Overview of JIVE Project

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(on behalf of everyone)

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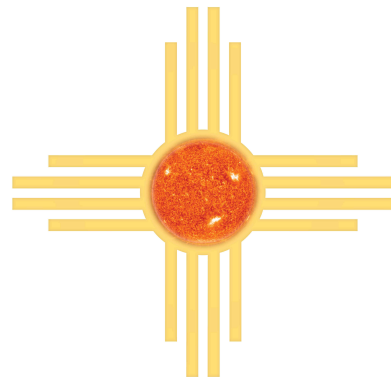
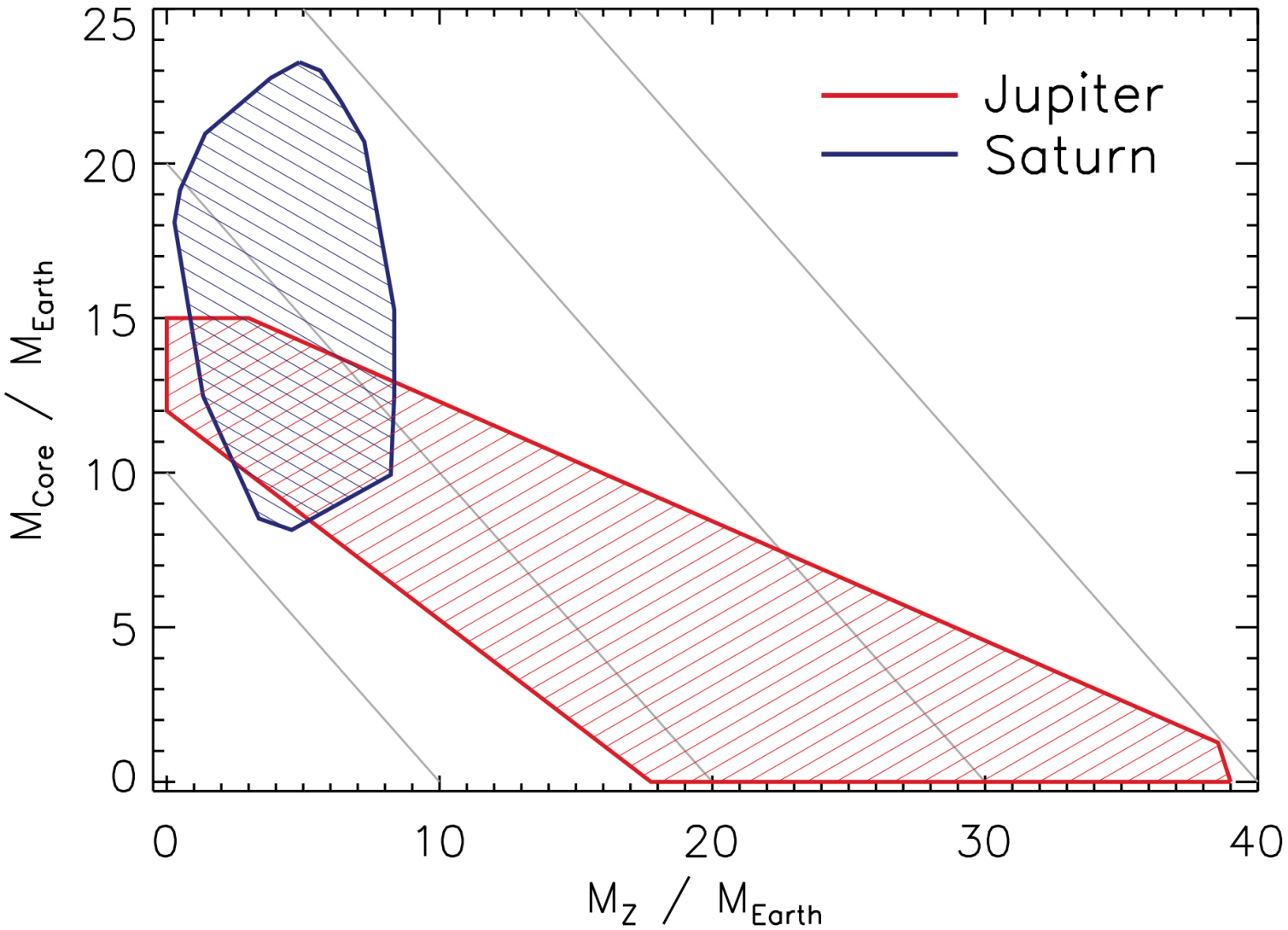
New Mexico State University

