Some new instabilities in the midlatitude E and F regions

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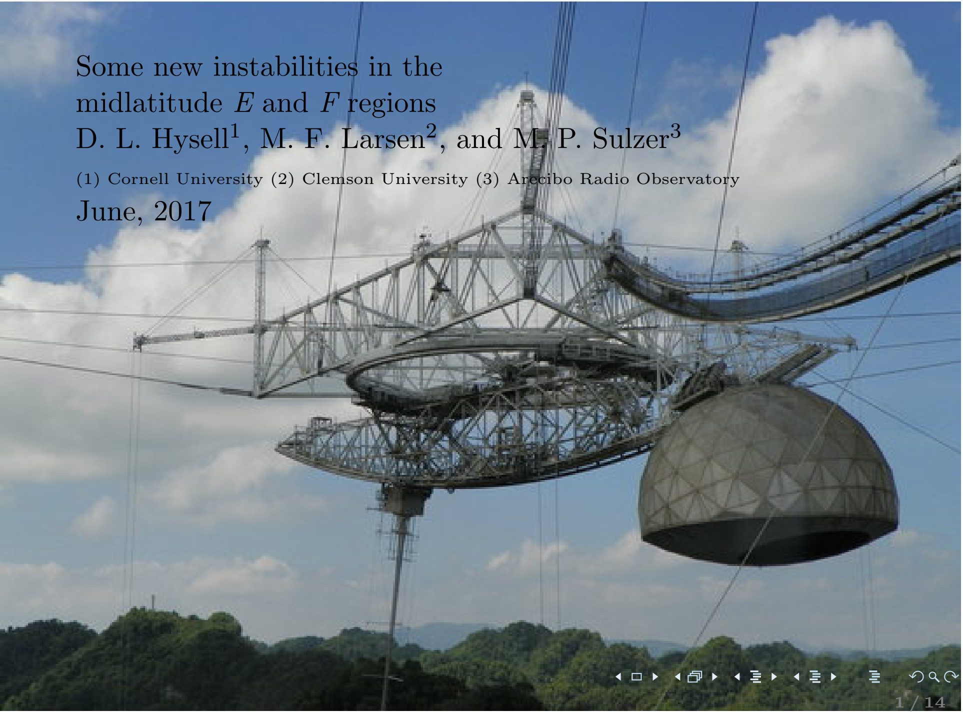
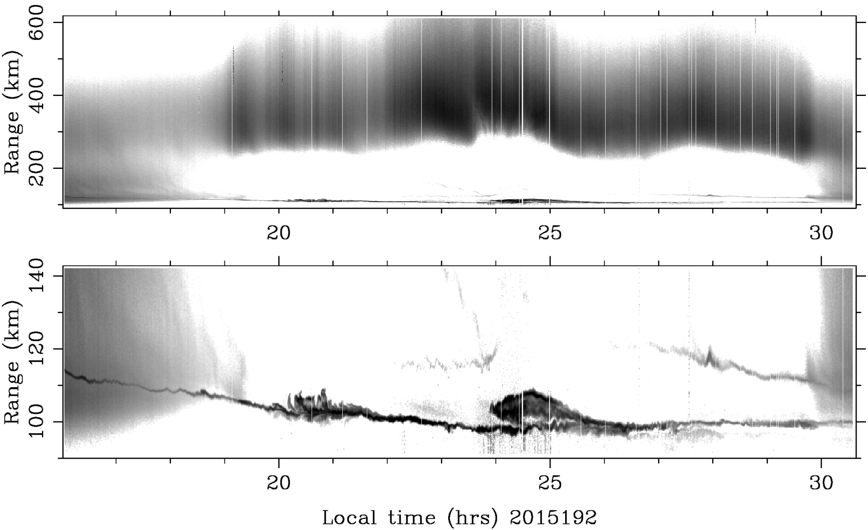
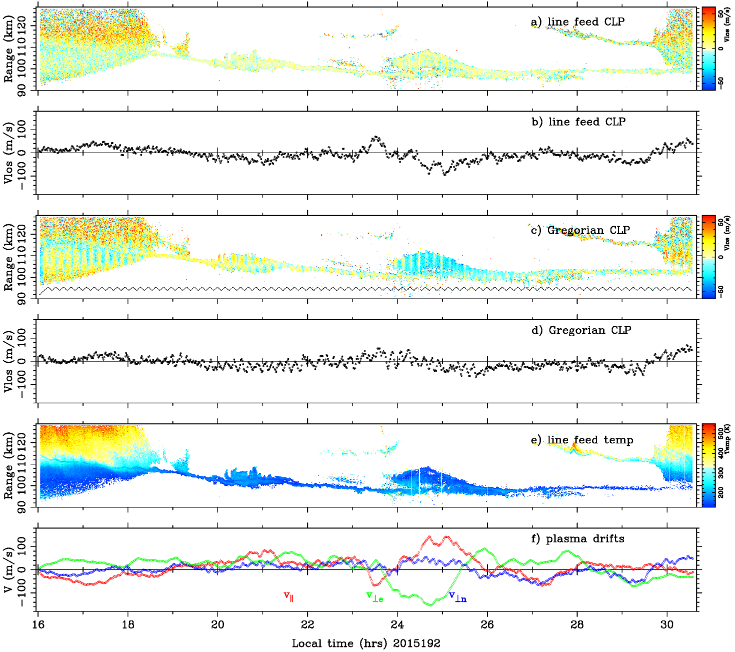


