Radio Observatorio de JICAMARCA Radio Observatory

Comparison of ionosonde and incoherent scatter drift measurements at the magnetic equator

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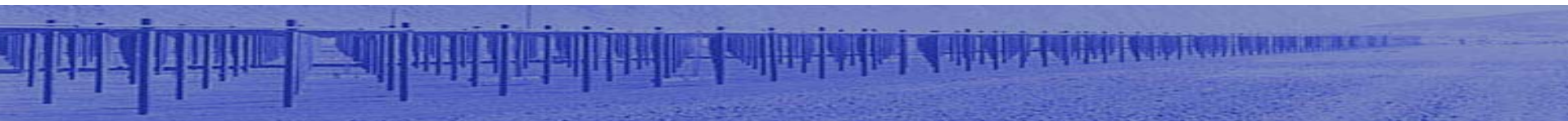

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Experimental Setup

- Ionosonde-> Digisonde

  (*Bullet, 1994*))

- Jicamarca IS radar, Vertical and E-W drift mode

  (*Woodman and Hagfors, 1969;*
  Woodman, 1972; Kudeki et al.,1999)

Vertical Drift ISR vs DPS

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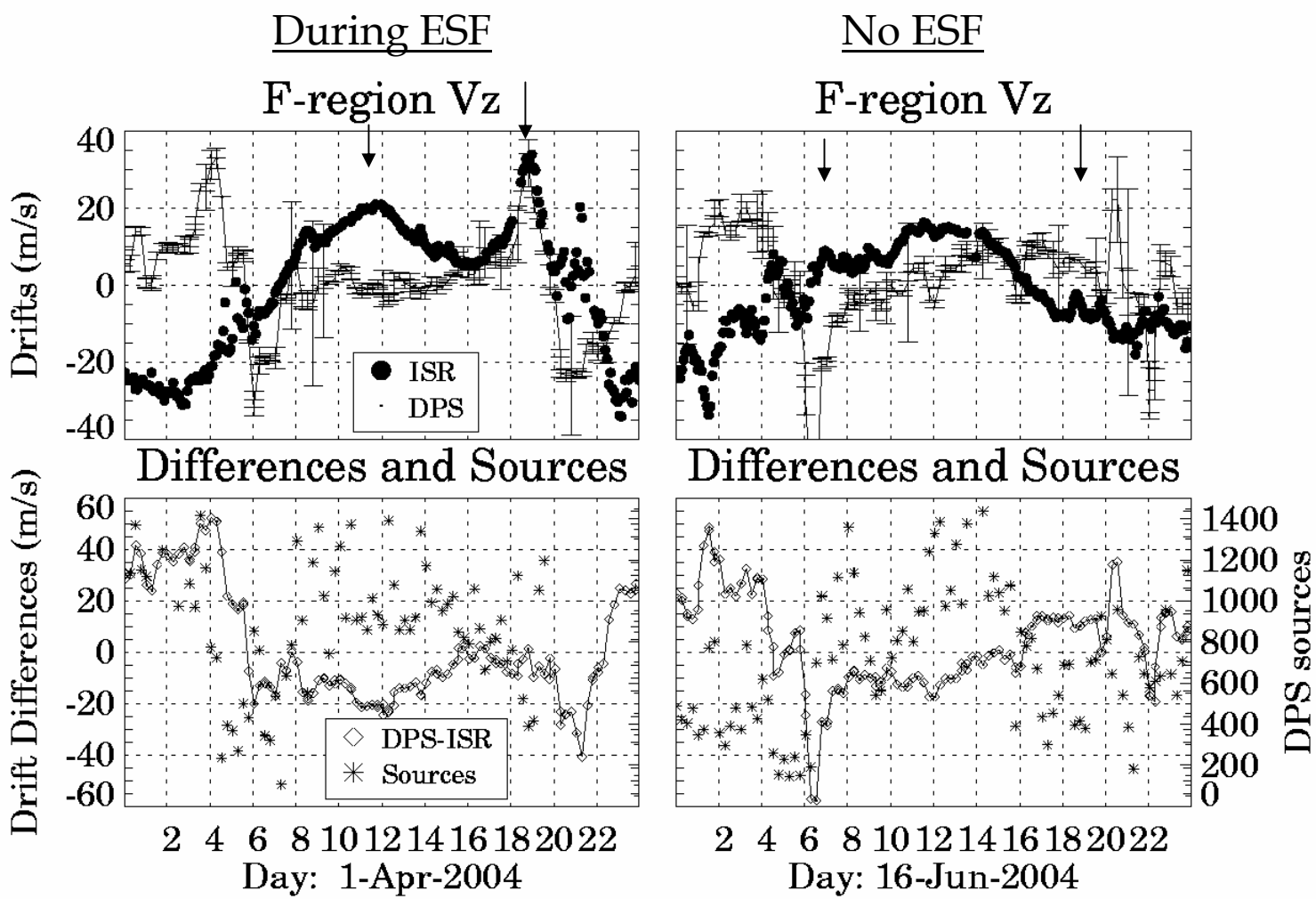

