

On two-dimensional dynamics of equatorial spread F structures observed by AMISR-14

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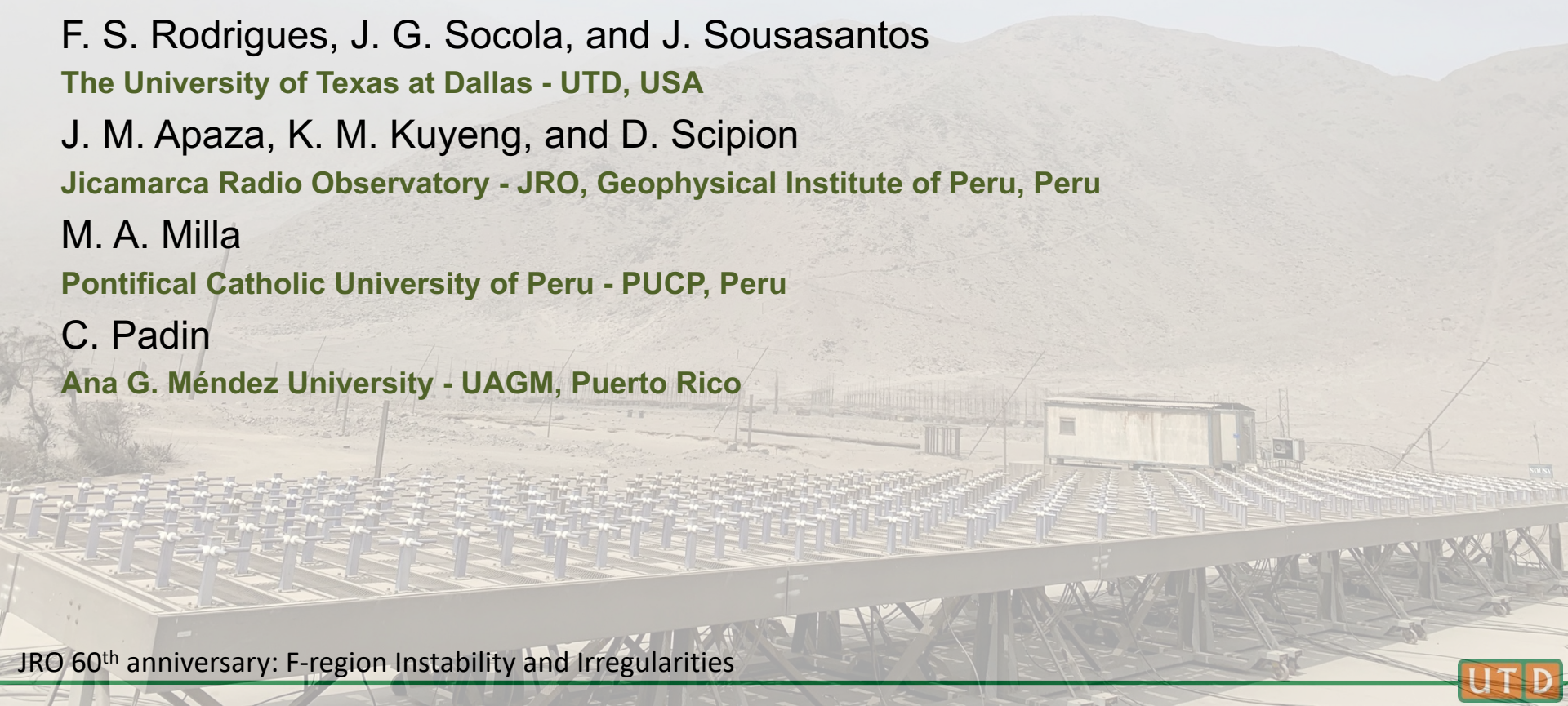
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1. AMISR-14
2. 2D ESF Mode
3. Examples of observations
4. Status of operations

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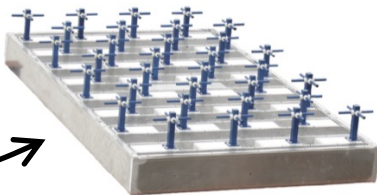
1. AMISR-14

- AMISR is an advanced mobile, modular UHF 2D phased-array radar system.
- The nominal 128-panel system is capable of providing 3D incoherent scatter radar measurements of the ionospheric plasma.