June 26, 2017

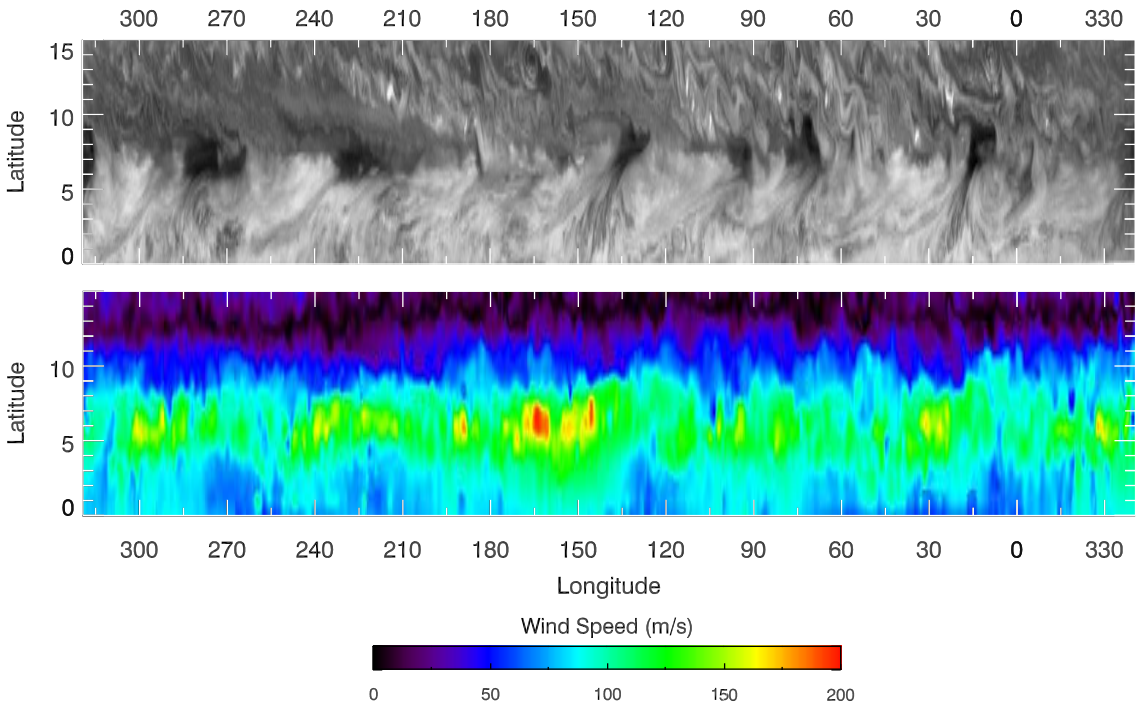
NASA Technical Review

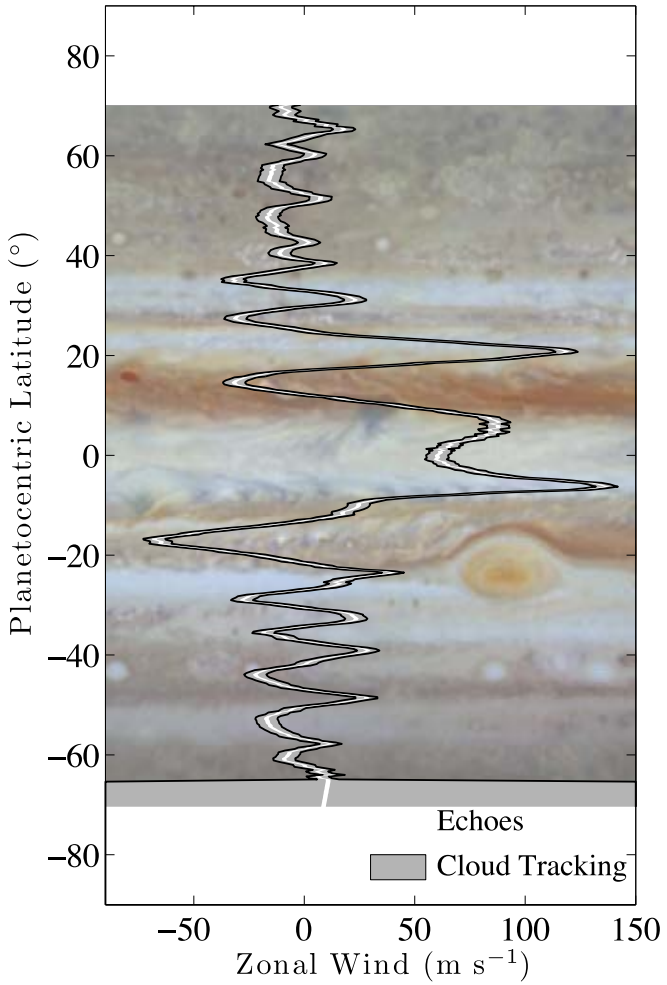


Motivation - Interiors