Zonal Drift ISR vs DPS

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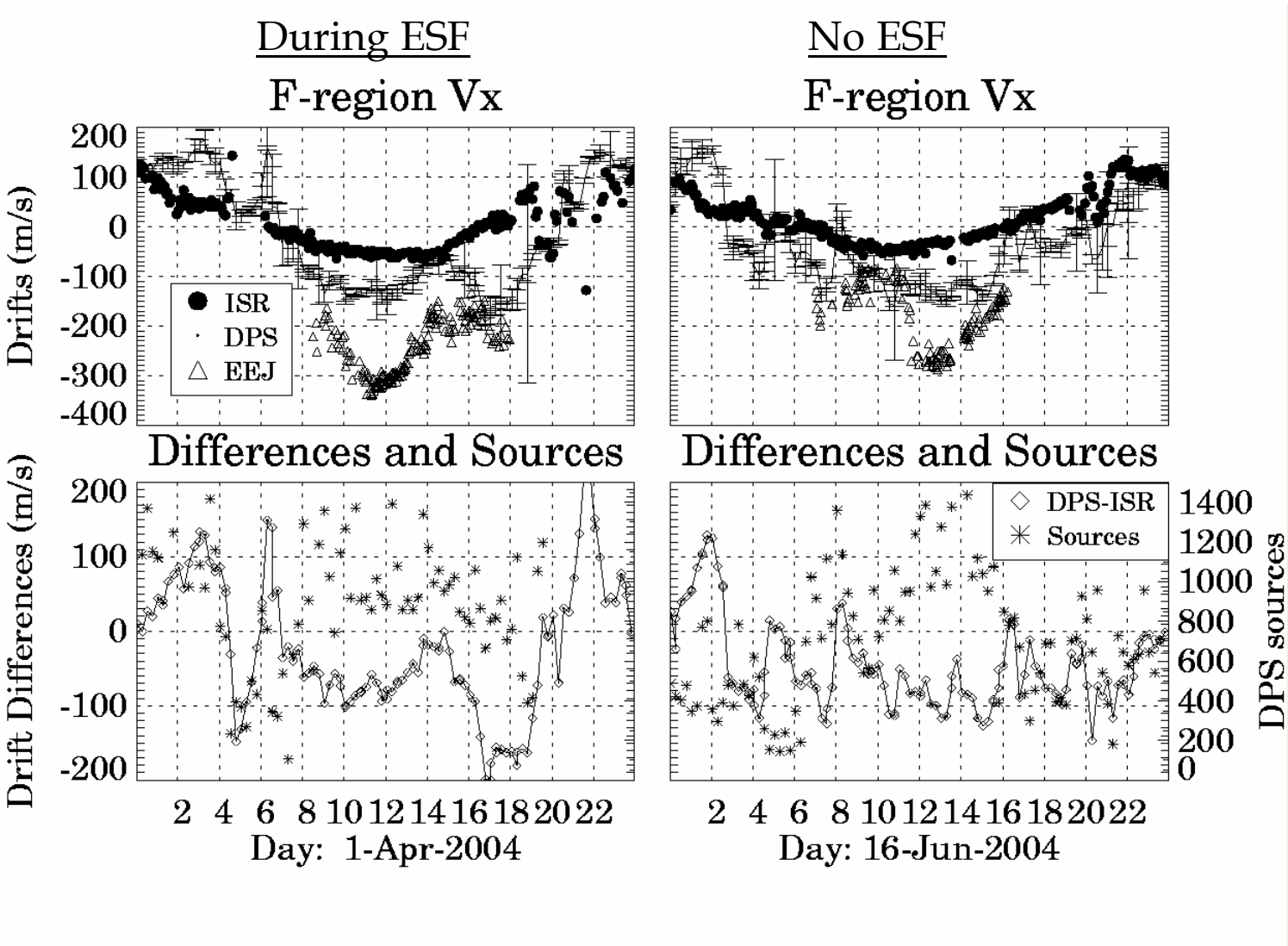

