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12 Characterization of the ionospheric drifts over São Luis, Brazil

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53 Seminário da Latin American Conference on Space (COLAGE)

54 3-7 nov. <1988>

56 San Jose

57 Costa Rica

58 DGE

61 <CI>

64 <1998>

68 PRE

76 ASTROFÍSICA

83 We have studied ionospheric drifts utilizing digital ionosondes (digisondes). In addition to the regular ionograms, provided by analogical ionosondes, digisondes also provide information about ionospheric drift using a receiving antenna array, shifted echo frequency and phase differences between the receiving antennas of the array. Recorded information is digitally treated by an in house processor which controls all functions of the instrument, generating archives that are post-processed. Post-processed data analysis permitted us to note some interesting ionospheric drifts characteristics on the October 1997 data from Sao Luis. We observed that vertical and zonal drift velocity components behavior is different from that measured by incoherent scatter radar at Jicamarca, Peru, described by Batista et al. (1996) and Fejer et al. (1985). A probable cause for this differentiated behavior is of instrumental origin. Digital ionosonde uses the HF pulses reflection principle and so, during the daytime, drifts measurements are strongly influenced by photoionization production reactions. In this way it indeed measure a so called "apparent velocity". But, around 2100 UT (1800 UT) when the photoionization production ends, the observed vertical drift shows a pre-reversal enhancement peak due to the eletromagnetic drift ($E \times B$), as expected. Zonal drift shows a behavior going from slightly eastward between 12 00 UT and 20 00 UT, to slightly westward after that time. The validation of the digisonde ionospheric drifts at the Brazilian stations will fill the gap on low and equatorial latitude drift measurements, over this region, that is characterized by a large magnetic declination, and that shows remarkable differences from Jicamarca pattern. It will permit to obtain diurnal pattern of the vertical drift (until now $dh'F/dt$ has been used to derive vertical drifts, but this is only valid around sunset), as well as meridional and zonal.

Characterization of the ionospheric drifts over São Luís, Brazil

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We have studied ionospheric drifts utilizing digital ionosondes (digisondes). In addition to the regular ionograms, provided by analogical ionosondes, digisondes also provide information about ionospheric drift using a receiving antenna array, shifted echo frequency and phase differences between the receiving antennas of the array. Recorded information is digitally treated by an in house processor which controls all functions of the instrument, generating archives that are post-processed. Post-processed data analysis permitted us to note some interesting ionospheric drifts characteristics on the October 1997 data from São Luís.