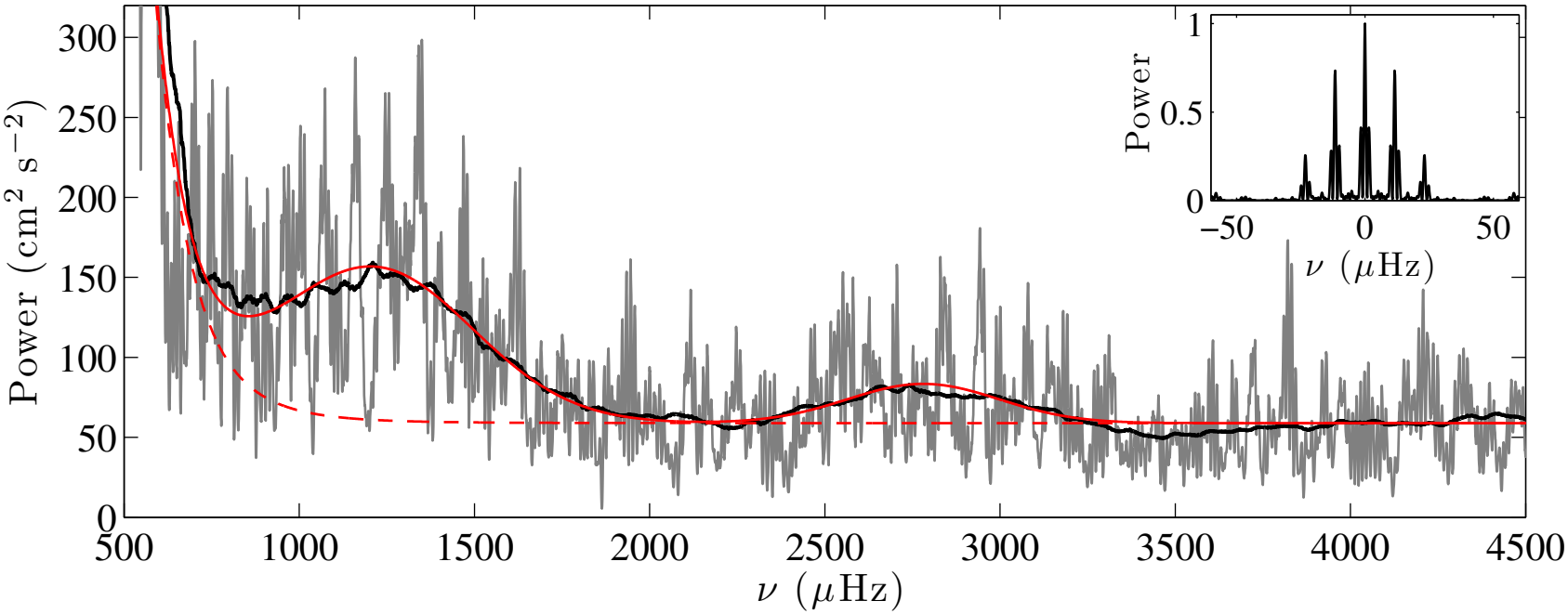


Motivation - Atmosphere

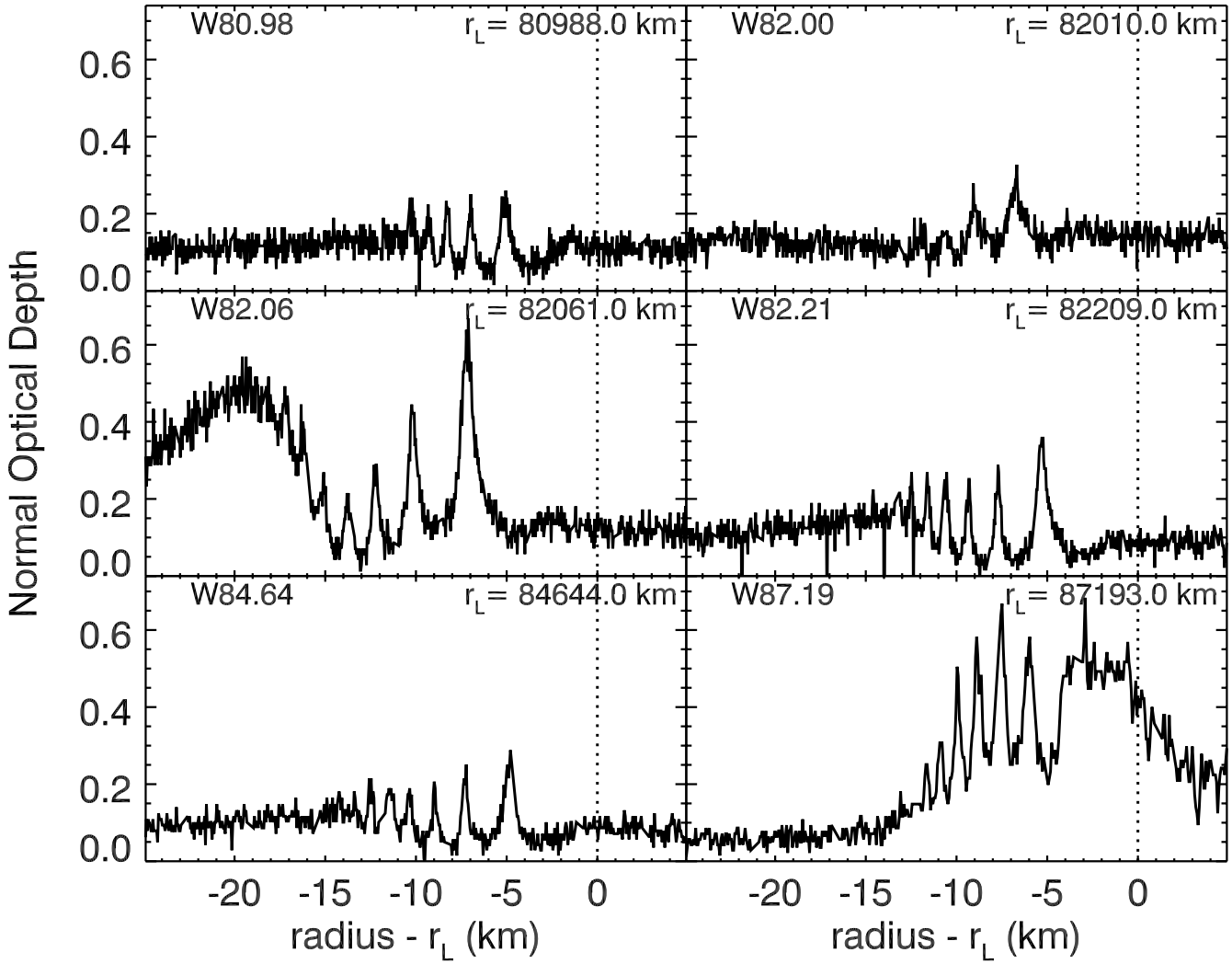




Motivation - modes on Jupiter



Motivation - modes on Saturn



Hedman & Nicholson (2013)

Goal 1

Instrumentation Goal: *Build an imaging spectrograph capable of measuring Jovian oscillations within the three-year award period.*