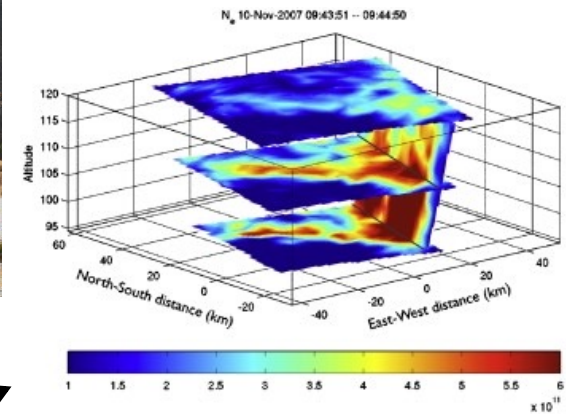
Antenna Element Unit (AEU, 500 W)



Panel (32 AEU, 16 kW)



Face (128 panels, 2 MW)



Semeter et al. (2009).

1. AMISR-14



- AMISR-14 is a 14-panel (224 kW) version of AMISR
- 2010: MRI to UMET (now Ana G. Mendez University), Puerto Rico
- 2014: Deployed at Jicamarca but suffered several technical issues
- 2019: UTD-Jicamarca started repairs (NSF). Tech. support from SRI.
- 2021: Started semi-routine observations in July.

1. AMISR-14

- ISR thought to be difficult and 2014 ISR experiments were not successful. Focus given to CSR observations.
- Our ability to model ESF has evolved dramatically over the past several years. See, for instance, works by J. Huba, D. Hysell, J. Retterer, T. Yokoyama, etc.
- The community would benefit of a similar evolution in our ability to observe ESF.
- Work with AMISR-14 was targeted at producing a *two-dimensional views of ESF dynamics* in the magnetic equatorial plane.

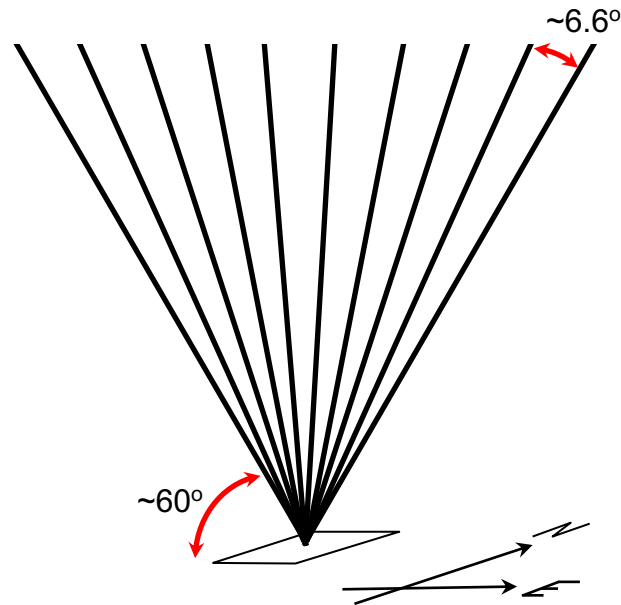
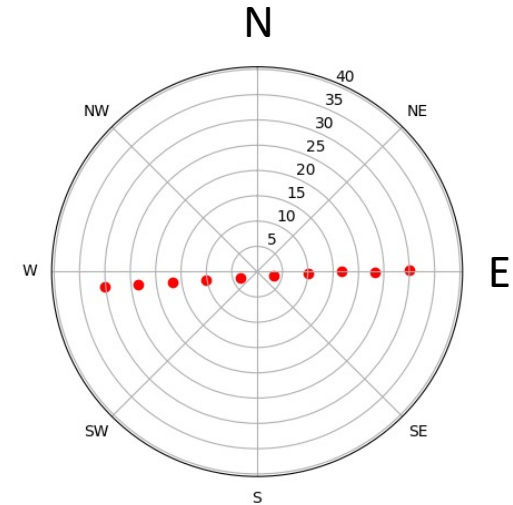
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2. Two-dimensional ESF Mode