AO World Day Jul. 11/12, 2015

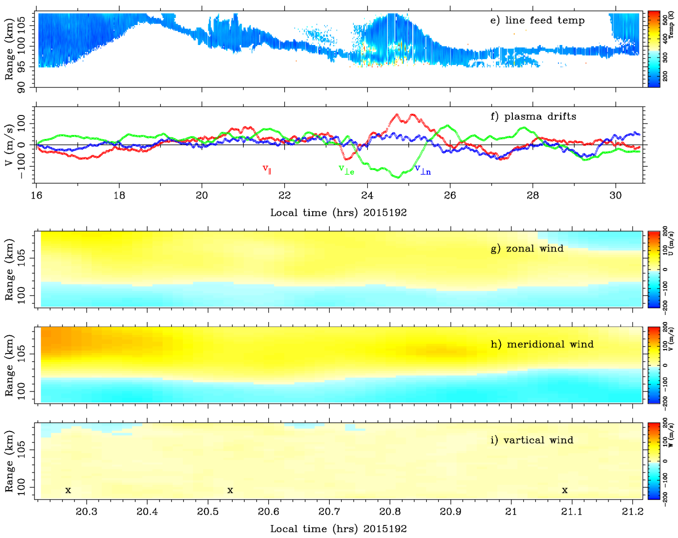


AO World Day

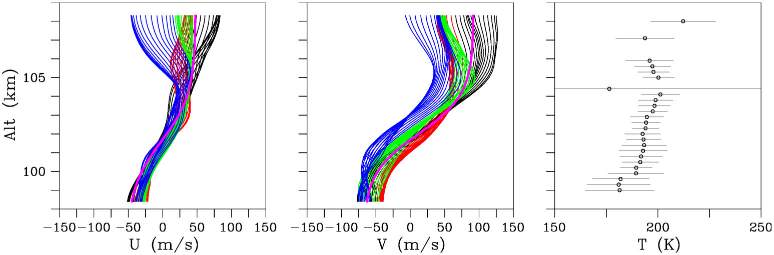


a) line feed CLP
b) line feed CLP
c) Gregorian CLP
d) Gregorian CLP
e) line feed temp
f) plasma drifts
Range (km)
Vlos (m/s)
V (m/s)
Local time (hrs) 2015192