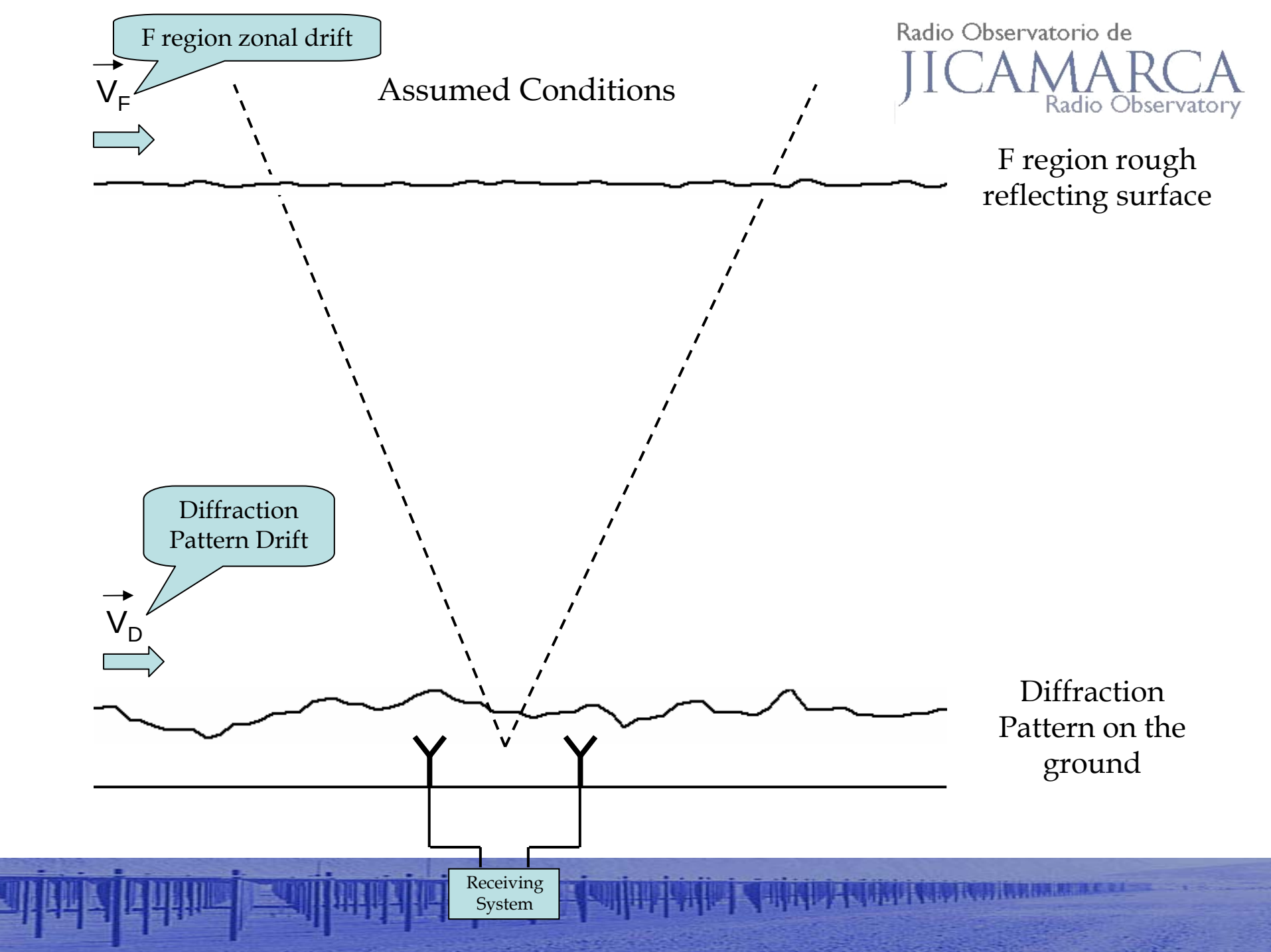
F region zonal drift
V_F
Assumed Conditions
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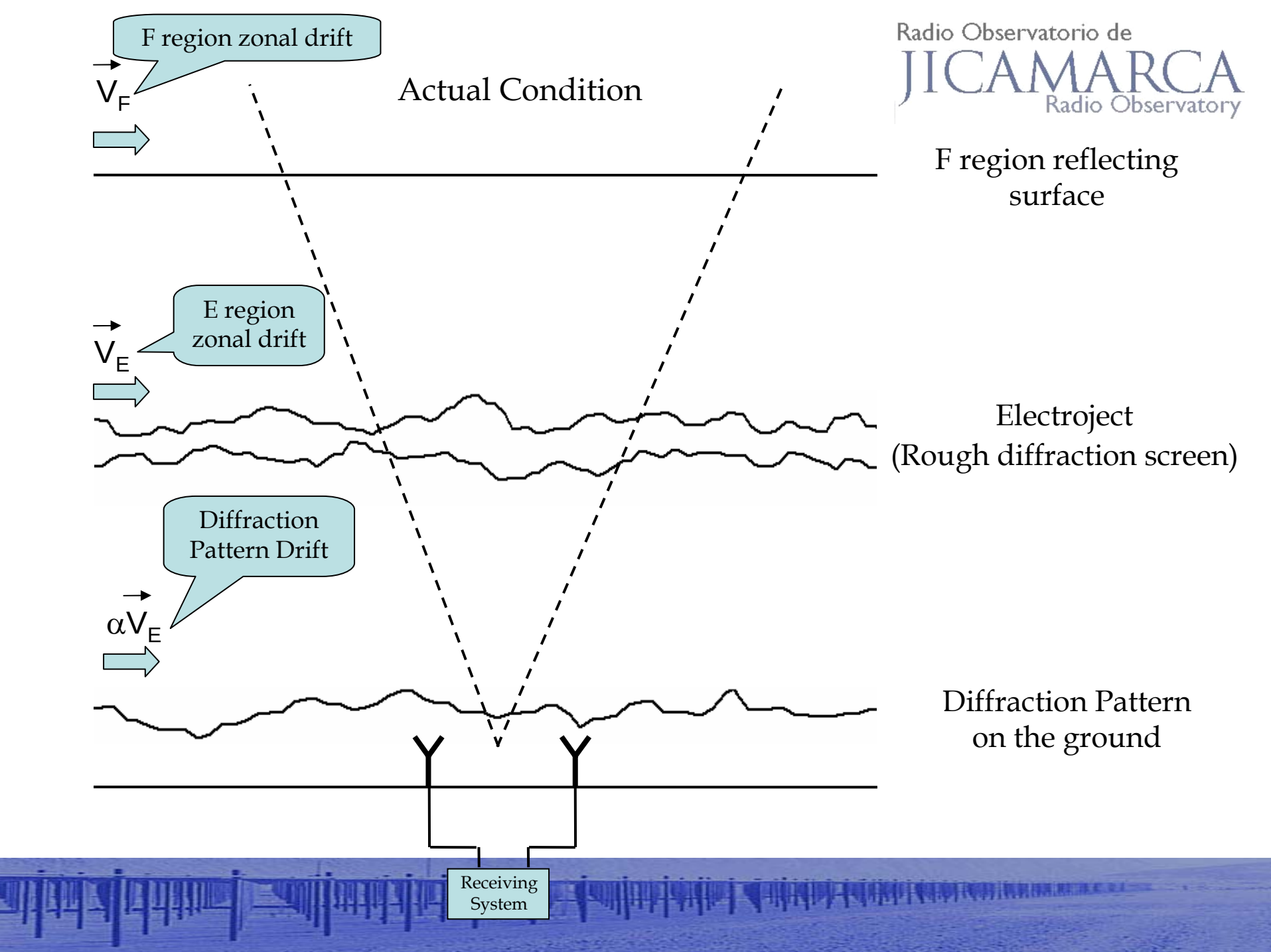
F region rough
reflecting surface
Diffraction
Pattern Drift
V_D
Diffraction
Pattern on the
ground
Receiving
System



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F region reflecting surface

Electroject (Rough diffraction screen)