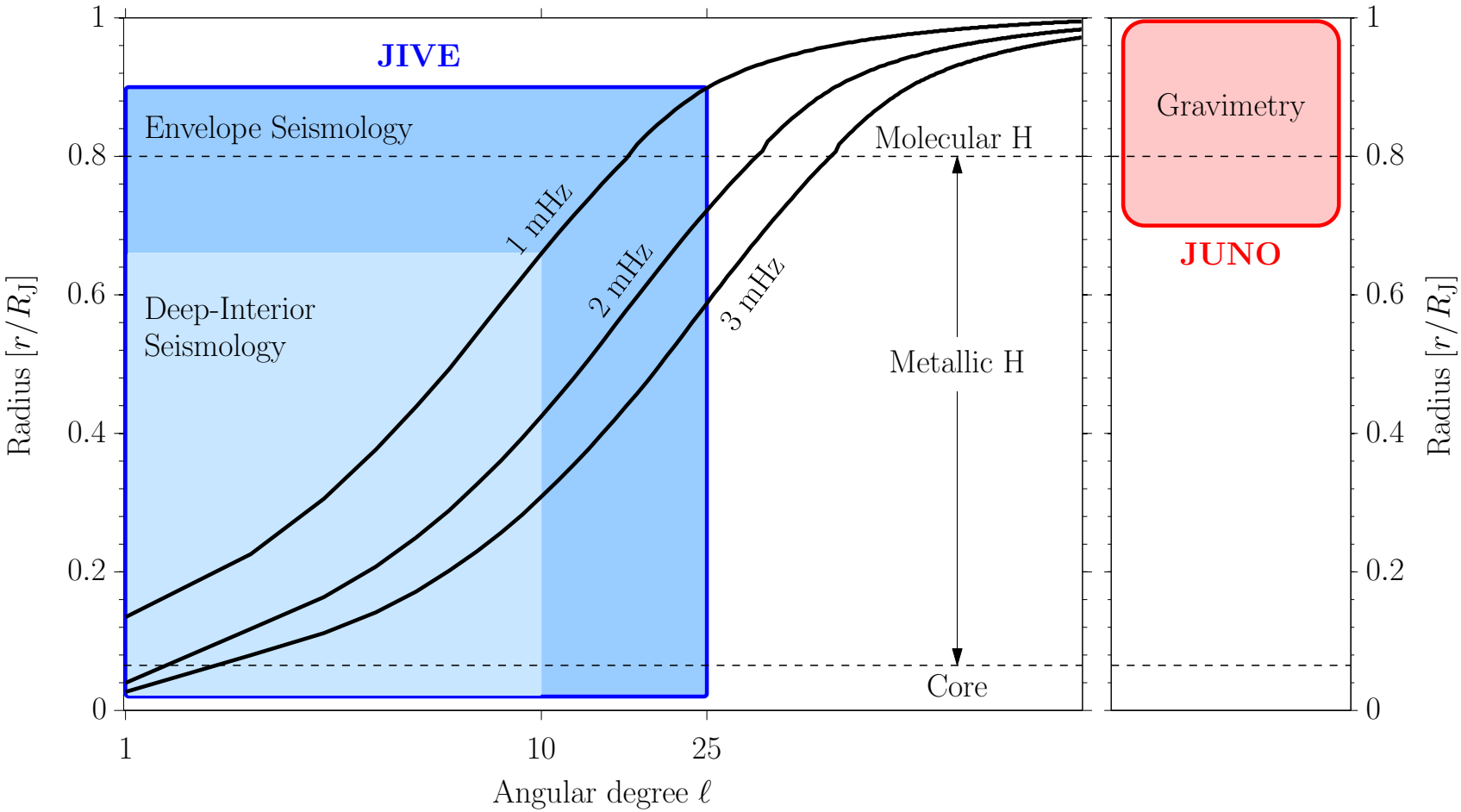
- Adapt an instrument design that has an expected order of magnitude more sensitivity than previous instruments (T2);
- Mount the instrument on a suitable telescope to carry out monitoring of giant planets (T3);
- Develop the software needed to control the instrument and perform data acquisition and reduction(T3);
- Assemble a team of experts who regularly meet and review construction progress.

Goal 2

Science Goal: *Determine the interior structures of Jupiter and Saturn to a precision better than ever achieved, enabling the resolution of competing theories about the formation of our giant planets.*

- Measure Jupiter and Saturn's core mass to within several Earth masses;
- Measure the total mass of heavy elements to within several Earth masses;
- Identify structural discontinuities of the interior density and sound-speed profiles (T5);
- Validate and compare JIVE sub-surface inferences with those from the NASA Juno mission.

