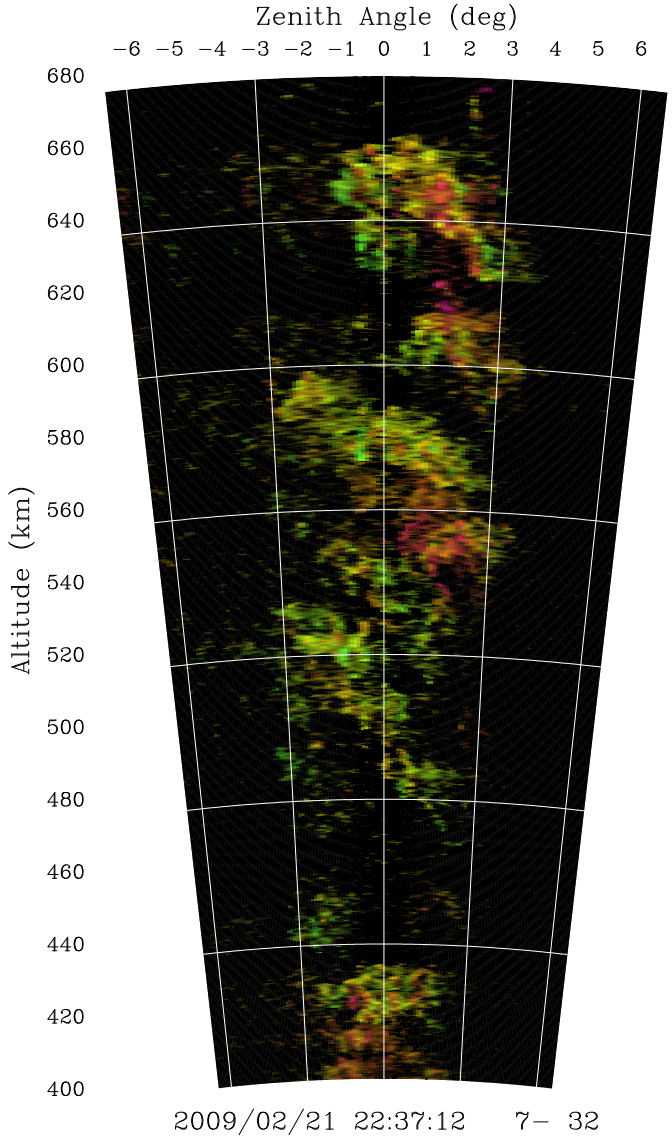

SNR (dB) – Channel A
Range (km)
From: 20–Feb–2009 to: 21–Feb–2009


SNR (dB) – Channel A
Range (km)
From: 21–Feb–2009 to: 22–Feb–2009