2021 10-beam F-region experiment

Parameter	Value
Frequency	445 MHz
Panel Config.	7(NS) x 2(EW)
Beamwidth	2°(NS) x 8°(EW)
Total power	~200 kW
IPP	937.5 km
Pointing directions	10
Code	28-bauds
Baud length	3.0 km
Coherent int.	None
Incoherent int.	320/beam (20s scans)

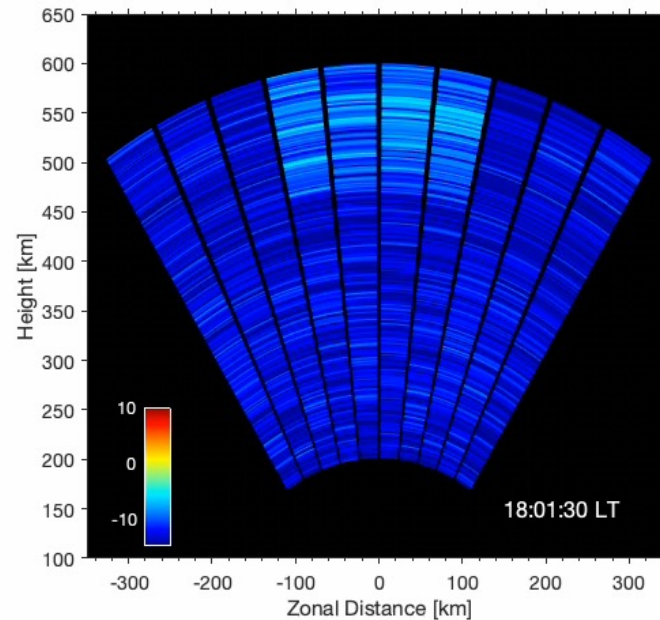
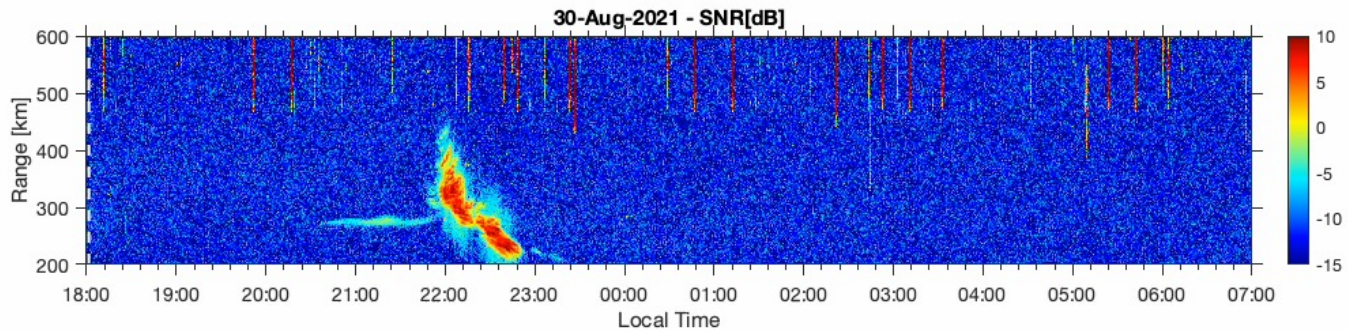
Beam	Az	Elev
1	-95.2°	59.5°
2	-96.5°	65.8°
3	-97.7°	73.8°
4	-99.5°	80.3°
5	-108.4°	86.6°
6	102.5°	85.1°
7	93.2°	80.4°
8	90.0°	74.0°
9	90.0°	66.0°
10	88.9°	61.2°