Where do these modes probe?



Goal 3

Science Goal: *Uncover new details of the dynamic atmospheres and climatology of the Jovian planets.*

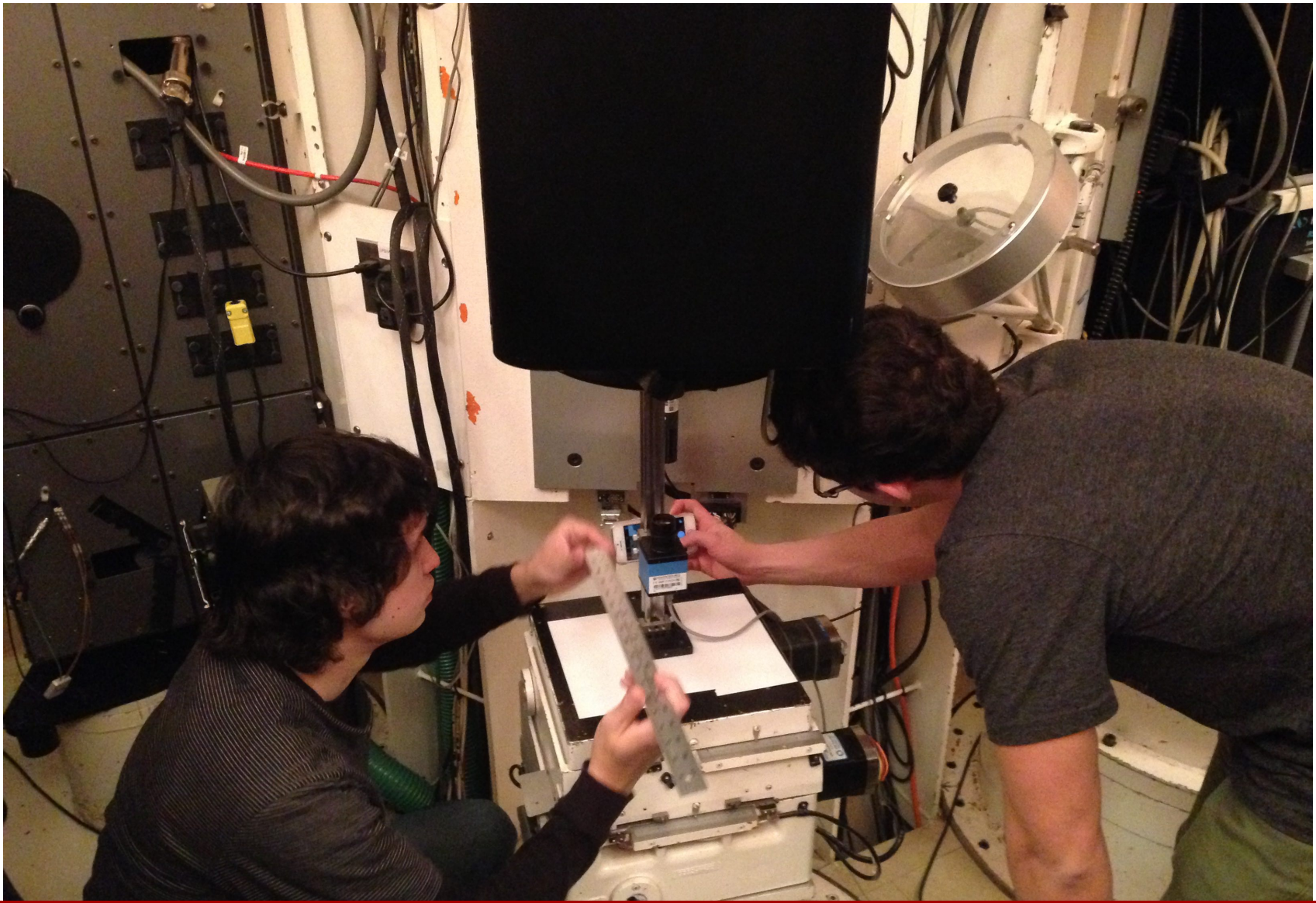
- Determine wind speeds directly from JIVE maps and compare to cloud-tracking results;
- Measure the momentum cycle driving zonal jets by calculating eddy momentum fluxes;
- Directly characterize the planetary-scale waves in the wind signatures in the Jovian atmosphere;
- Indirectly probe the deep convective region of the planet to advance our understanding of tropospheric-stratospheric coupling (T6, T7).