ROJ RTI

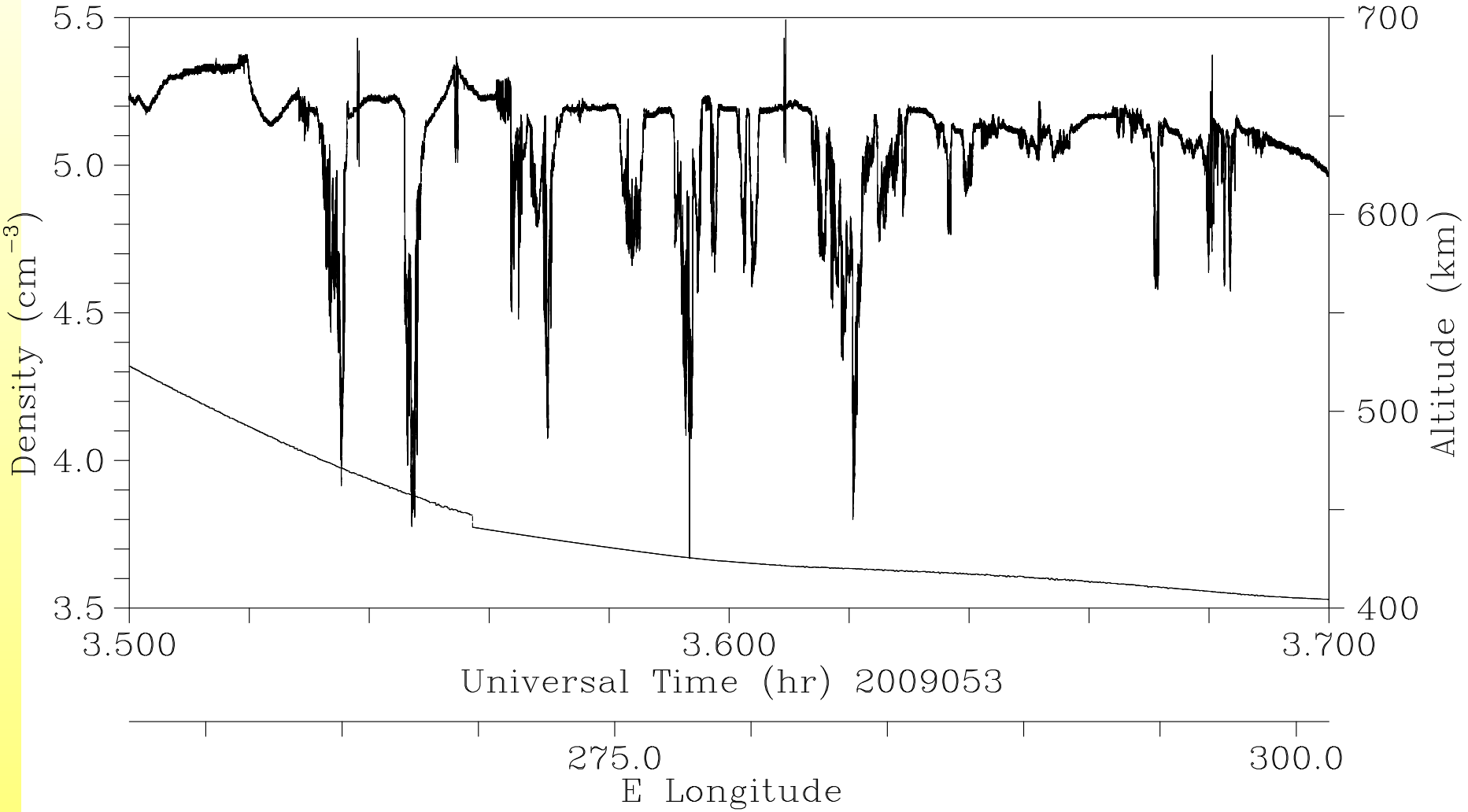

700
600
500
400
300
200
100
Range (km)
20:00
20:30
21:00
21:30
22:00
22:30
23:00
23:30
Local Time 2009/02/21
0
10
20
S/N (dB)

