Challenges for Deployment of Optical Instrumentation

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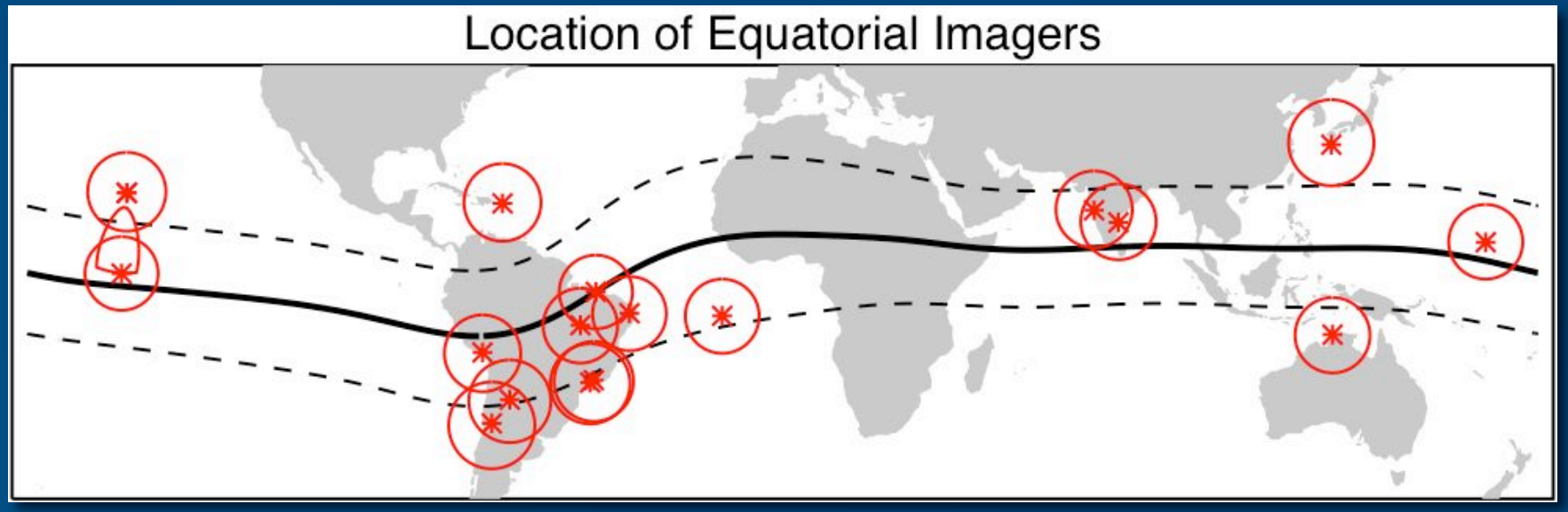
Motivation

- Optical instruments (ASIs, NFIs, FPIs, etc) will play a significant role in a successful DASI
  - Provide information (winds, 2D structure, etc) not easily obtainable from other insturments
- There are several (possibly) unique challenges involved in planning, deploying, and maintaining a network of optical instruments
- This talk represents the views of a "new and small player" in the terms of Eric Donovan's morning talk