Diffraction Pattern on the ground

Zonal Drift ISR vs DPS

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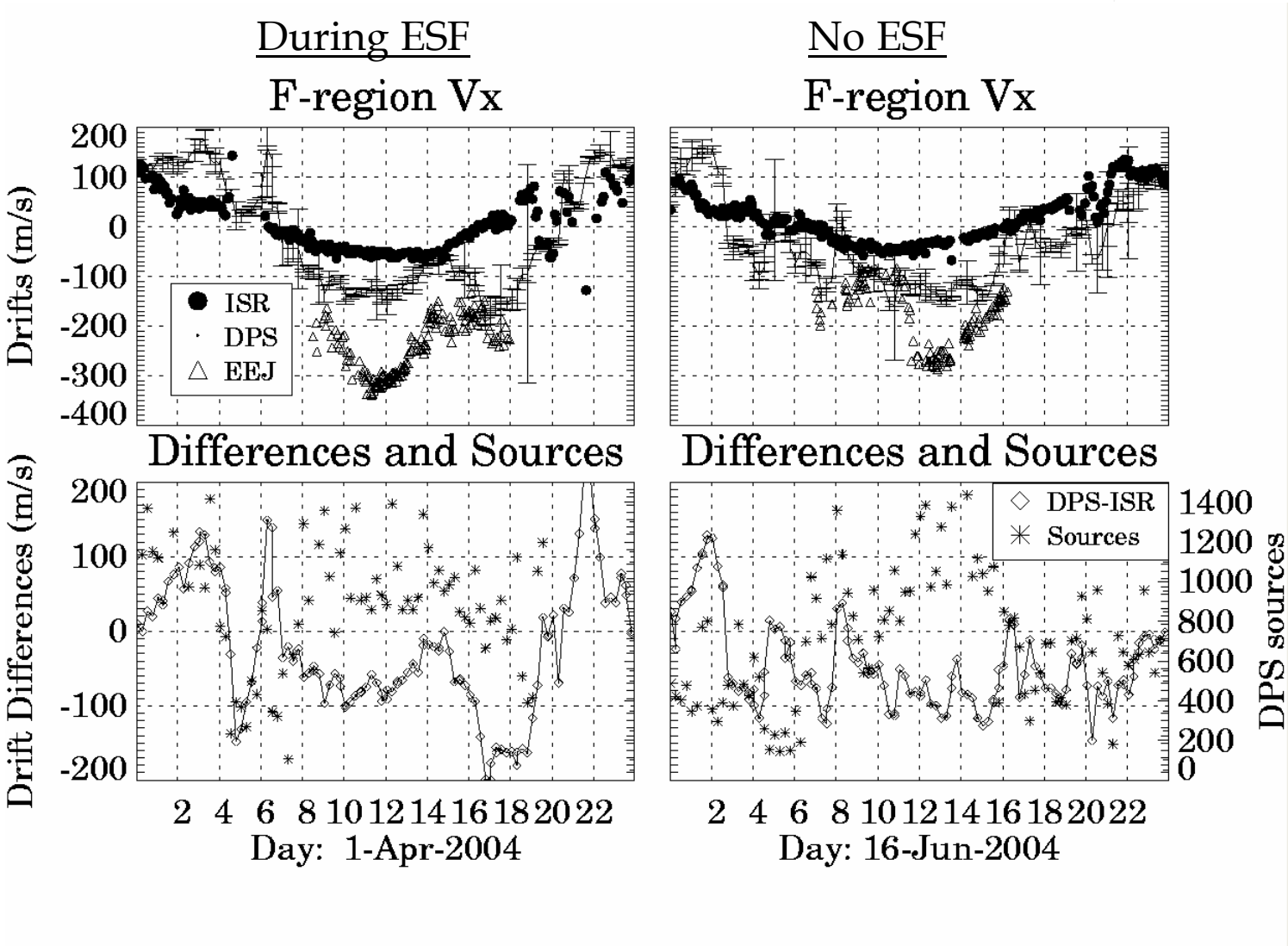