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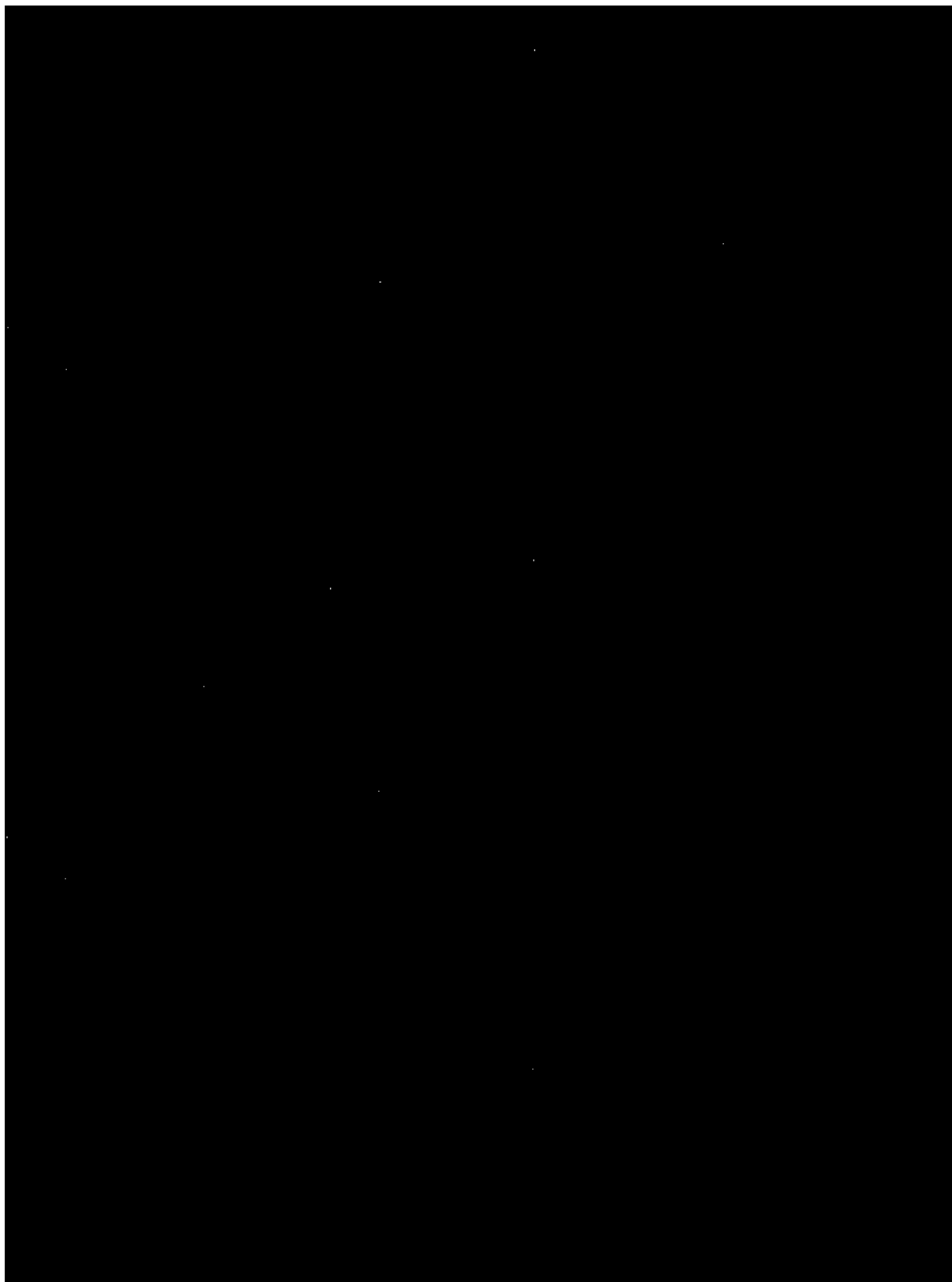
The validation of the digisonde ionospheric drifts at the Brazilian stations will fill the gap on low and equatorial latitude drift measurements, over this region, that is characterized by a large magnetic declination, and that shows remarkable differences from Jicamarca pattern. It will permit to obtain diurnal pattern of the vertical drift (until now $dh'F/dt$ has been used to derive vertical drifts, but this is only valid around sunset), as well as meridional and zonal.

- Batista, I.; Medeiros, R. T.; Abdu, M. A.; Souza, J. R.; Bailey, G. J., Paula, E. R. Equatorial

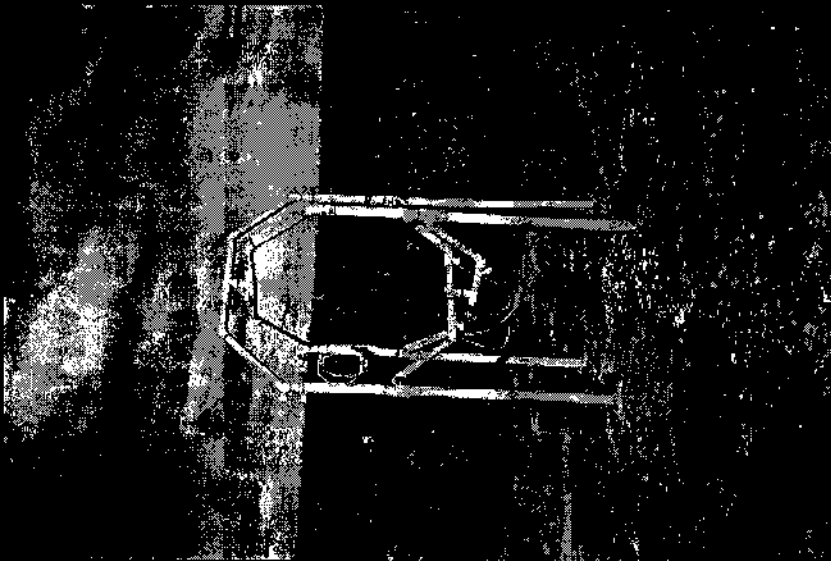
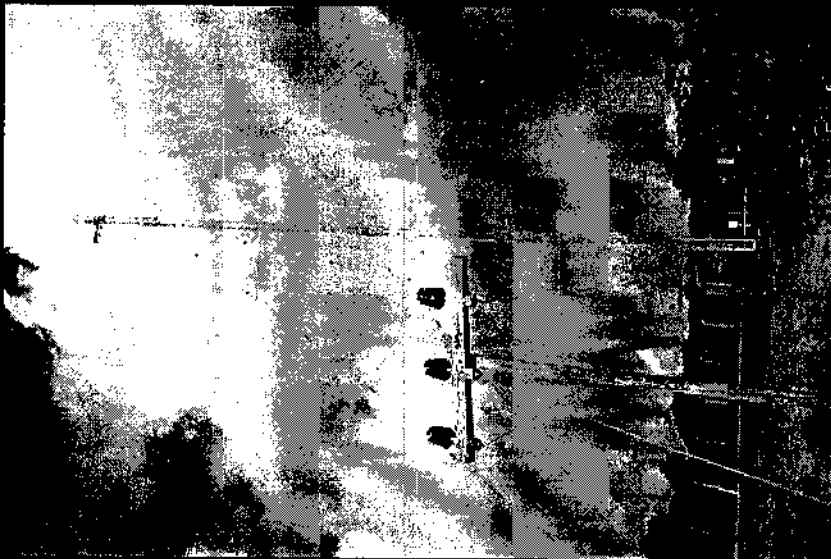
ionospheric vertical plasma drift model over the Brazilian region. J. Geophys. Res.,