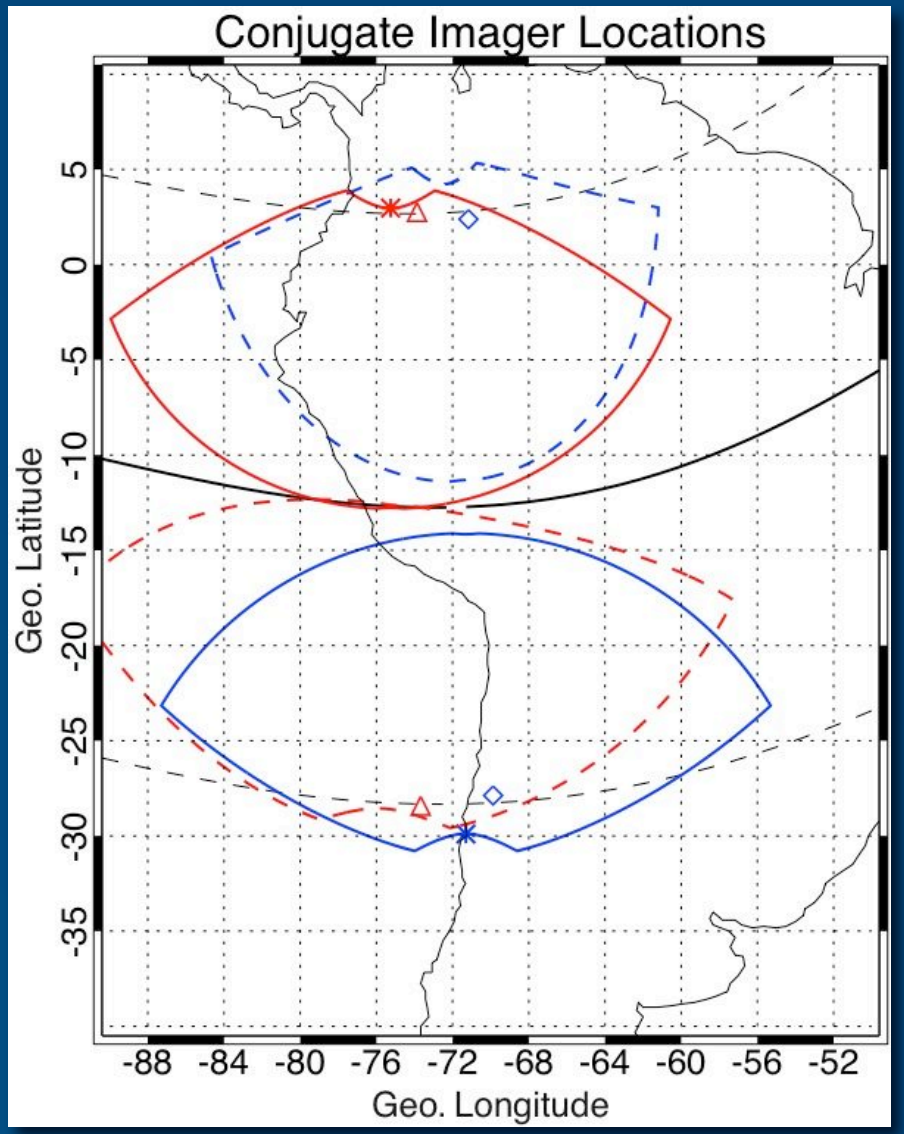
Low-Latitude Imaging



- Figure is circa 2005, more systems are planned from various groups in the near future
- Large arrays at high latitudes

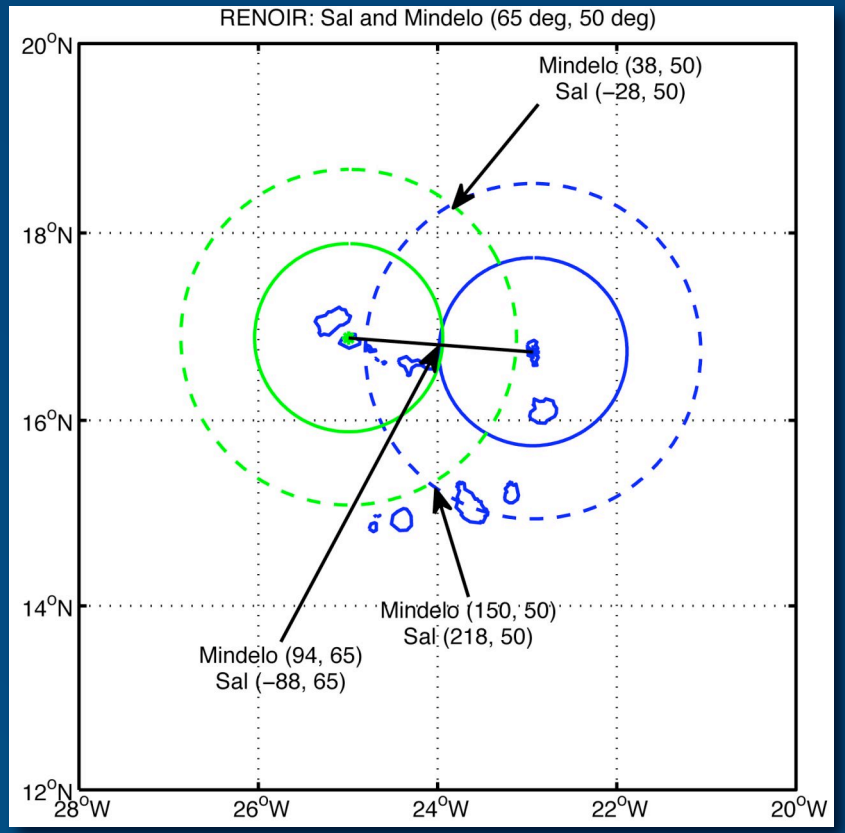
South America

- Imaging system and GPS L1 scintillation monitors
  - Cerro Tololo Inter-American Observatory (operating since Aug 2006)
  - Colombia (in progress)
- Collaborations with JRO and LISN



