



LISN activities at Jicamarca

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Outline

- LISN Engineering
 - Operations and Data quality
 - Databases and data access
 - VIPIR (Ionosonde) modes and programs

• LISN Science

- Atmospheric Connections (Low latitude Ionosphere during Sudden Stratospheric Warming events)
- 0 150-km echoes and daytime valley region

LISN Engineering: Operations (1)

- Real time monitoring of instruments every 15 minutes
- Monthly statistics of operations
- Off-line access of data not transfer in real-time





LISN Engineering: Operations (2)





ARGENTINA

NIGERIA, CHILE and COLOMBIA



LISN Engineering: Operations (3)



[see poster by *de la Jara et al.*]

LISN Engineering: Databases

- Realtime displays for all instruments (GPS, Magnetometers and ionosondes)
- User access to different data products and on-line displays
- Data availability depends on who owns the instrument. Most of our data are easy to access to register users
- Open-source development under Pyhton, PHP and HTML, Fortran

LISN Engineering: GPS Database

- Daily and monthly files
 - Rinex
 - Scintillation
 - Position
 - Binary
- On-line plots
 - Scintillation
 - TEC (soon)

http://200.60.148.173/	gps	
☐ Apple (148) ▼ Amazon eBay Yahoo!	News (1053) •	
Low-latitude Ionosphe Sensor Network	eric	3
	Daily files	
Look for Station Peru	Rinex Data : piur_090603.09d.tar.gz (355.40 kB)	
2009	Scintillation Data : piur_090603.scn.gz (81.17 kB)	
June	Position Data : piur_090603.pos.gz (370 Bytes)	
June	Binary Data : piur_090603.nvd.gz (1.88 MB)	
SMTWTFS		
14 15 16 17 18 19 20		
21 22 23 24 25 26 27		
28 29 30		
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Monthly files		
Select Data		_
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LISN Engineering: VIPIR Database

- Daily files
 - NCDF
 - IDL SAVE files
- On-line plots
 - Power ionograms (O and X modes)

http://200.60.148.173/ionosonde					
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LISN Engineering: VIPIR Modes

- Standard "B" mode every 15 minutes [T. Bullet, V. Eccles, N. Zabotin, ...]
- High resolution "sunrise/sunset" modes (every 2 seconds) [B. Livingston and C. Valladares]
- ESF modes in conjunction with C/NOFS (every 1 minute) [D. Hysell and J. Chau]
- ESF and Gravity wave modes (optimized for Doppler) [C. Valladares and T. Bullet]



- E-region mode around sunset [J. Chau and R. Woodman]
- Daytime Valley-region and 150-km echoes: ISR and VIPIR [J. Chau, M. Milla, and E. Kudeki]

Examples of VIPIR scientific products when operates in the B-mode (dynasonde)



VIPIR E-region: Spectra



VIPIR E-region: "Ionogram"



VIPIR E region: EW Structure



- Use of interferometry/imaging to determine angle of arrival
- Lowest frequency measurements around 0.8 MHz.
- More tests are scheduled to find better AM gaps
- Difficult to discriminate between scattering and reflection

VIPIR Imaging (1)





Power B





VIPIR Imaging (2)



VIPIR Sunrise: High-time resolution

- Ionograms every few seconds
- Around sunrise, rich temporal and spatial structure
- Valley region is also very structured
- Lots of meteor echoes!





LISN Science: Atmospheric Connections (1)



- ΔExB: Morning amplitude ExB difference with respect to expected averages, after fitting a semidiurnal wave.
- ΔSSW: differences with respect to 30-year median values.
- High correlation/anticorrelation: ΔExB vs. $\Delta T/\Delta U$ during SSW.
- Note the "persistence" of the ExB drift pattern during SSW period.

[from *Chau et al.*, 2009]

Atmospheric Connections: ExB no SSW



Atmospheric Connections: ExB during SSW



GPS TEC change no SSW



•GPS TEC (Total Electron Content) data show largescale picture of ionospheric behavior

•Before the warming, TEC change is 10-20% from mean and vertical drift is small

[see L. Goncharenko's highlight]

GPS TEC change during SSW (morning)



- During stratwarming, TEC increases by 50-100% in the morning
- Large upward drift in the morning
- The magnitude of increase is similar to effects of severe geomagnetic storms

[see L. Goncharenko's highlight]

LISN Science: Valley region



ISR and VIPIR Fitting





140-170 km => virtual heights of 160-210 km

VIPIR Ionograms: Every 2 minutes

MPIR D-X lonogram at Jicamarca



150-km echo observations at 50 MHz



Plasma Frequency vs. 150-km irregularities





VIPIR "Range-time" parameters