radar image

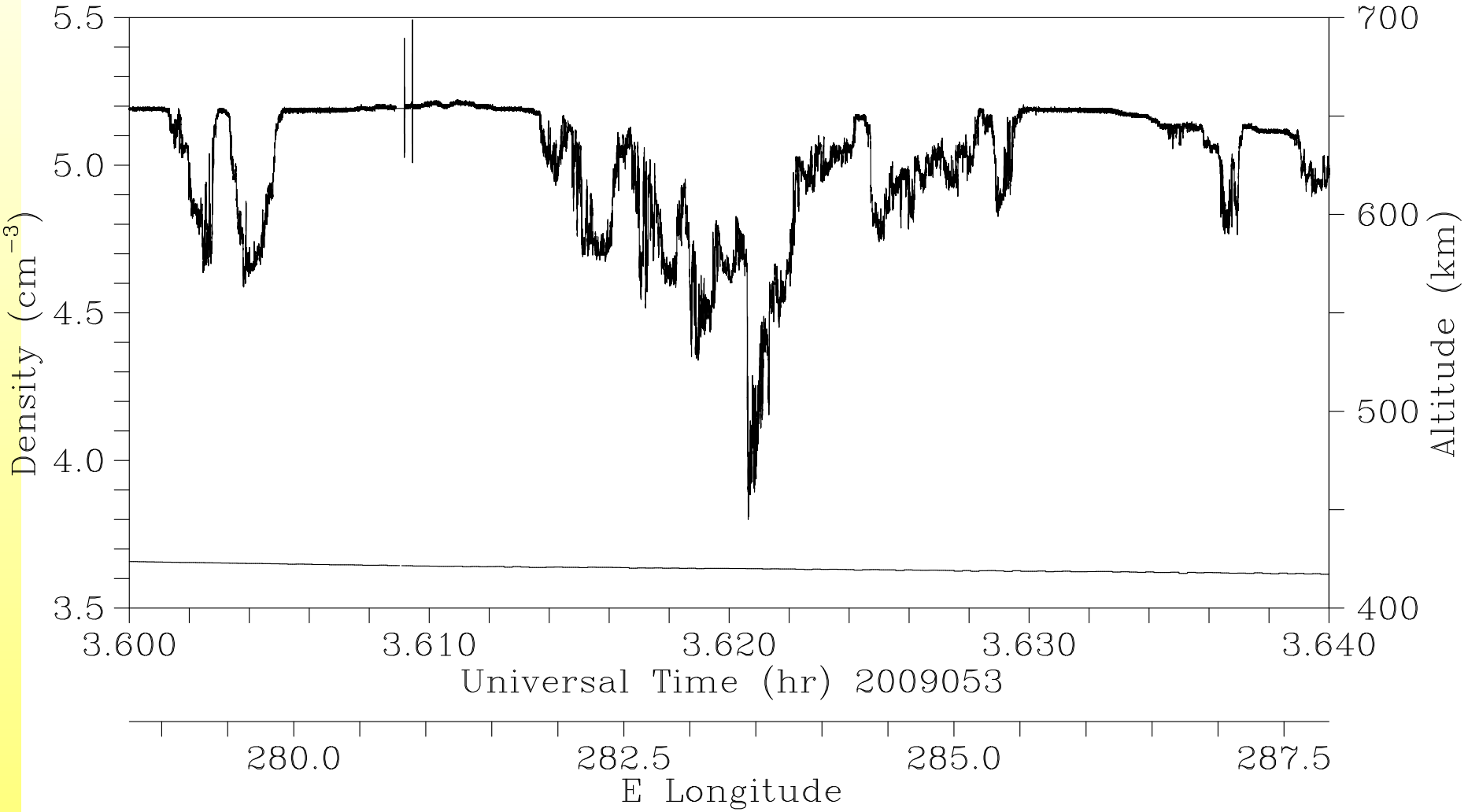


image

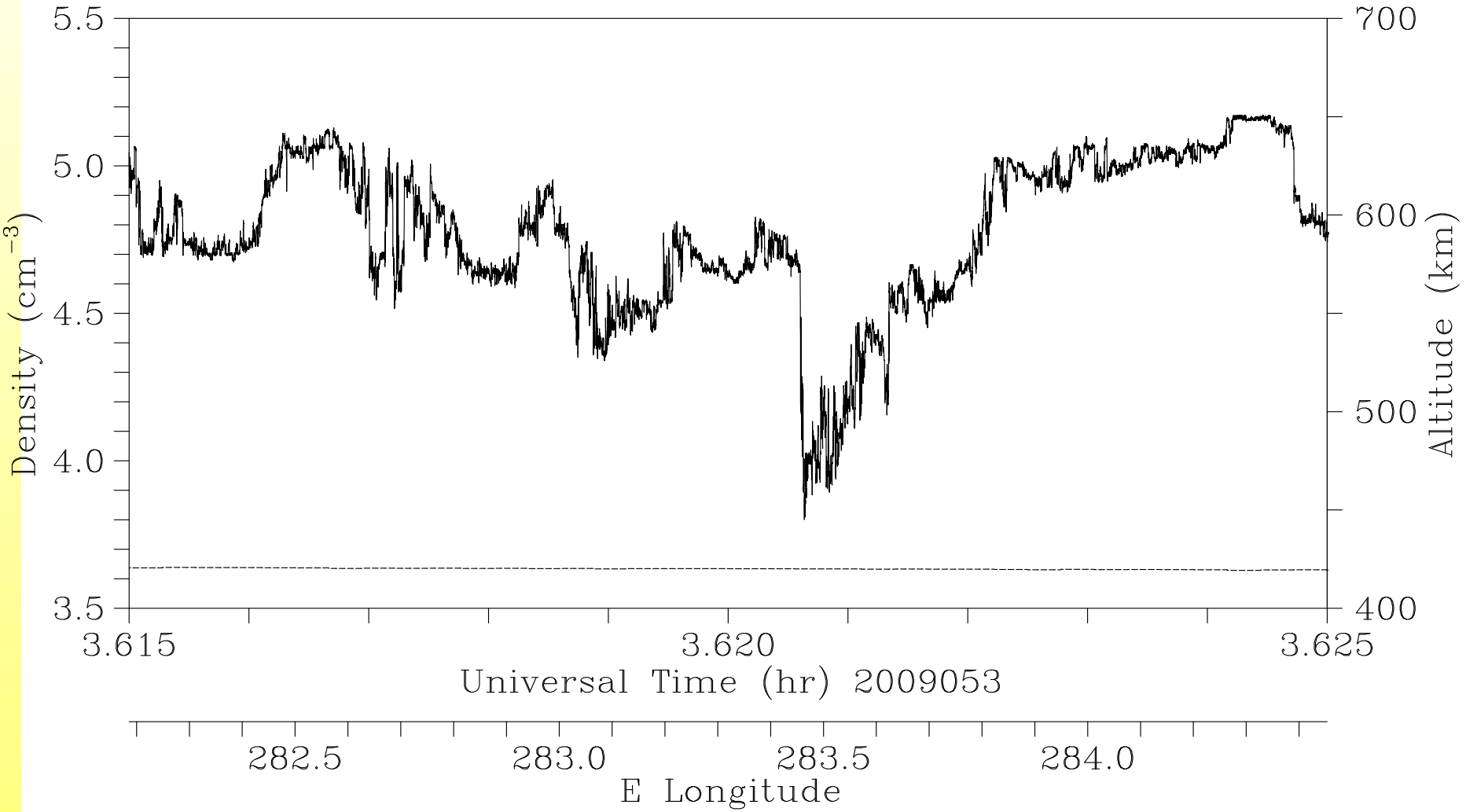
PLP


5.5
5.0
4.5
4.0
3.5
Density (cm^{-3})
700
600
500
400
Altitude (km)
3.500
3.600
3.700
Universal Time (hr) 2009053
275.0
300.0
E Longitude