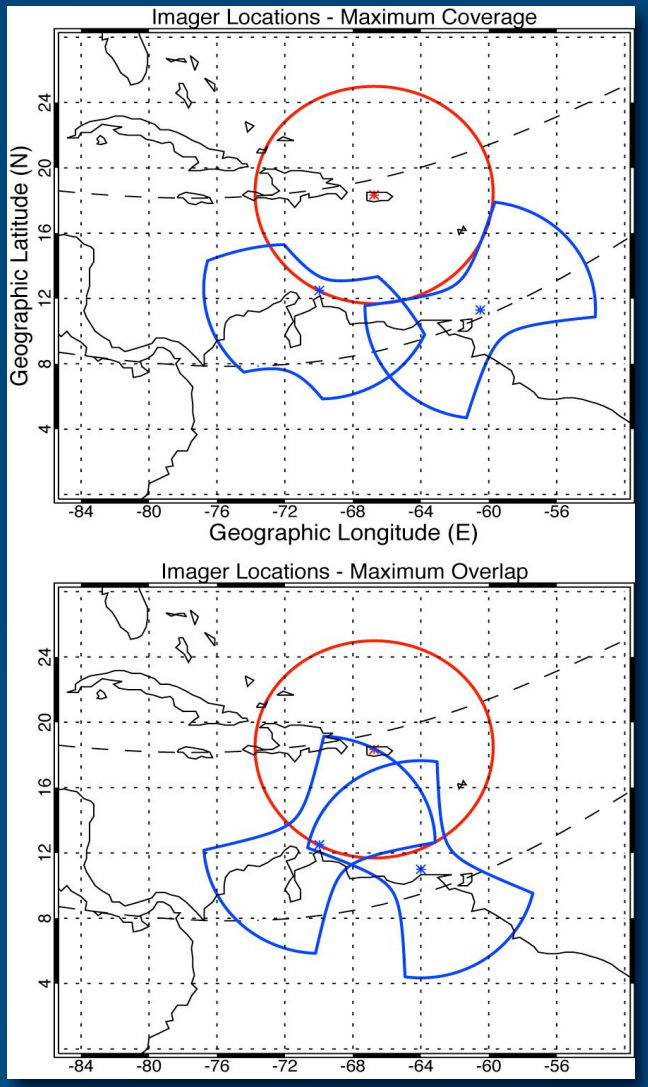
RENOIR in Cape Verde

- **R**elocatable **E**quatorial **N**ighttime **O**bservatory of **I**onospheric **R**egions (RENOIR) to be located in Cape Verde
  - Two FPI systems
  - One PICASSO system
  - Five GPS L1 scintillation monitors
  - One dual-frequency GPS receiver
- Collocated with an AFRL SCINDA station



Southern Caribbean

- Additional imagers in the Caribbean will allow studying spatial extent of mid-latitude structures
- Overlapping fields-of-view will allow attempting tomographic inversion of data
- GPS equipment will monitor system effects



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Deployment Considerations

- Optical instrumentation tends to be larger, more fragile, and more expensive than most of the radio equipment (e.g., GPS) being considered for DASI
- Infrastructure required is likewise more complex than supporting a GPS receiver
- Consequently, the network of optical instruments in DASI will be sparser than the GPS network
  - Compensated by larger fields of view