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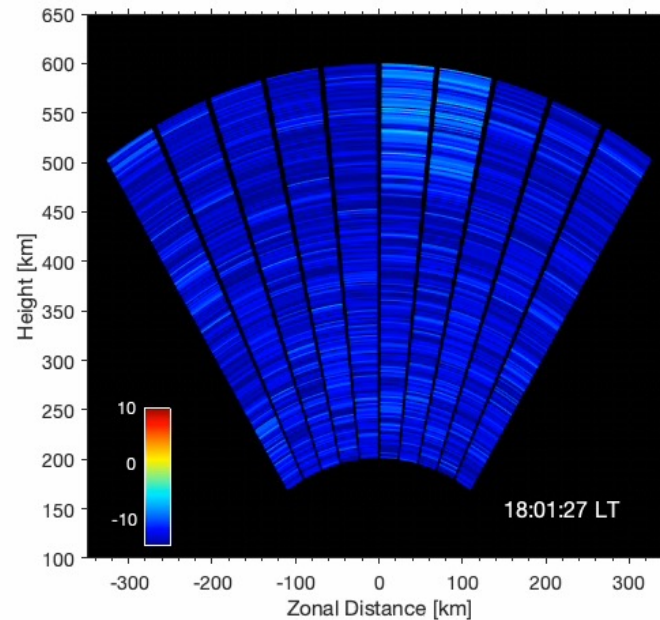
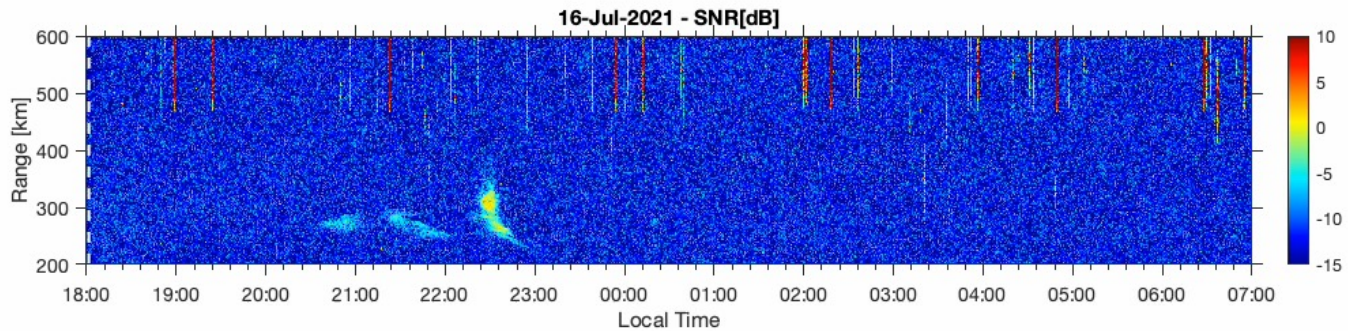
3. Examples of observations