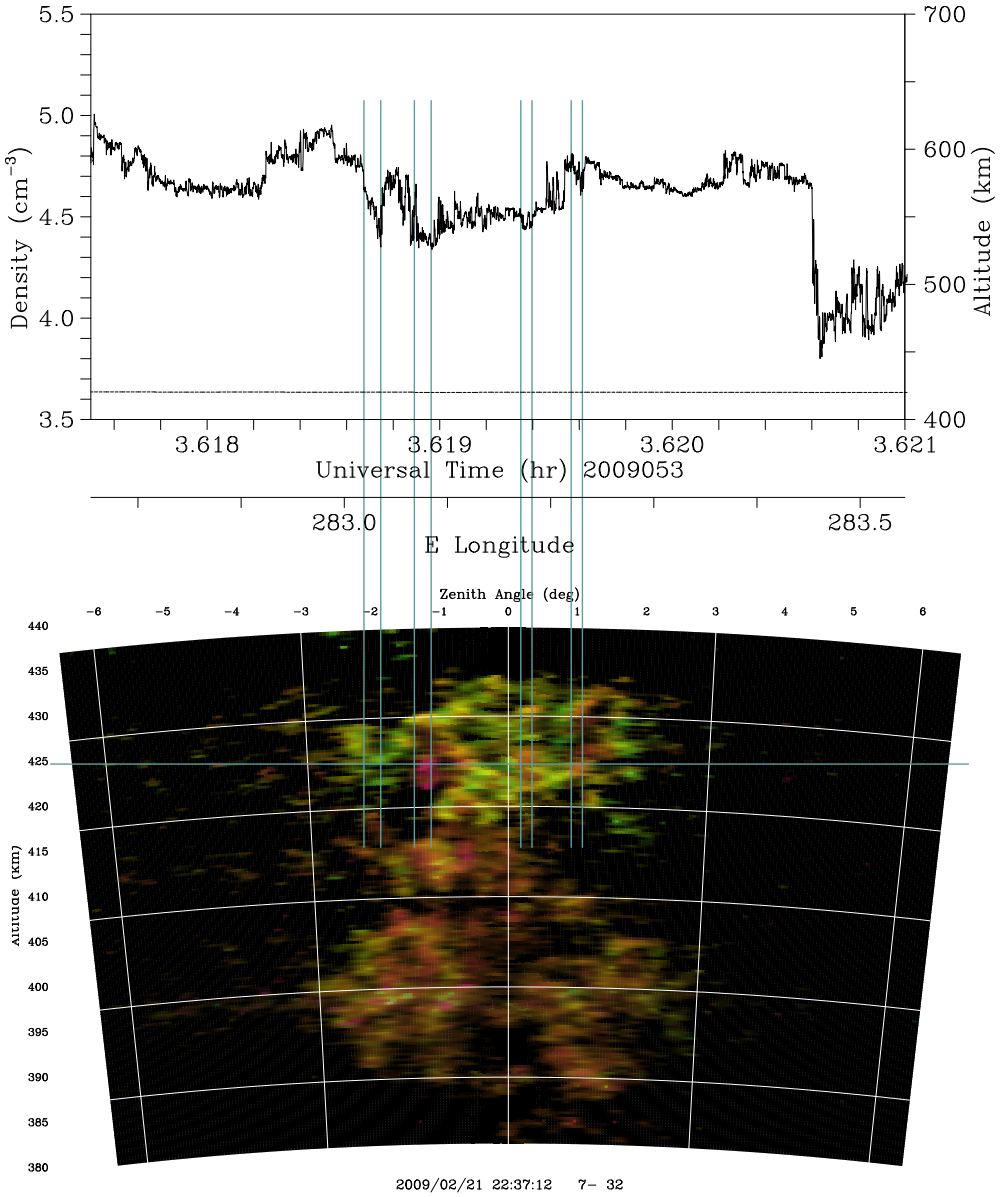
PLP


5.5
5.0
4.5
4.0
3.5
Density (cm^{-3})
700
600
500
400
Altitude (km)
3.600
3.610
3.620
3.630
3.640
Universal Time (hr) 2009053
280.0
282.5
285.0
287.5
E Longitude