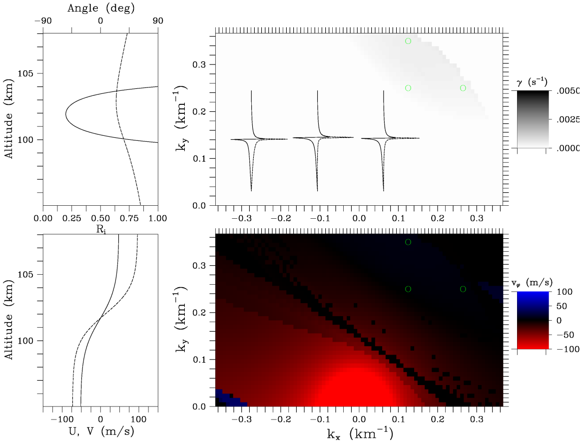
1st irregular Es layer



1st irregular Es layer

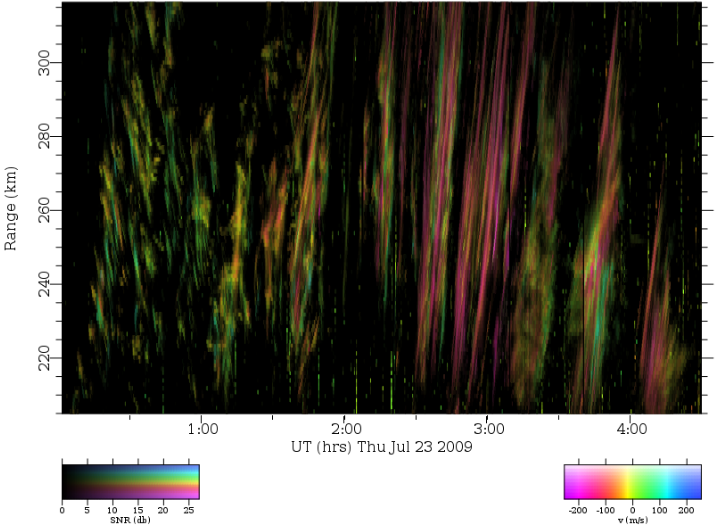


BVP

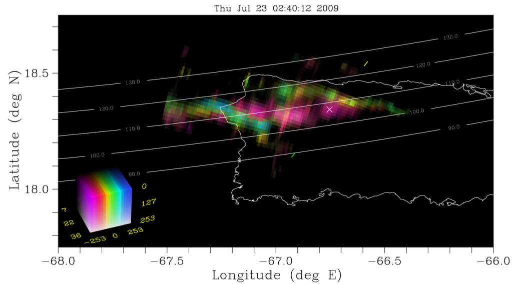


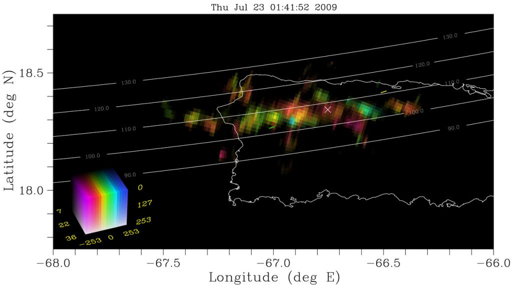
Angle (deg)
−90
0
90
105
100
Altitude (km)
0.00
0.25
0.50
0.75
1.00
R_i
105
100
Altitude (km)
−100
0
100
U, V (m/s)
0.3
0.2
0.1
0.0
k_y (km^{-1})
−0.3
−0.2
−0.1
0.0
0.1
0.2
0.3
γ (s^{-1})
.0050
.0025
.0000
0.3
0.2
0.1
0.0
k_y (km^{-1})
−0.3
−0.2
−0.1
0.0
0.1
0.2
0.3
k_x (km^{-1})
v_φ (m/s)
100
50
0
−50
−100