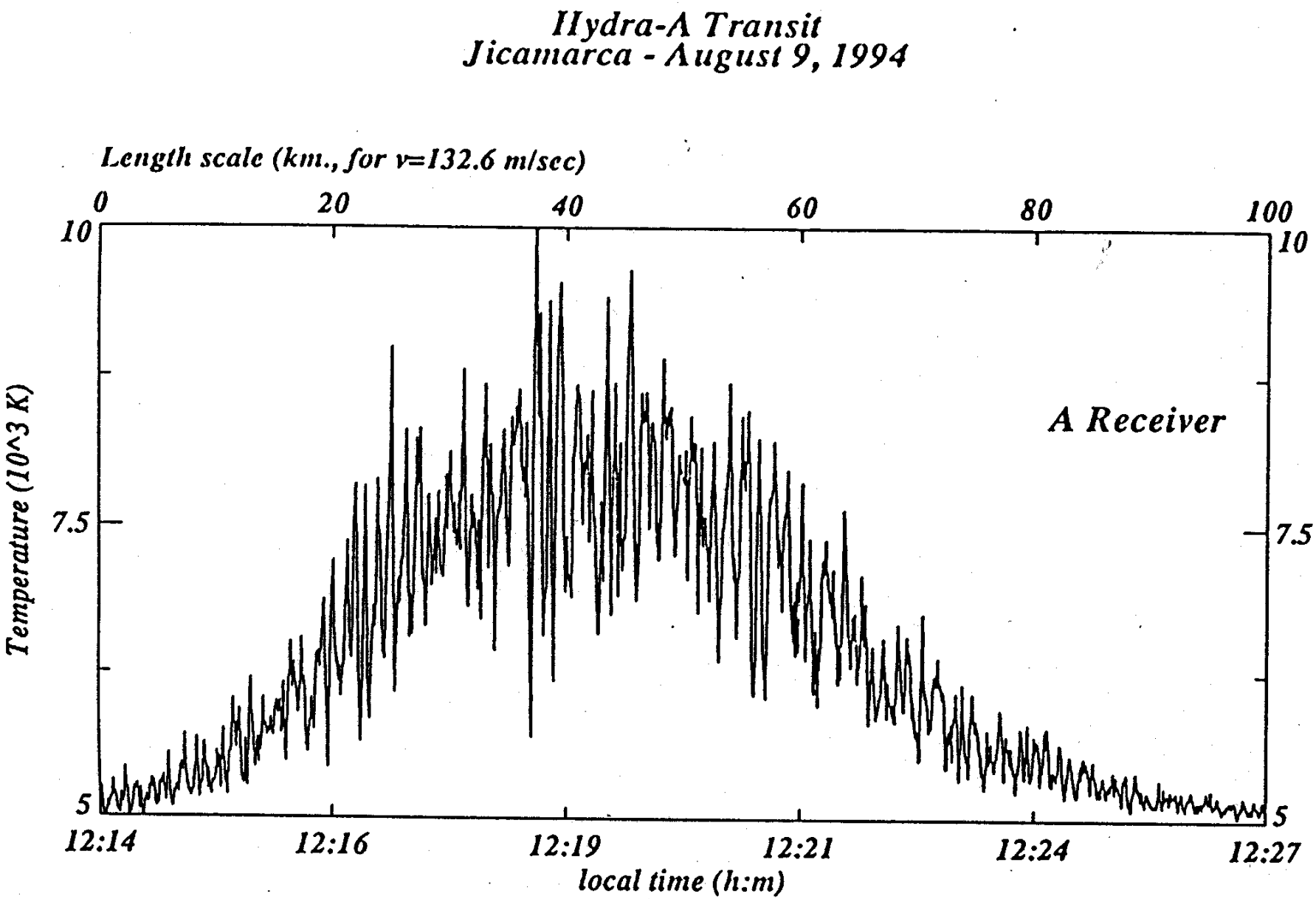
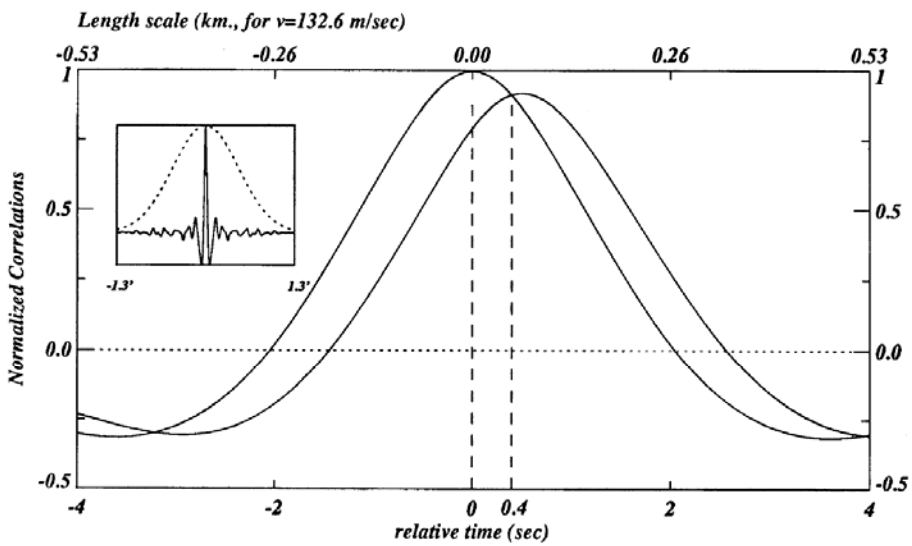
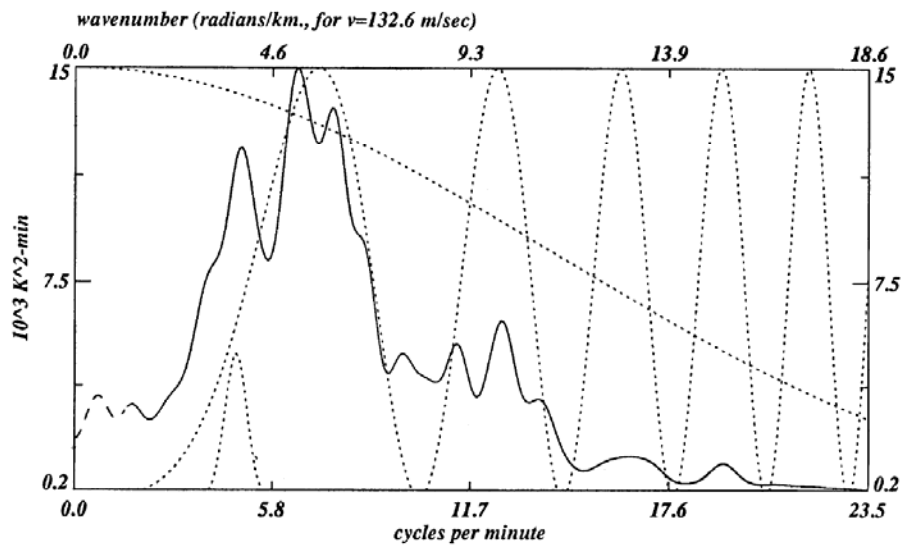