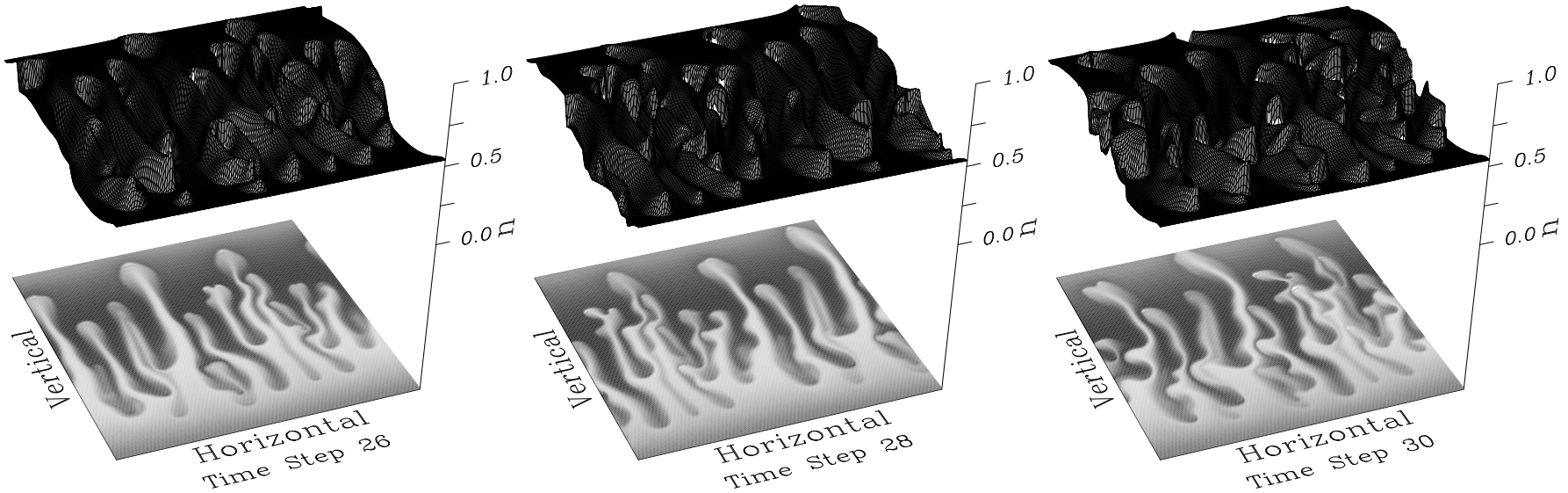
PLP

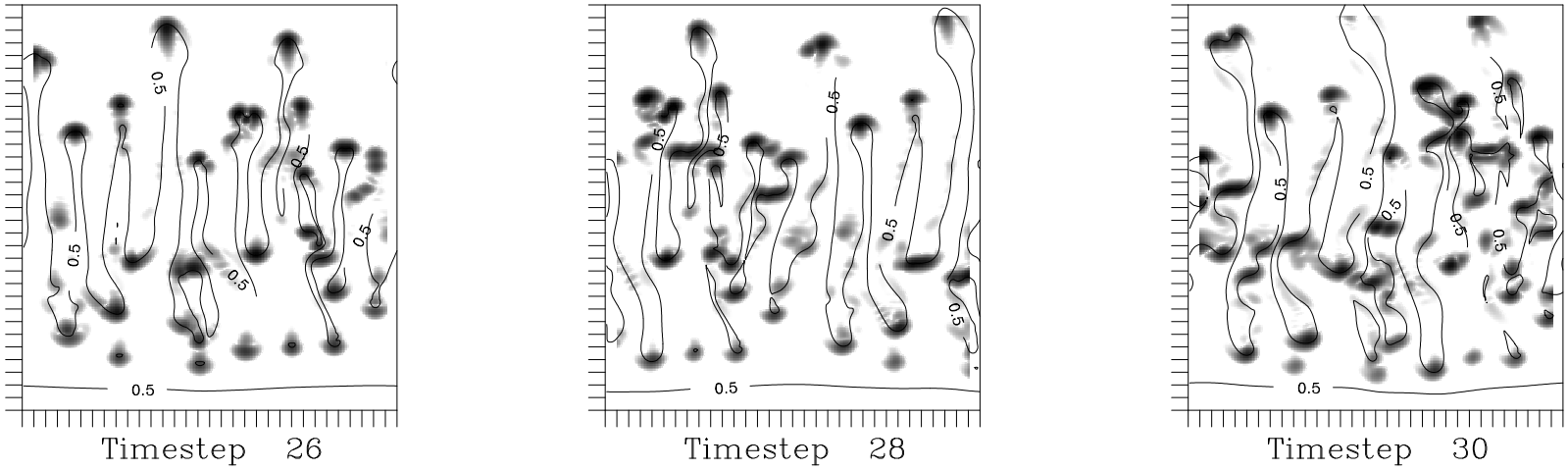

5.5
5.0
4.5
4.0
3.5
Density (cm^{-3})
700
600
500
400
Altitude (km)
3.615
3.620
3.625
Universal Time (hr) 2009053
282.5
283.0
283.5
284.0
E Longitude