101 (A5): 10.887-10.892, 1996.

-Fejer, B. G.; Paula, E. R. de; Gonzales, S. A.; Woodman, R. F. Average vertical and zonal F region plasma drifts over Jicamarca. J. Geophys. Res., 96 (A8): 13901-13906, 1991.



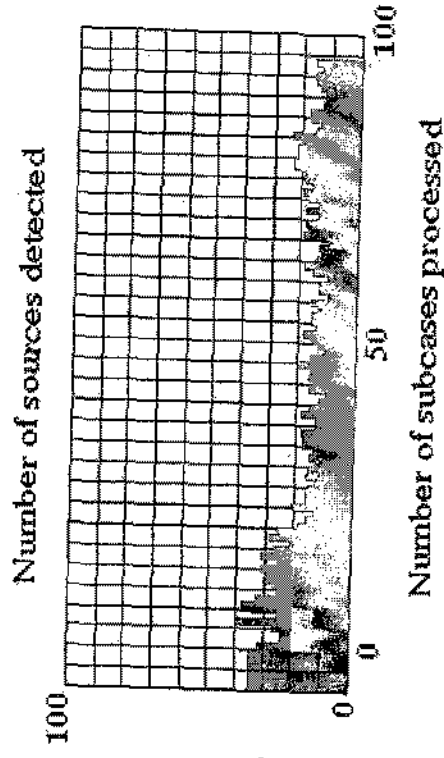
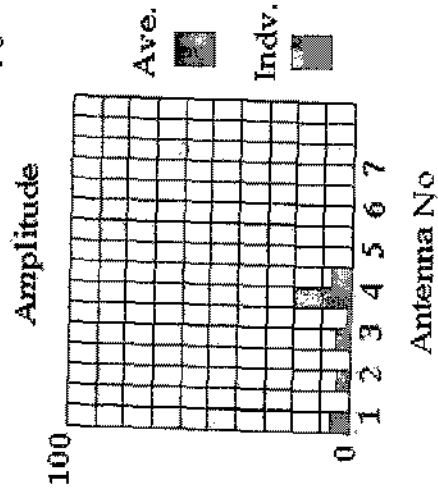
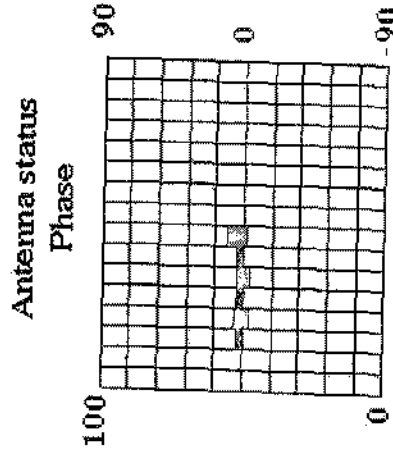
Diaisondes provide information about ionospheric drift using a receiving antenna array, shifted echo frequency and phase differences between the receiving antennas of the array. Recorded information is digitally treated by an in house processor which controls all functions of the instrument, generating archives that are post-processed.