Hydra-A Transit
Jicamarca - August 9, 1994
Length scale (km., for v=132.6 m/sec)
0
20
40
60
80
100
10
7.5
5
Temperature (10^3 K)
A Receiver
12:14
12:16
12:19
12:21
12:24
12:27
local time (h:m)


Correlation and Crosscorrelation Functions of Scintillating Fluctuations
Length scale (km., for v=132.6 m/sec)
-0.53
-0.26
0.00
0.26
0.53
1
0.5
0.0
-0.5
Normalized Correlations
-13'
13'
-4
-2
0
0.4
2
4
relative time (sec)

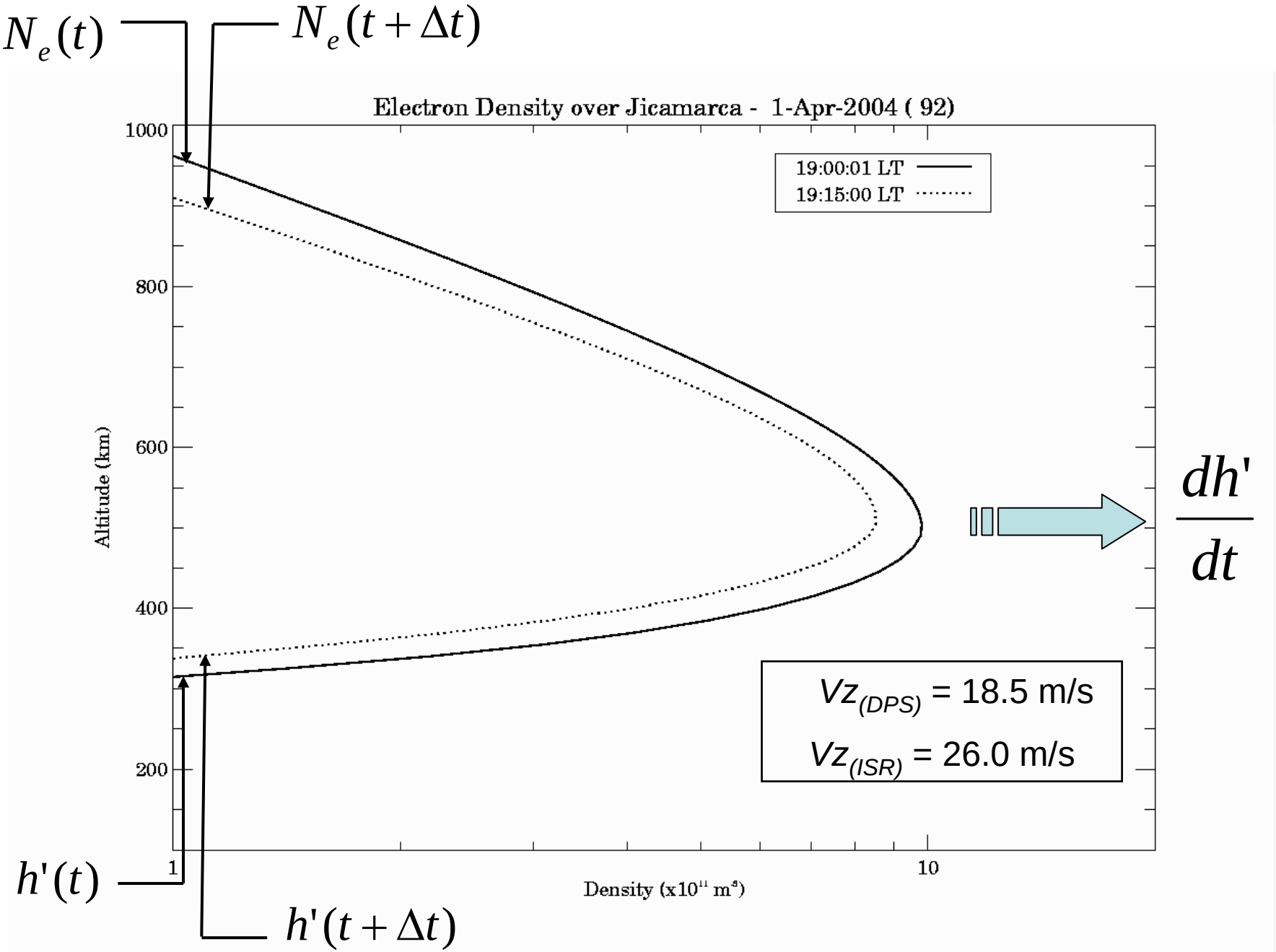

Frequency (and wavenumber) Power Spectrum
wavenumber (radians/km., for v=132.6 m/sec)
0.0
4.6
9.3
13.9
18.6
15
7.5
0.2
10^3 K^2-min
0.0
5.8
11.7
17.6
23.5
cycles per minute

Conclusions

- Vertical Drifts
  - Disagreement during significant production or recombination
  - Agreement when there is no production or recombination (e.g. pre-reversal enhancement).
  - Useful, if used concurrently with chemistry models
- Zonal Drifts
  - Poor in general
  - During the day, they correspond to phase velocity of 2 km EEJ irregularity waves
  - They agree at night during SpF conditions
  - Useful, if used to measure EEJ and SpF dynamics

(Woodman and Chau, accepted, JRL, 2005)

Thanks for your attention


$N_e(t)$
$N_e(t+\Delta t)$
Electron Density over Jicamarca - 1-Apr-2004 (92)
19:00:01 LT
19:15:00 LT
1000
800
600
400
200
Altitude (km)
1
10
Density (x10^{11} m^{-3})
$\frac{dh'}{dt}$
$Vz_{(DPS)}$ = 18.5 m/s
$Vz_{(ISR)}$ = 26.0 m/s
$h'(t)$
$h'(t+\Delta t)$

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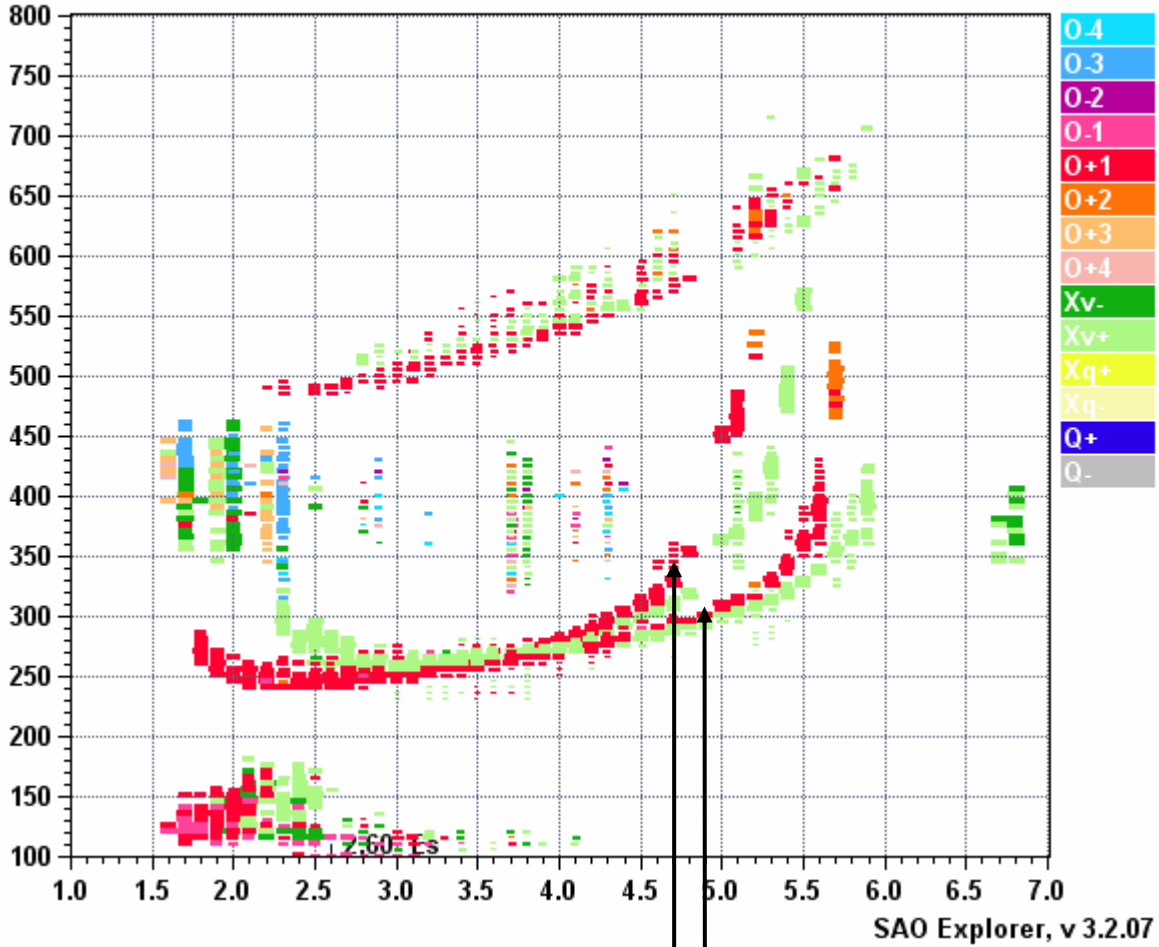