Infrastructure Requirements

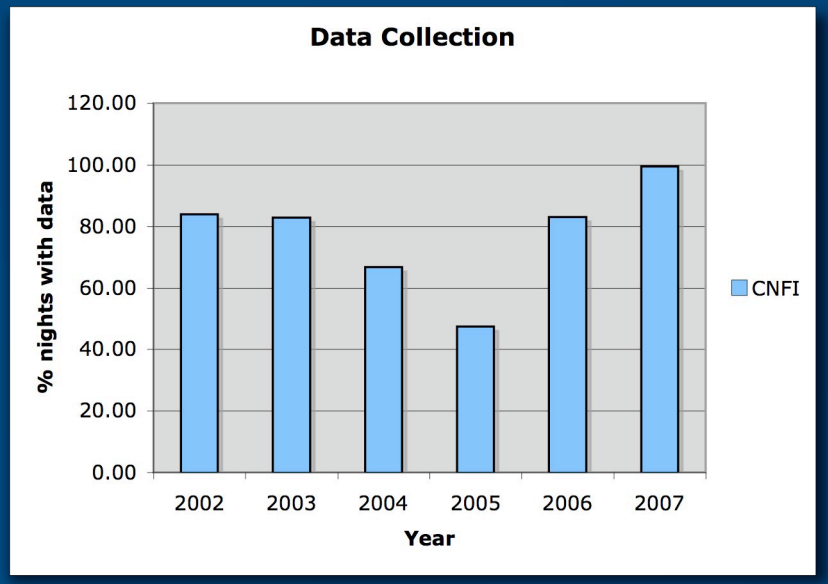
- Dark, clear skies removed from city light pollution
- A good/stable thermal environment
- Reliable power and internet connections
- Permanent buildings when possible, but modified trailers or shipping containers will do

Shipping

- Each country has its own shipping/customs regulations
- Shipping as "academic equipment" helps lessen the cost of customs, but requires paperwork and someone on the inside to help
- Easiest when a conduit (e.g., NSF facility) already exists to get instrument into the country
  - Having internal contacts helps, but does not guarantee a smooth process

Maintenance (Day-to-Day)

- Optical instruments are becoming significantly more robust in terms of long-term operation
- Periodic maintenance is still required
  - Cleaning optics/domes etc
  - Replacing liquid coolant (not an issue with newer CCDs)
  - Disk storage
- This costs time/money and requires on-site support (or a large travel budget)

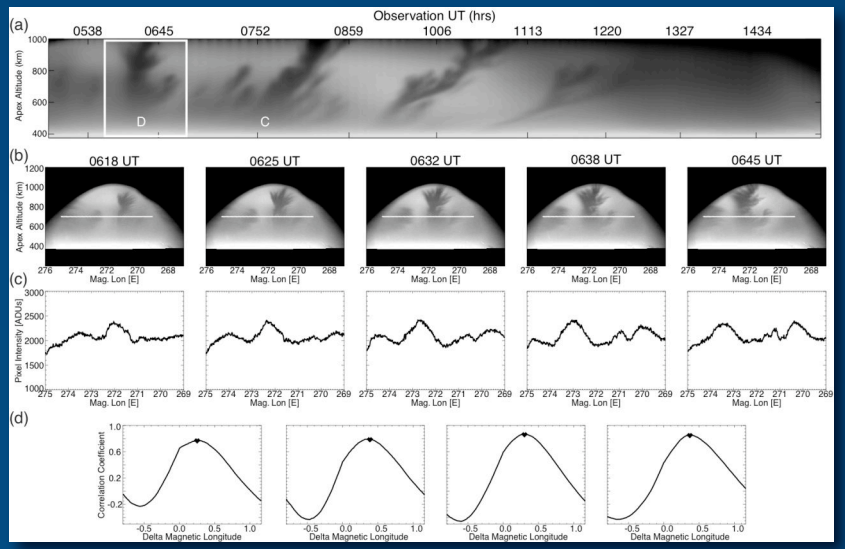


Maintenance (Malfunctions)

- Remotely diagnosing a malfunctioning system is tricky and time consuming, usually requiring people at both ends
- Replacing an entire optical system (e.g., having spares) may not be a feasible option due to cost of single instrument
  - CCDs, mechanics (filter wheel, scanning heads), and computers are most likely culprits and spares should be on hand
- Recalibration may be an issue

Automated Processing

- Imaging systems create large data sets
  - ~1 Gb/night/system, larger with newer/larger CCDs
- For real-time implementation, this must be reduced
  - Quick-look information routines currently available for most types of optical instruments
- For post-processing, large storage arrays are needed



Integration into the Larger System

- For the small player, need to maintain something "unique" about their dataset
- To integrate into a database/model/VxO, the community needs to agree upon data formats and standard processing routines
  - Is a "standard" instrument required/desired to obtain this, or is there an advantage to diversity?
- Need easily searchable databases to find corollary datasets

Pre-DASI Considerations

- A centralized location to handle shipping/customs for DASI instruments is highly desirable
- Maintenance of optical instrumentation is inevitable and will likely require on-site support
- Automated processing techniques need to be developed now to reduce amounts of bandwidth required for real-time operations
- Still need an agreed-upon standard for imaging products and processing methods