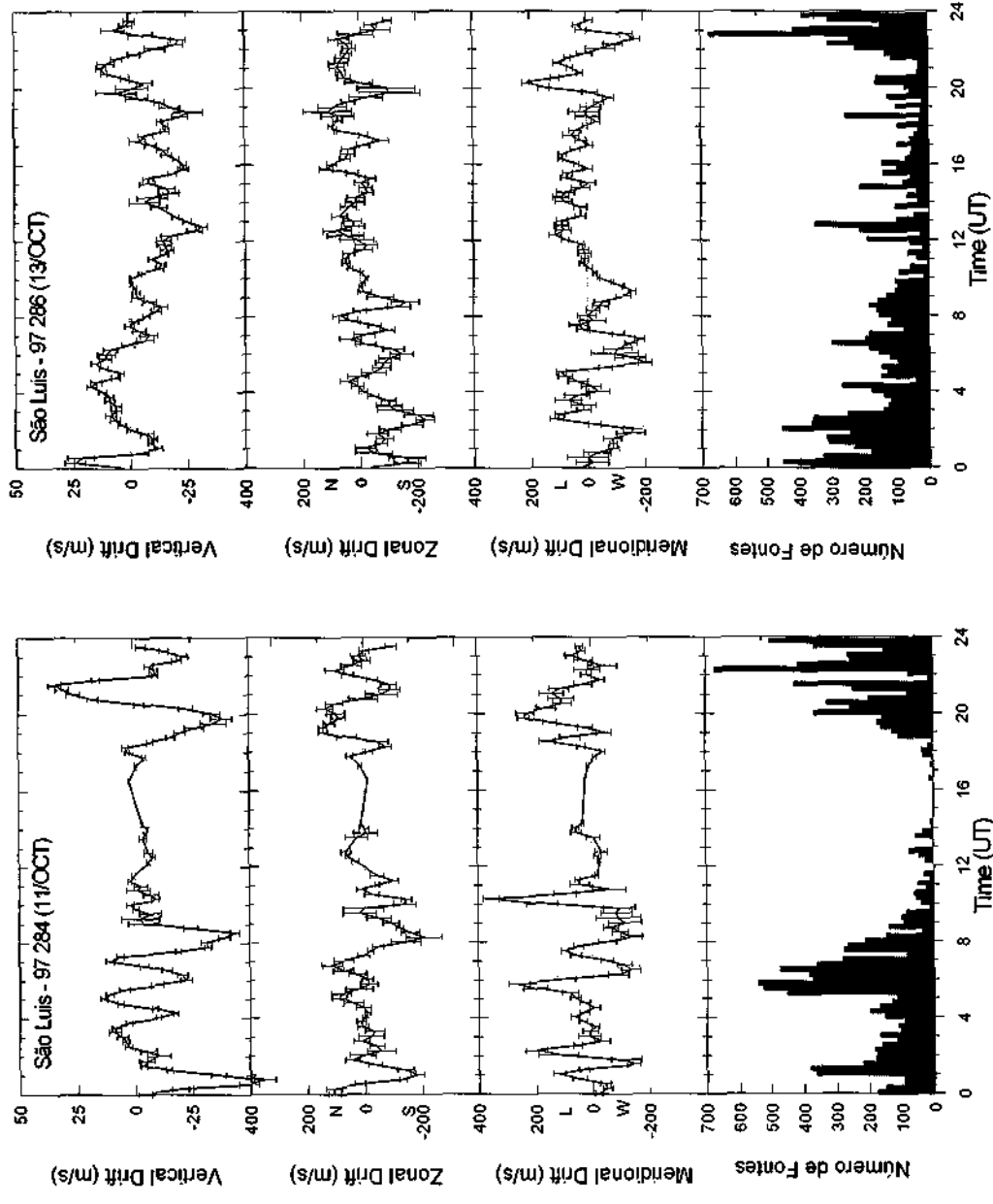
D.D.A.
Quality Control

System status
Option Sao Luis cdt's COMPASS.