$h'(t)$ [06:45 LT]

$h'(t+\Delta t)$ [07:00 LT]

$Vz_{(DPS)}$ = -20.5 m/s

$Vz_{(ISR)}$ = 7.3 m/s

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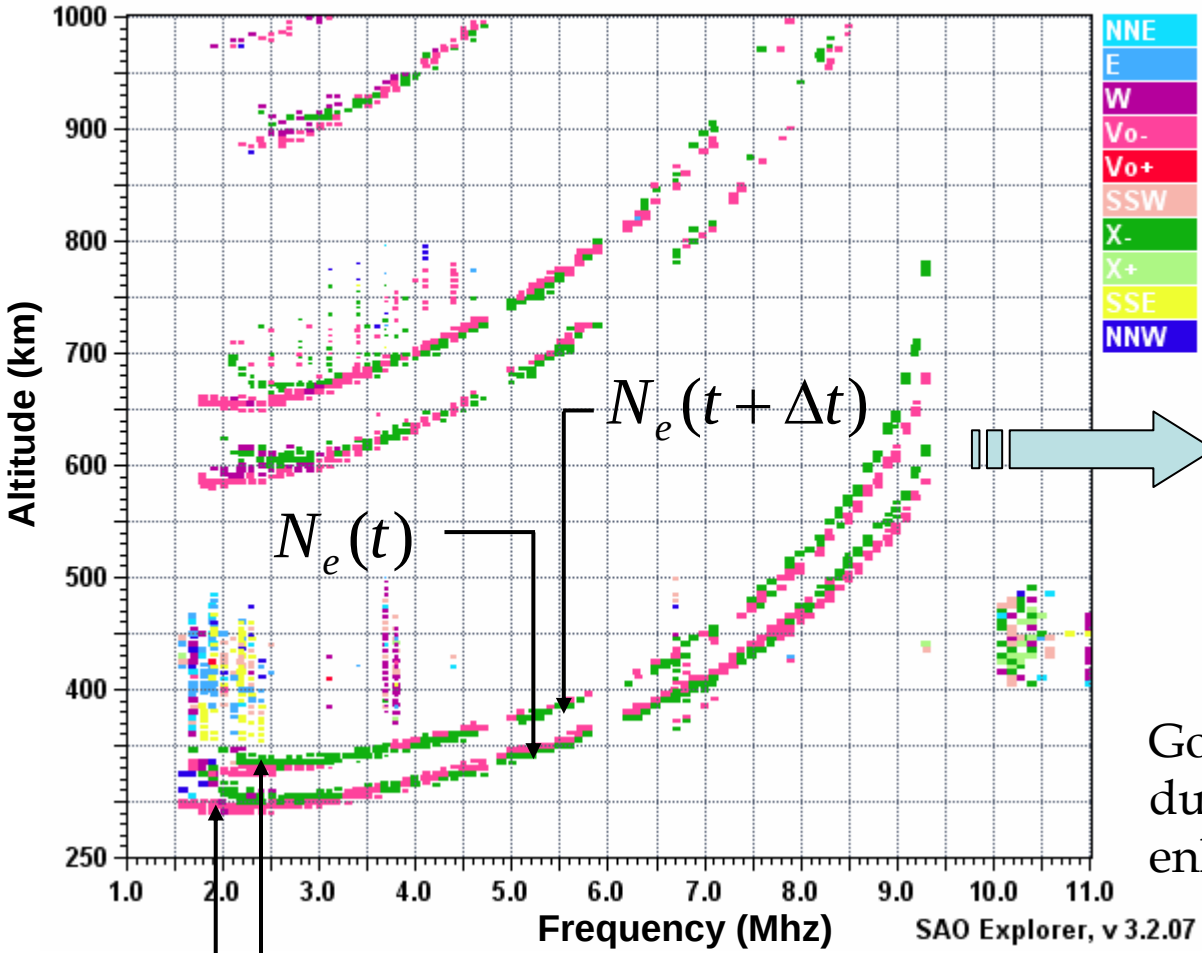
Agreement