Goal 4

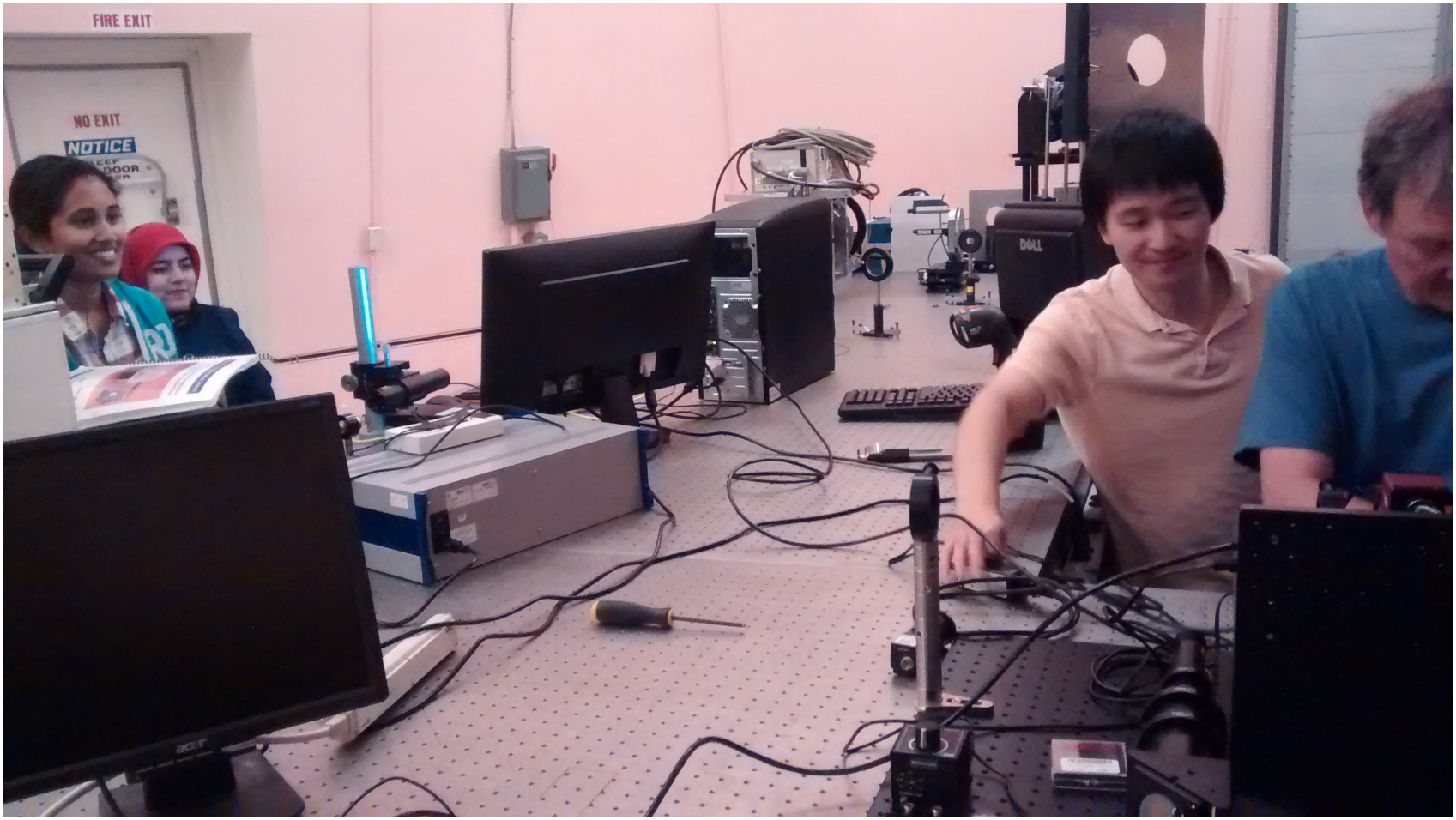
Education Goal: *Train students in technical areas of astronomical instrumentation and modern planetary science to prepare them for careers in related fields.*

- Hire three graduate students in engineering and astronomy whose work in JIVE will form the bulk of their graduate degrees;
- Involve up to six undergraduate students in all aspects of the project;
- Provide effective mentoring and advising practices to help form pathways for future student participation in JIVE.