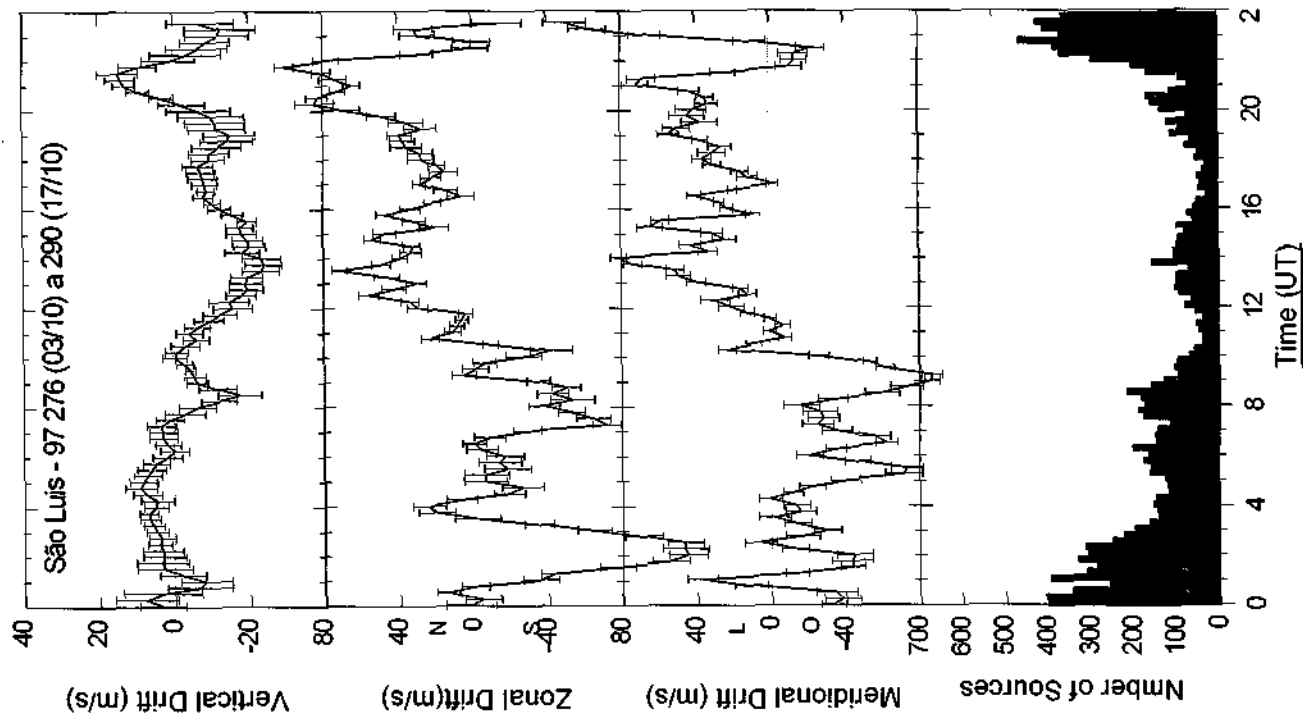
Tape / File : Tape online
Data block : Gathering data
Antenna Err : No errors detected
Antenna No :
Current time: 1997 286 01:05:28



Display example of post-processing data: in this way it is possible to get data quality control about antenna response and number of sources.