$$\frac{dh'}{dt}$$

Good comparison during a pre-reversal enhancement

$Vz_{(DPS)}$ = 29.5 m/s

$Vz_{(ISR)}$ = 30.0 m/s

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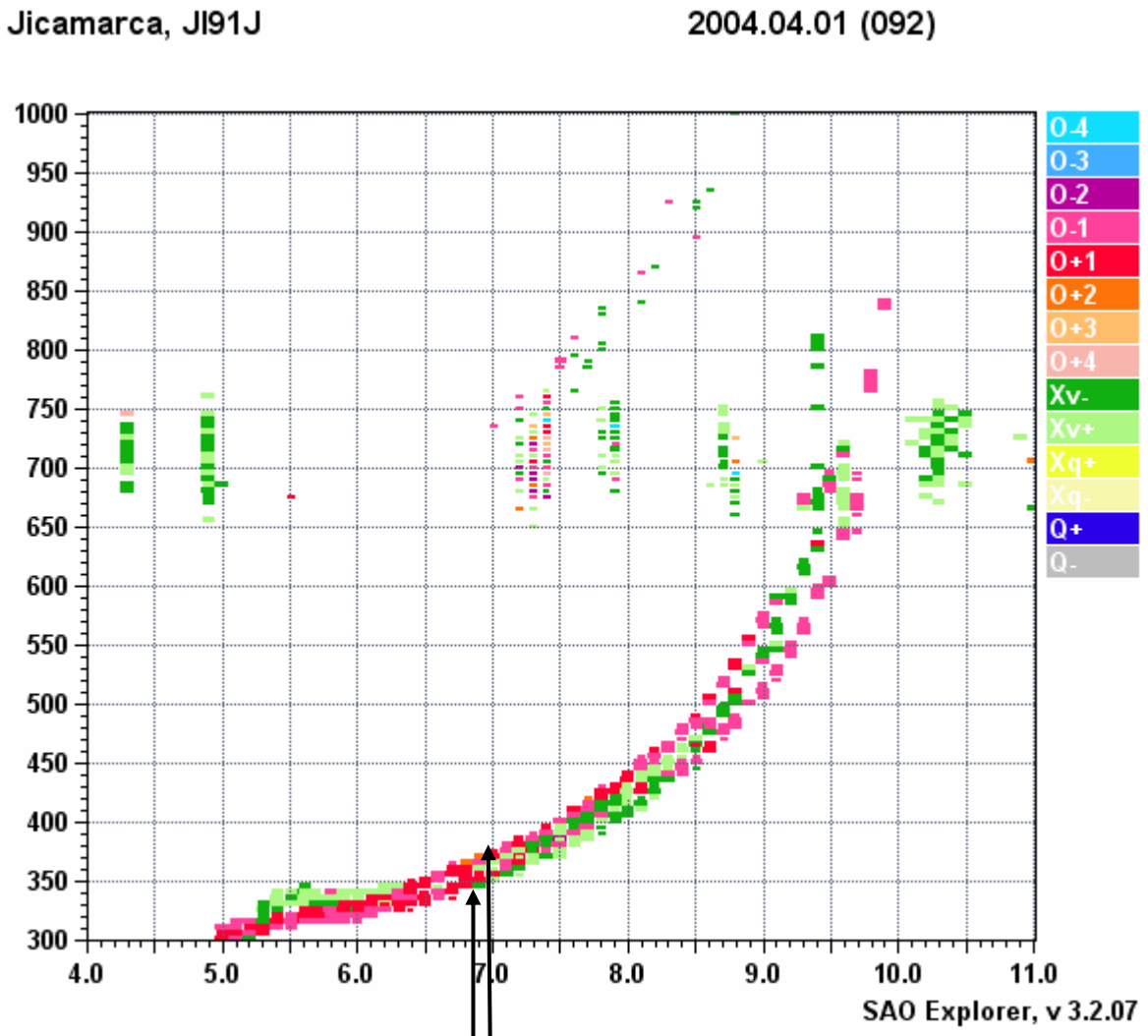

$h'(t)$ [11:30 LT]

$h'(t+\Delta t)$ [11:45 LT]

Disagreement

$Vz_{(DPS)}$ = -0.73 m/s

$Vz_{(ISR)}$ = 20.2 m/s

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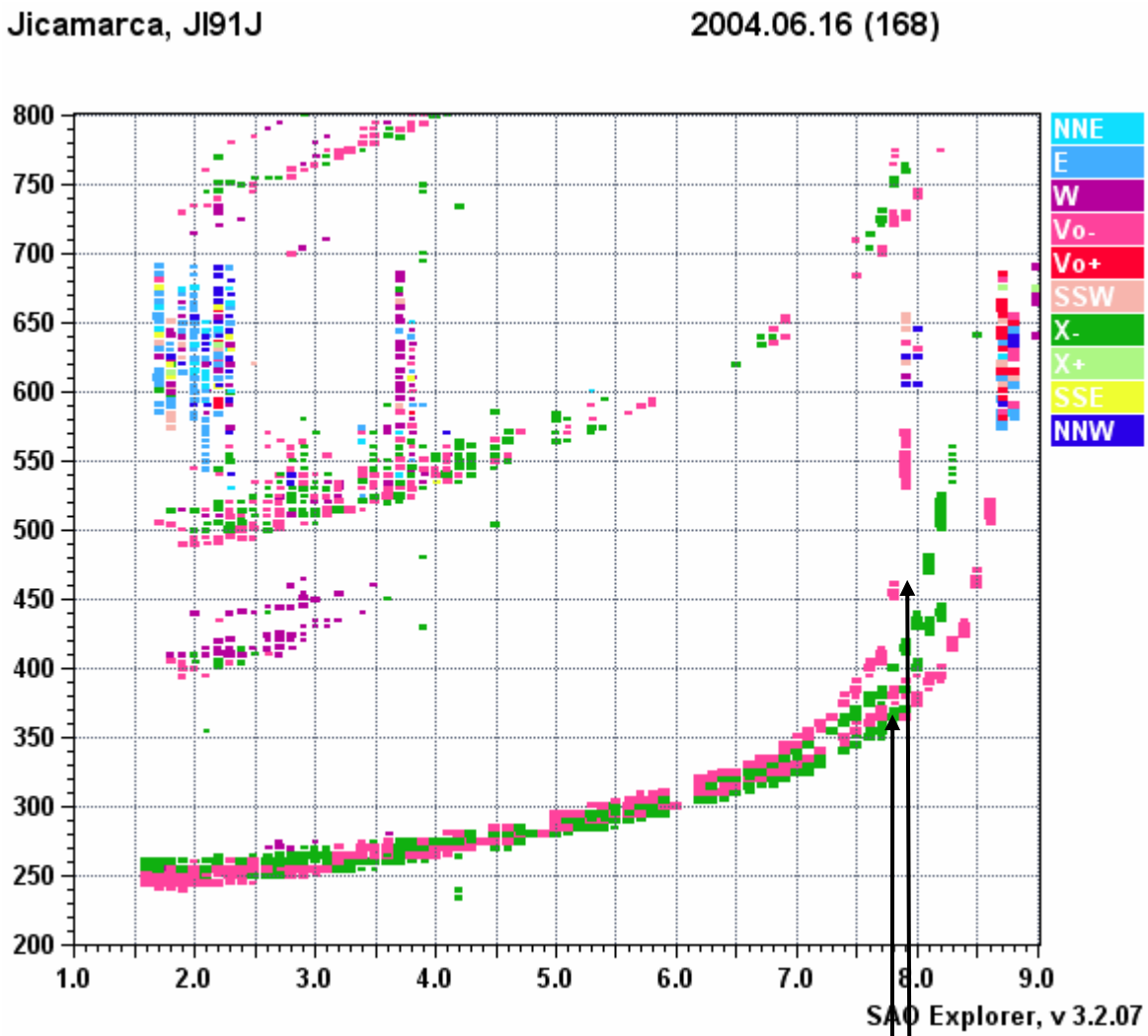

Disagreement

$Vz_{(DPS)}$ = 6.5 m/s

$Vz_{(ISR)}$ = -3.0 m/s

$h'(t)$ [18:30 LT]

$h'(t+\Delta t)$ [18:45 LT]