PLP comparison

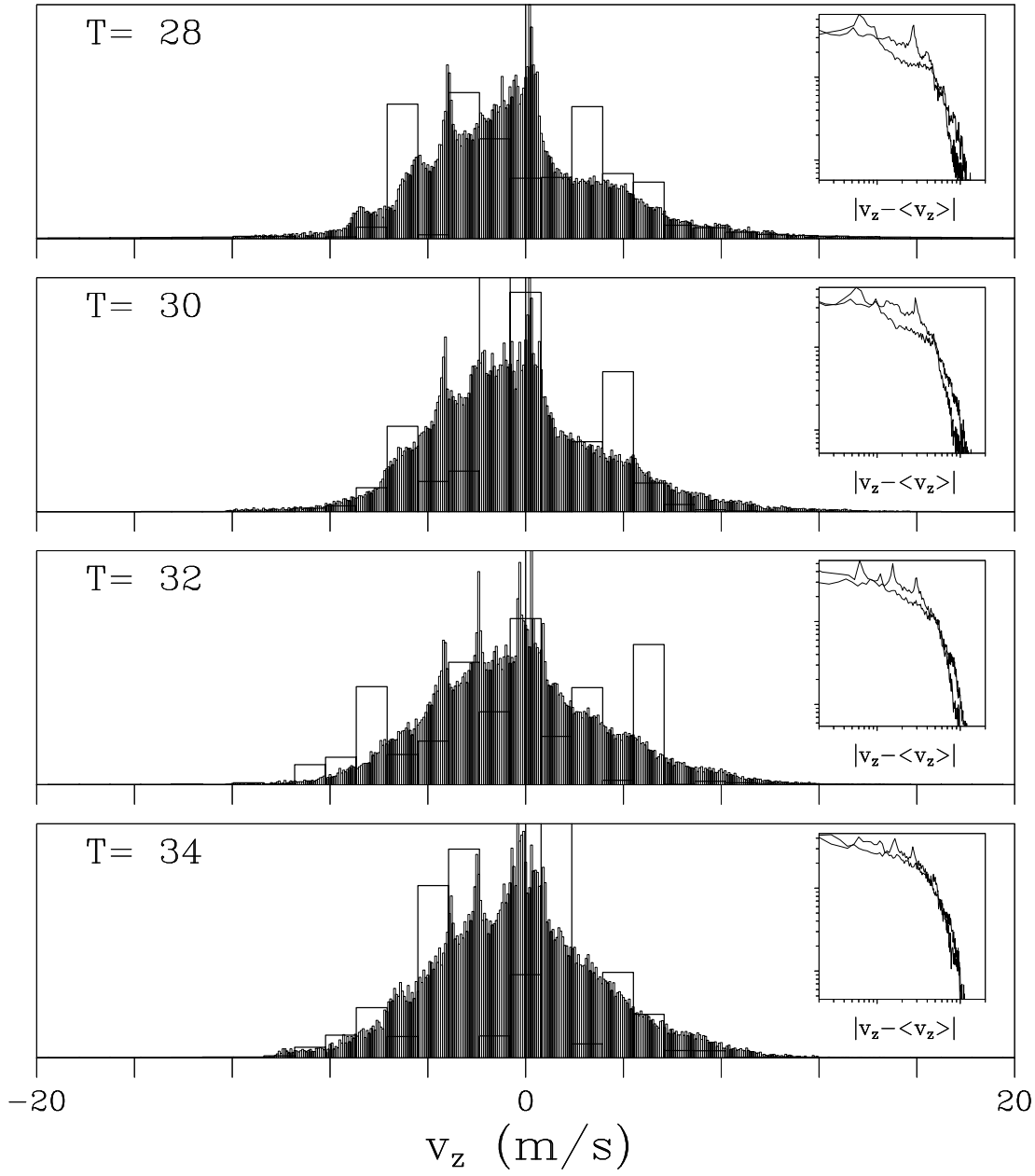


DNS

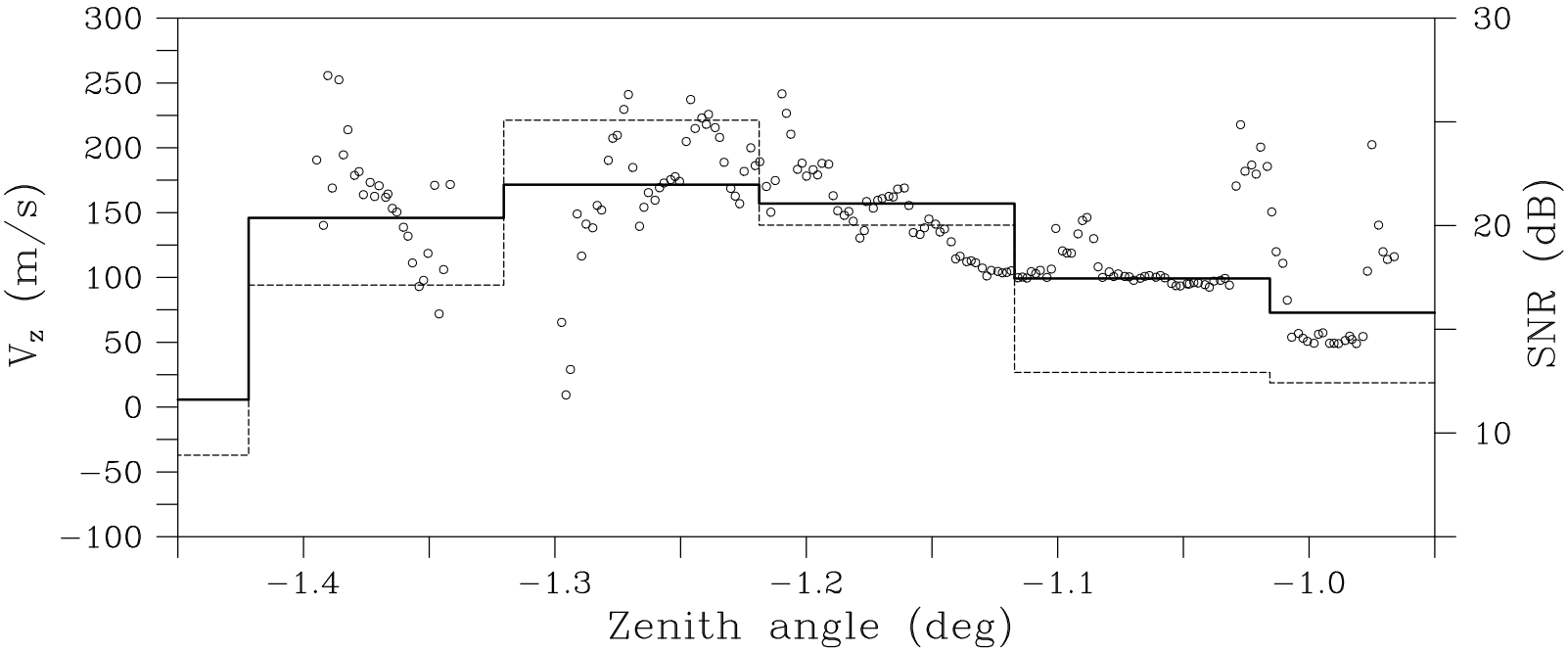

1.0
0.5
0.0
Vertical
Horizontal
Time Step 26
Time Step 28
Time Step 30


0.5
Timestep 26
Timestep 28
Timestep 30

DNS-Doppler



VEFI comparison



summary

- Intensified coherent radar scatter comes from regions where the plasma density observed by the C/NOFS satellite is structured and below background (localized depletions). This has been observed before, but never with as fine resolution.
- Still finer resolution might reveal more fine structure, although spectral analysis of satellite data has shown that the scalar variance $\langle |\delta n|^2 \rangle$ decreases rapidly for scale sizes less than about one kilometer.
- It follows that the apparent zonal motion of coherent scatter intensifications traces the advection of the localized depletions. In an incompressible flow, vertically-elongated density irregularities cannot overtake one-another as they drift horizontally and so must advect with the background flow on average.
- The Doppler shifts of the finely resolved scattering intensifications showed considerable spatial variability here despite the fact that the spread *F* event in question was in its decay phase.

summary II

- Individually, the Doppler shifts of the intensified scattering regions should give a good representation of the plasma convection speed in the compact regions of space they represent, the steepened structures being essentially zero-frequency waves in the plasma frame of reference.
- Representing extremes in both convection speed and plasma density, however, the compact, sparse scattering regions are not a representative sample of the bulk fluid flow.