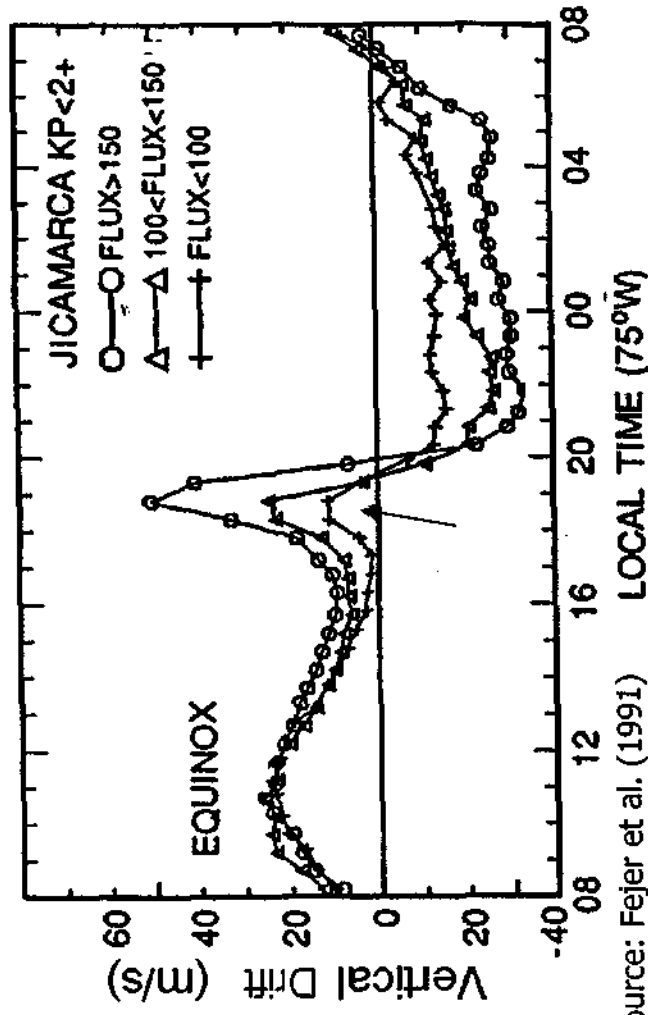
DGS drift velocity and number of sources relative to October 11 and 13, 1997. Good number of sources displayed at nighttime is a evidence for good data set.



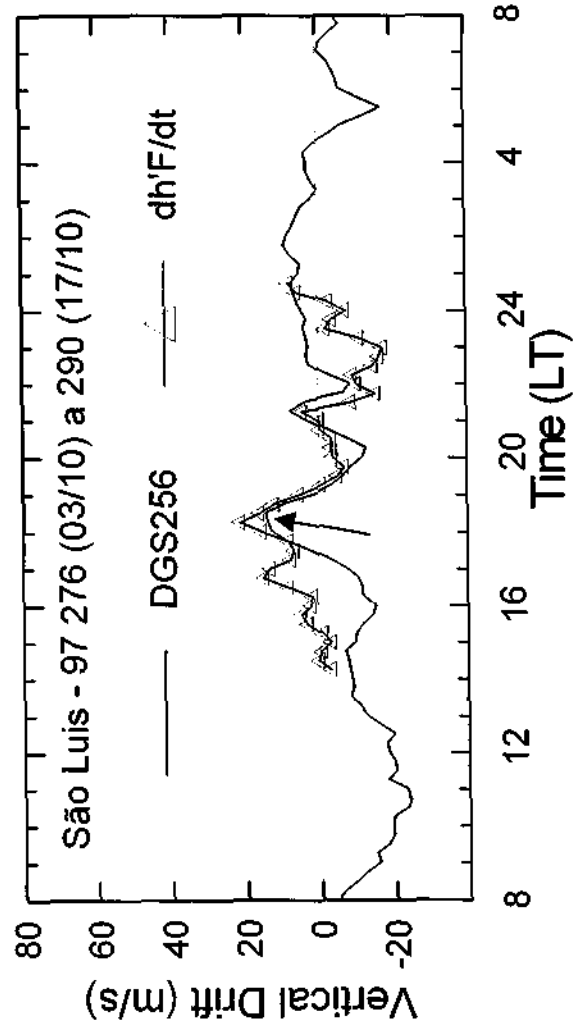
DGS 15 day average drift velocity over São Luís, include the number of source (bottom).

Around 2100 UT (1800 UT) when the photoionization production ends, the observed vertical drift shows a pre-reversal enhancement peak due to the electromagnetic drift ($E \times B$), as that described by Batista et al. (1996)* and Fejer et al. (1991)*.