- Example #1: Pre-midnight ESF

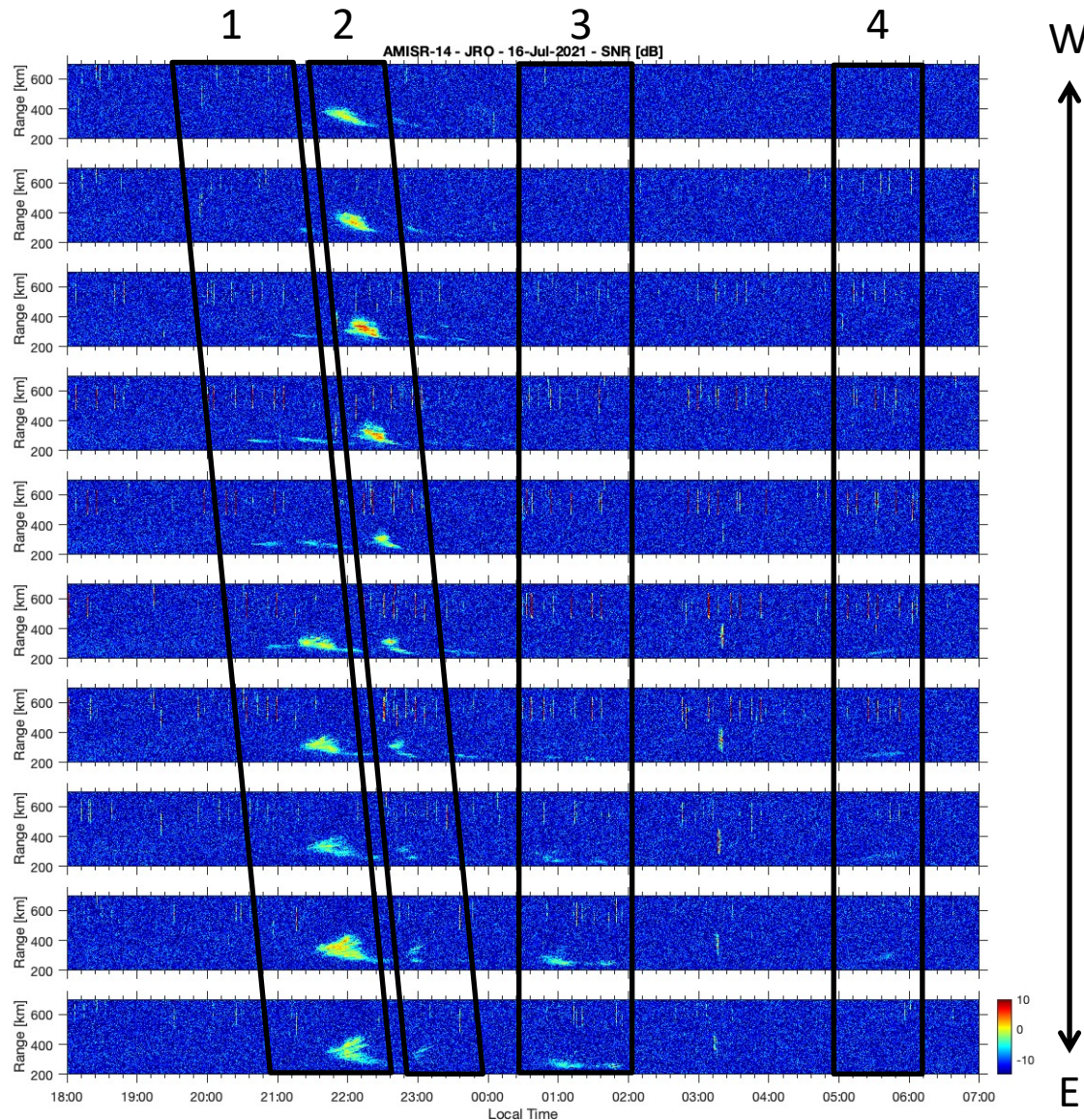


3. Examples of observations

- Example #2: Pre- and post-midnight ESF



3. Examples of observations



1. Local ESF.

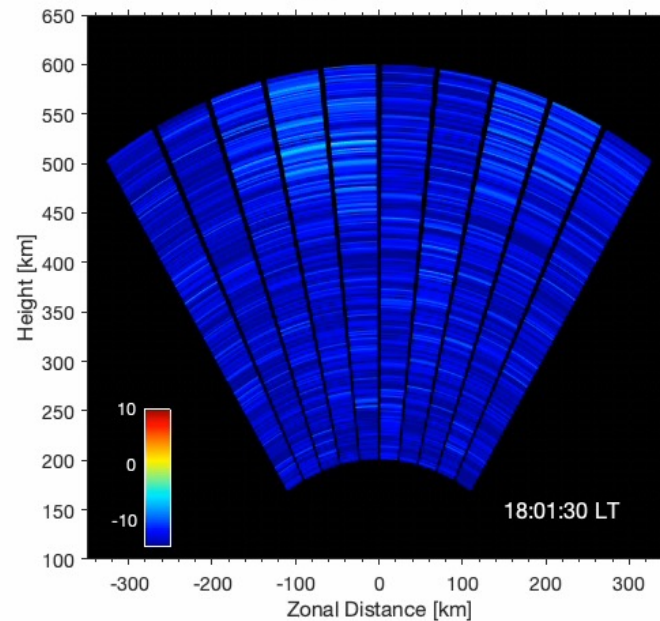
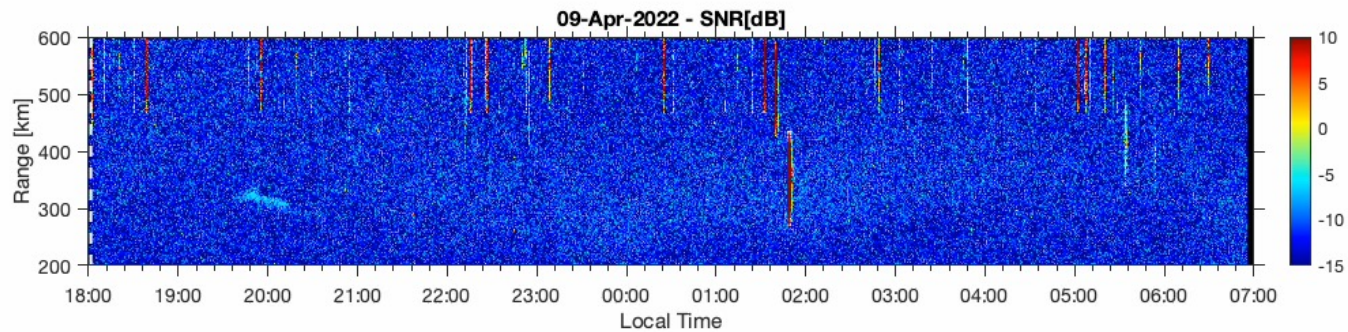
2. Non-local ESF.