coherent scatter RTI

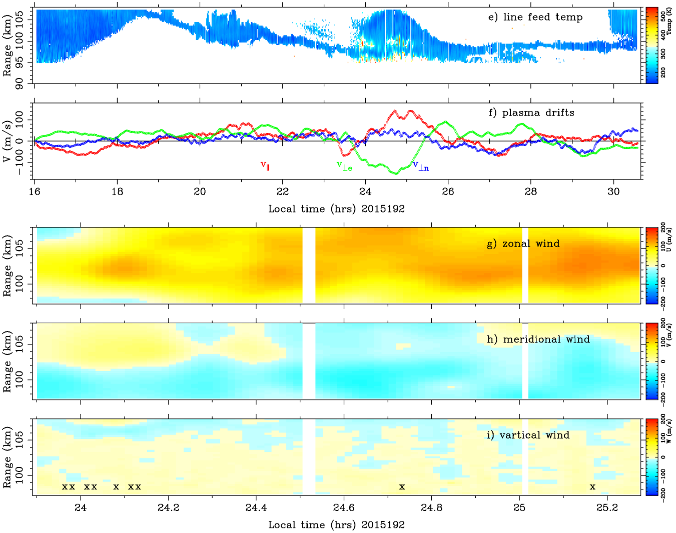


coherent scatter imagery

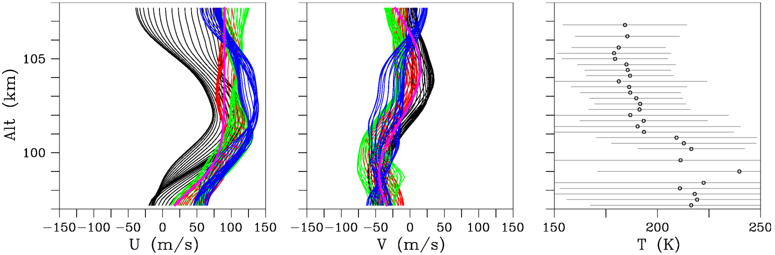




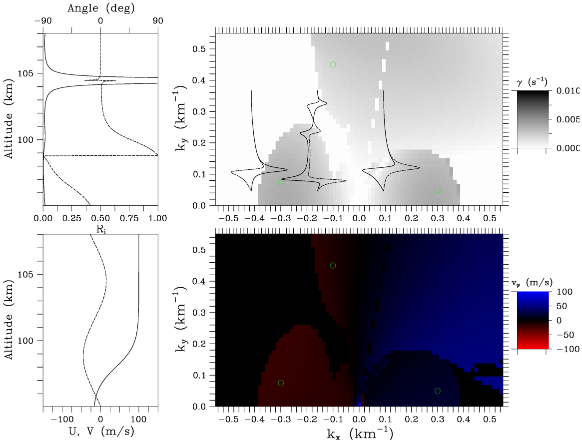
2nd irregular Es layer



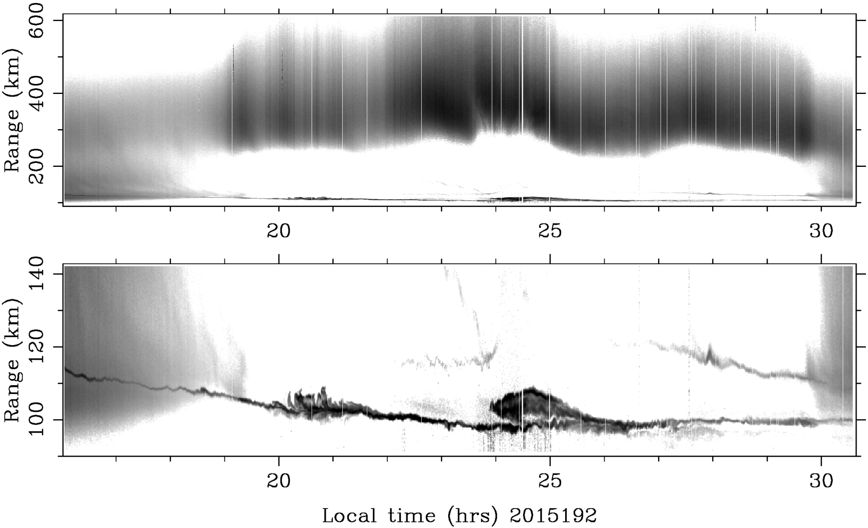
2nd irregular Es layer



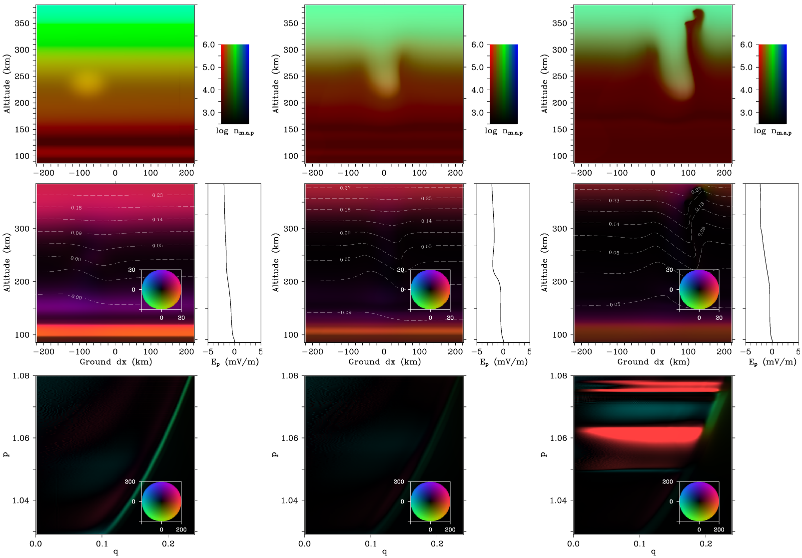
BVP



Angle (deg)
−90
0
90
105
100
Altitude (km)
0.00 0.25 0.50 0.75 1.00
R_i
0.5
0.4
0.3
0.2
0.1
0.0
k_y (km^{-1})
−0.5 −0.4 −0.3 −0.2 −0.1 0.0 0.1 0.2 0.3 0.4 0.5
γ (s^{-1})
0.010
0.005
0.000
105
100
Altitude (km)
−100 0 100
U, V (m/s)
k_x (km^{-1})
v_φ (m/s)
100
50
0
−50
−100


600
400
200
Range (km)
20
25
30
140
120
100
Range (km)
20
25
30
Local time (hrs) 2015192

3D numerical simulation



summary and conclusions

- Patchy sporadic E layers virtually always collocated with neutral shear layers that are unstable in the Richardson-number sense (dynamically unstable).
- In one case, a large E_s-layer patch appeared to be in a region of the MLT that was convectively unstable (or close to it). The condition guarantees dynamic instability.
- Just prior to the passage of an F-region depletion plume emblamatic of midlatitude spread F, a bulge in the bottomside number density associated with strong, parallel, upward flow was seen. This is not an unusual phenomenon per se, but ...
- The bulge would have redirected plasma flow around it so as to make the ionosphere susceptible to plasma convective instability. Indeed, this is what occurred in numerical simulation.
- Neutral dynamics catalyze or drive midlatitude plasma instabilities.