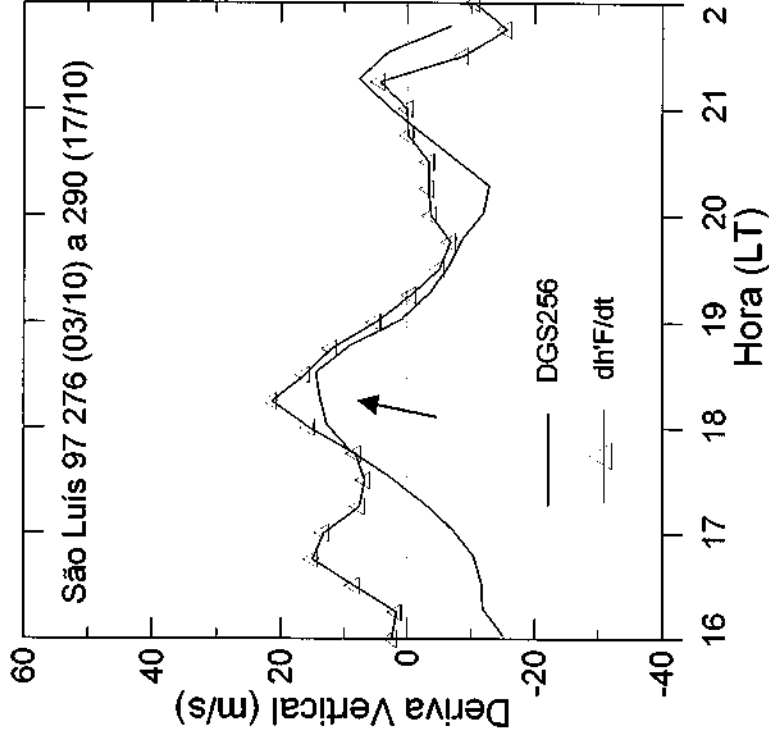
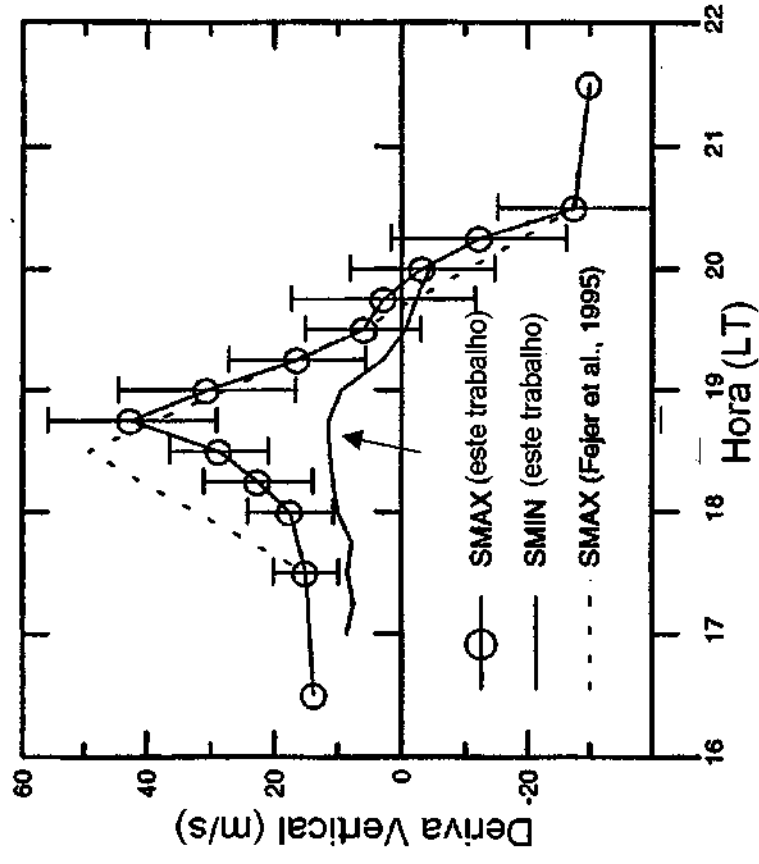
*For additional information see references.



Source: Fejer et al. (1991)