3. PM ESF.

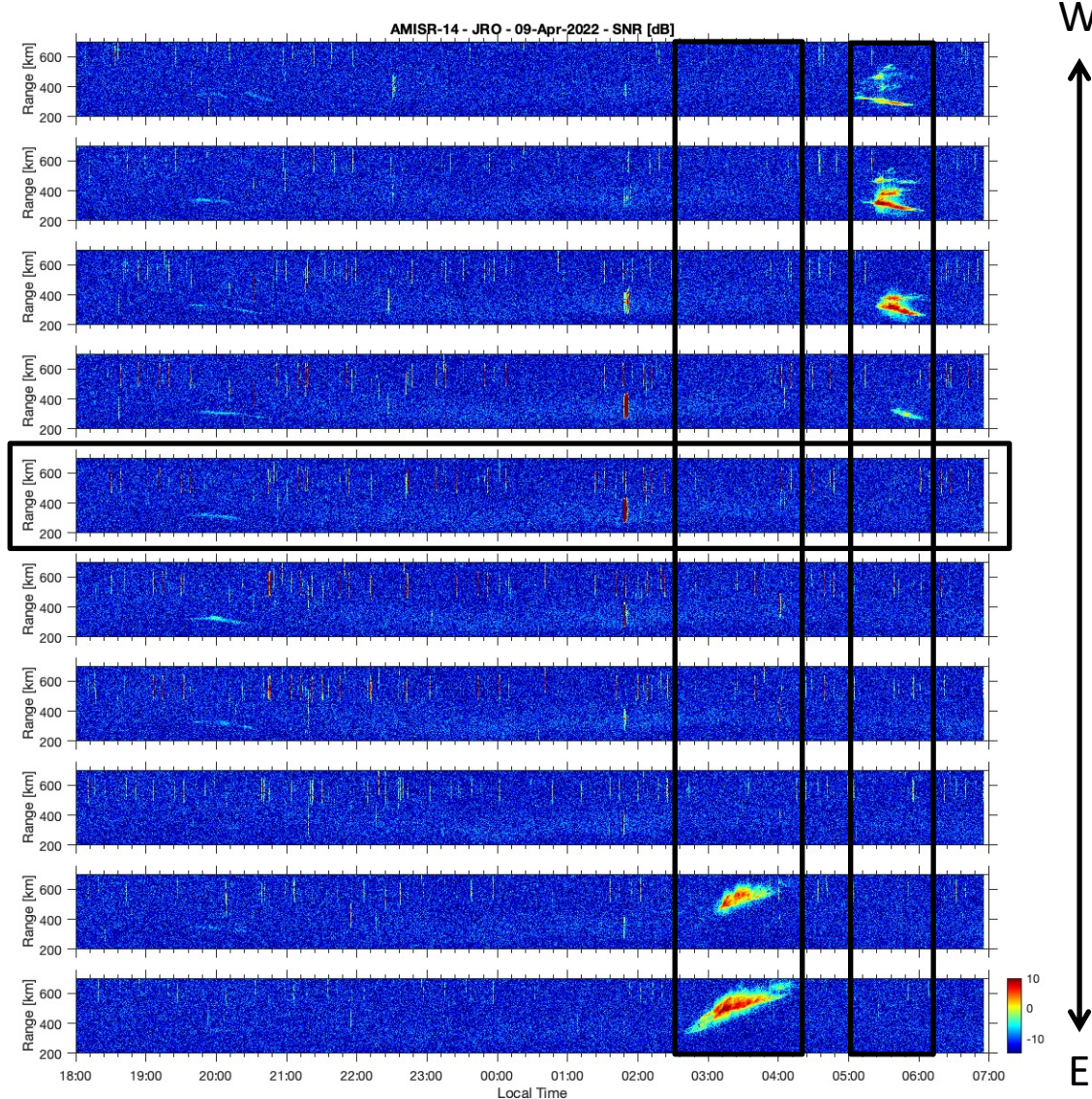
4. Pre-sunrise ESF.