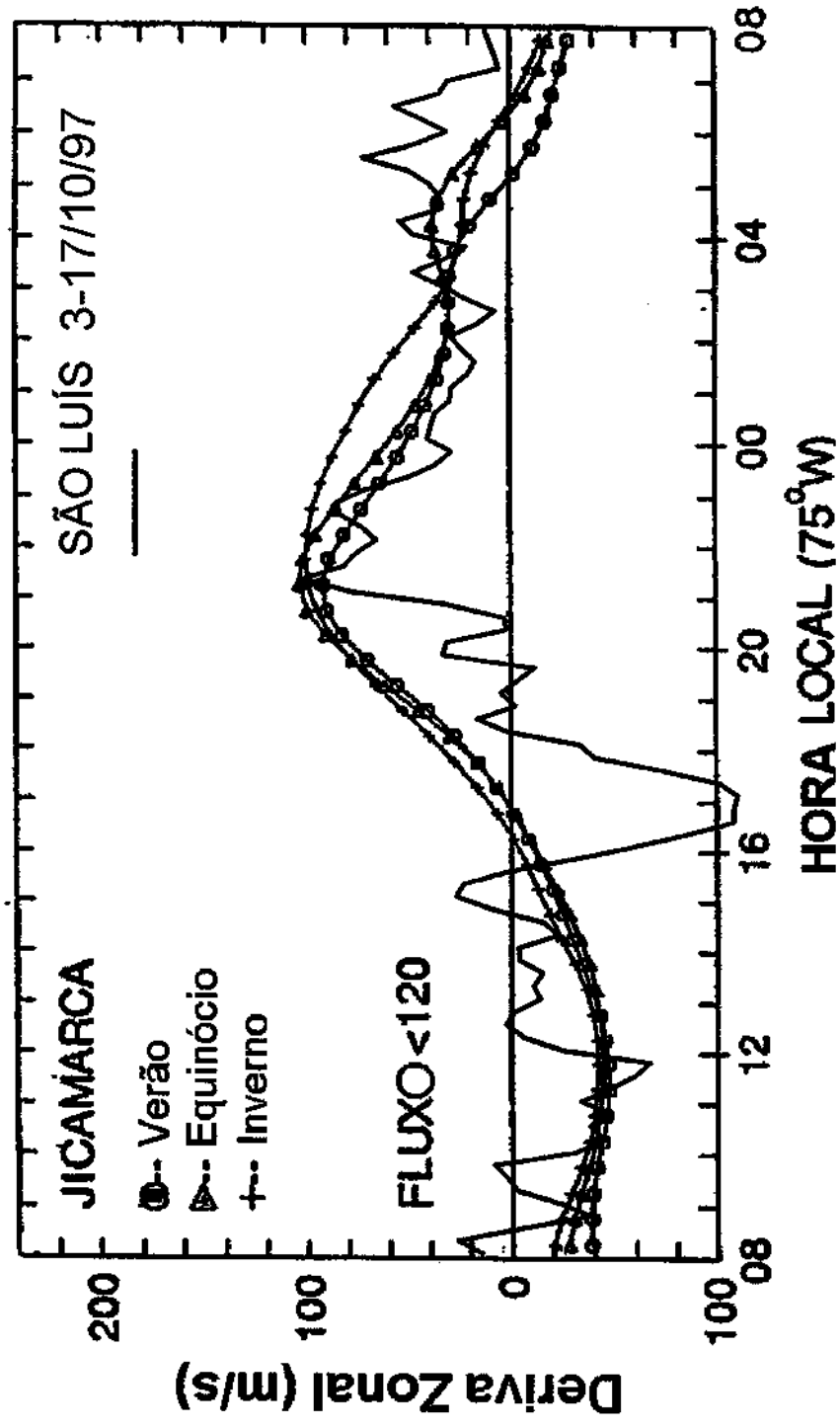
Vertical drift velocity
 plots: Jicamarca's ISR (top)
 and São Luís' DGS
 (bottom) show good
 agreement at pre-reversal
 peak time (red arrows).



Source: Batista et al. (1996)

Vertical drift velocity: ionosonde at Fortaleza (left) and DGS at São Luís(right) show good agreement at pre-reversal peak time (red arrows).

Digisonde's (DGS) zonal drift shows good agreement with that exhibited by the Jicamarca's incoherent scatter radar (see next figure).



Zonal drift velocity plot displaying a good agreement, in despite of fluctuations in the DGS curve, because its data set is lesser than the Jicamarca's ISR.

References

- Batista, I.; Medeiros, R. T.; Abdu, M. A.; Souza, J. R.; Bailey, G. J., Paula, E. R. Equatorial ionospheric vertical plasma drift model over the Brazilian region. J. Geophys. Res., 101 (A5): 10.887-10.892, 1996.
- Fejer, B. G.; Paula, E. R. de; Gonzales, S. A.; Woodman, R. F. Average vertical and zonal F region plasma drifts over Jicamarca. J. Geophys. Res., 96 (A8): 13901-13906, 1991.