3. Examples of observations

- Example #3: Post-midnight ESF

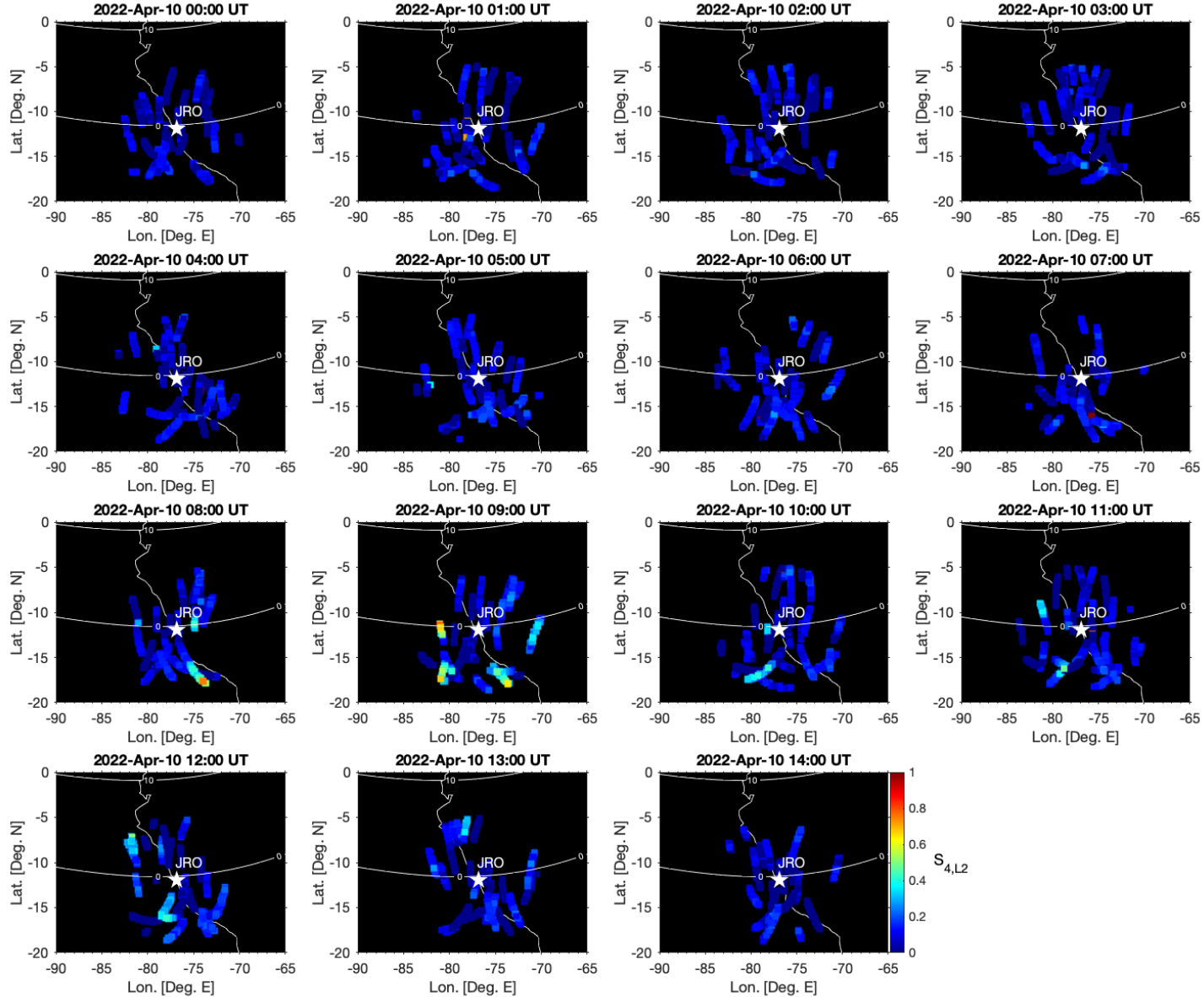


3. Examples of observations

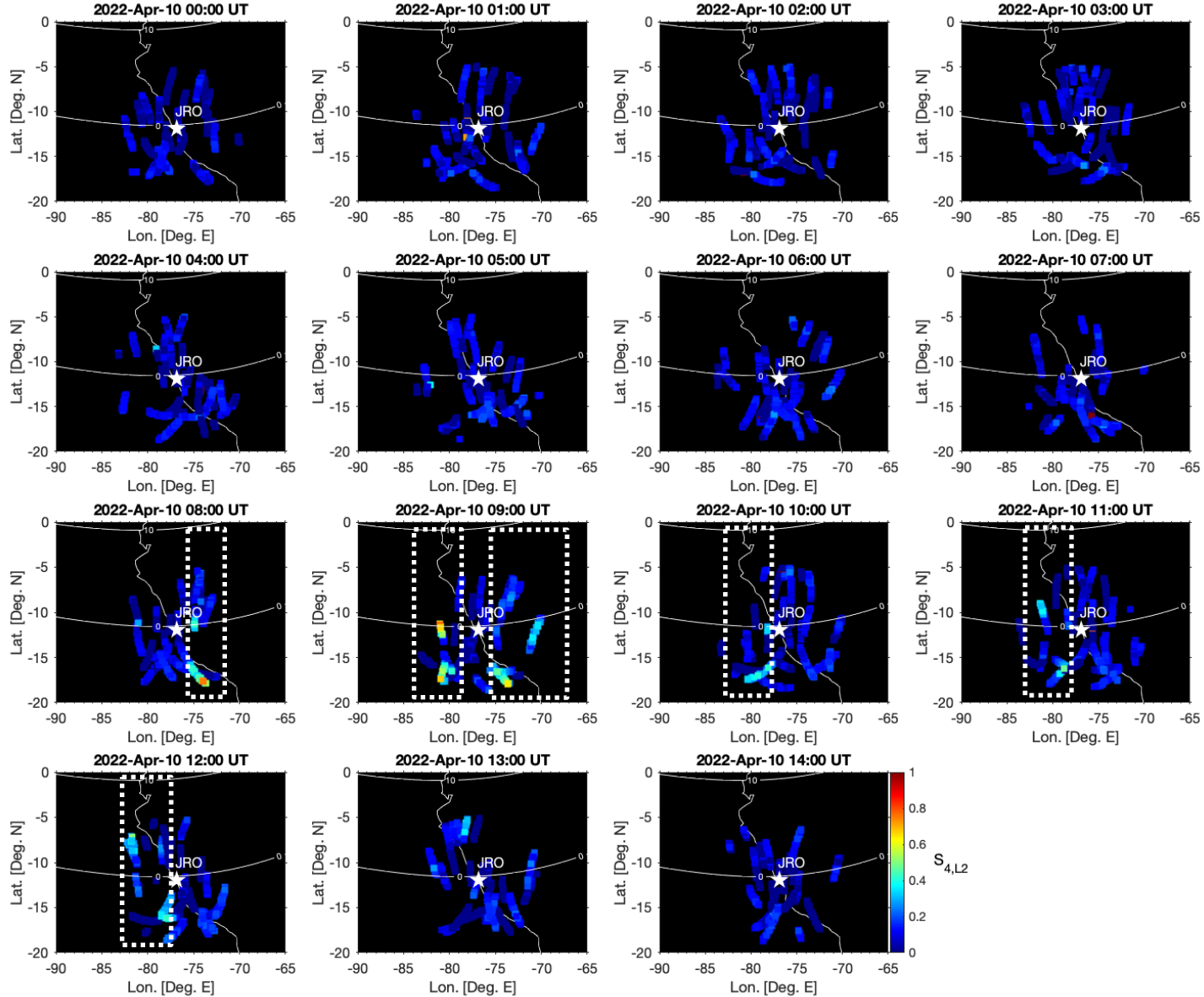


- A single pointing direction can miss important information.

3. Examples of observations



3. Examples of observations



Outline

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4. Status of observations and operations

- Semi-routine observations started on July 16, 2021. Over 200 observation nights between July 16, 2021 and May 22, 2022.
- Data being processed and products to be made available to the public.
- Other experiments done and underway (150 km echoes, high altitude echoes, etc.).
- Exciting additional result: Detection of ISR echoes. Talk by Marco Milla.