Initial setups



Last week



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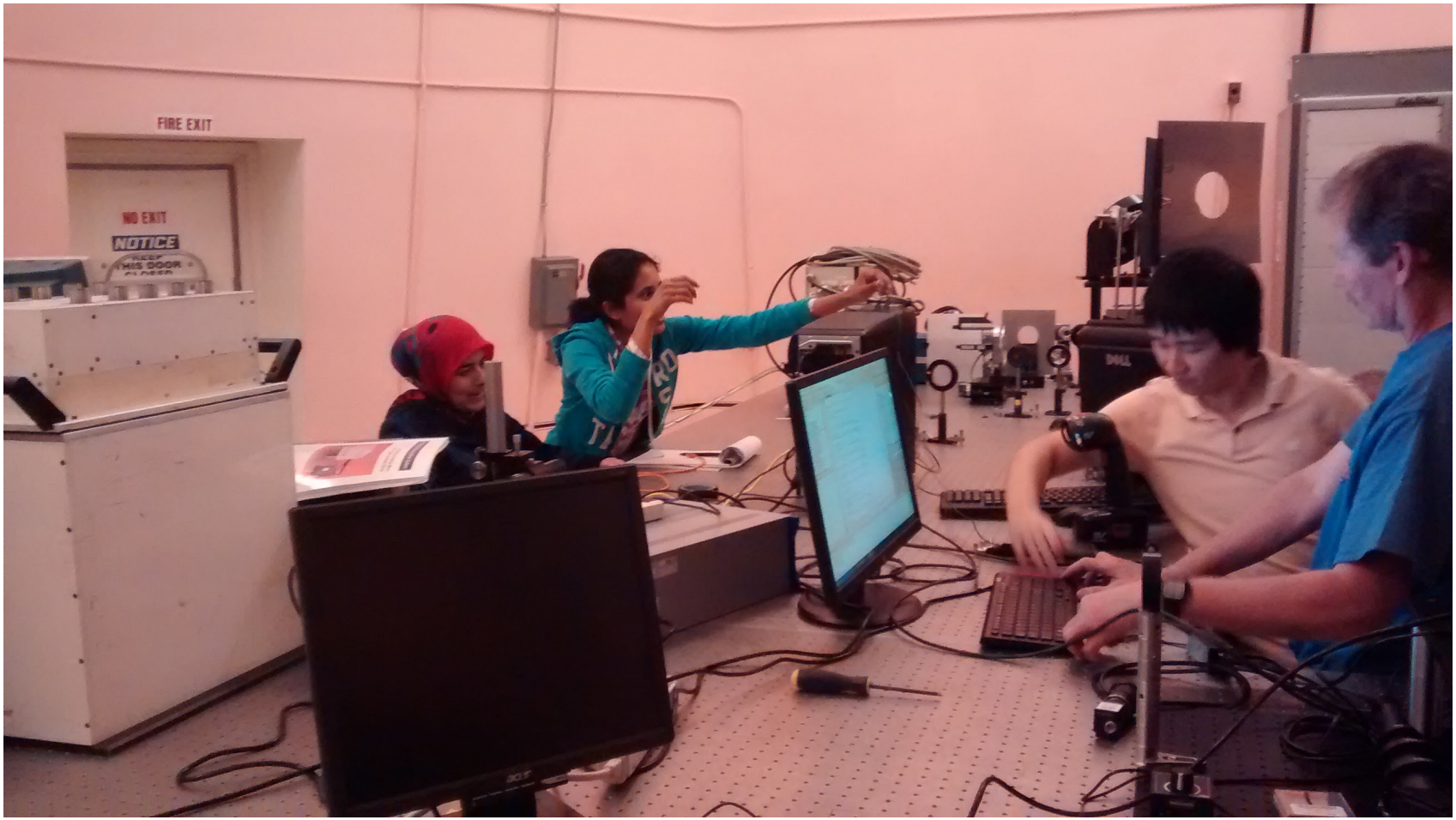


Goal 5

Collaboration Goal: *Develop long-lasting and diverse research partnerships within New Mexico and beyond*.

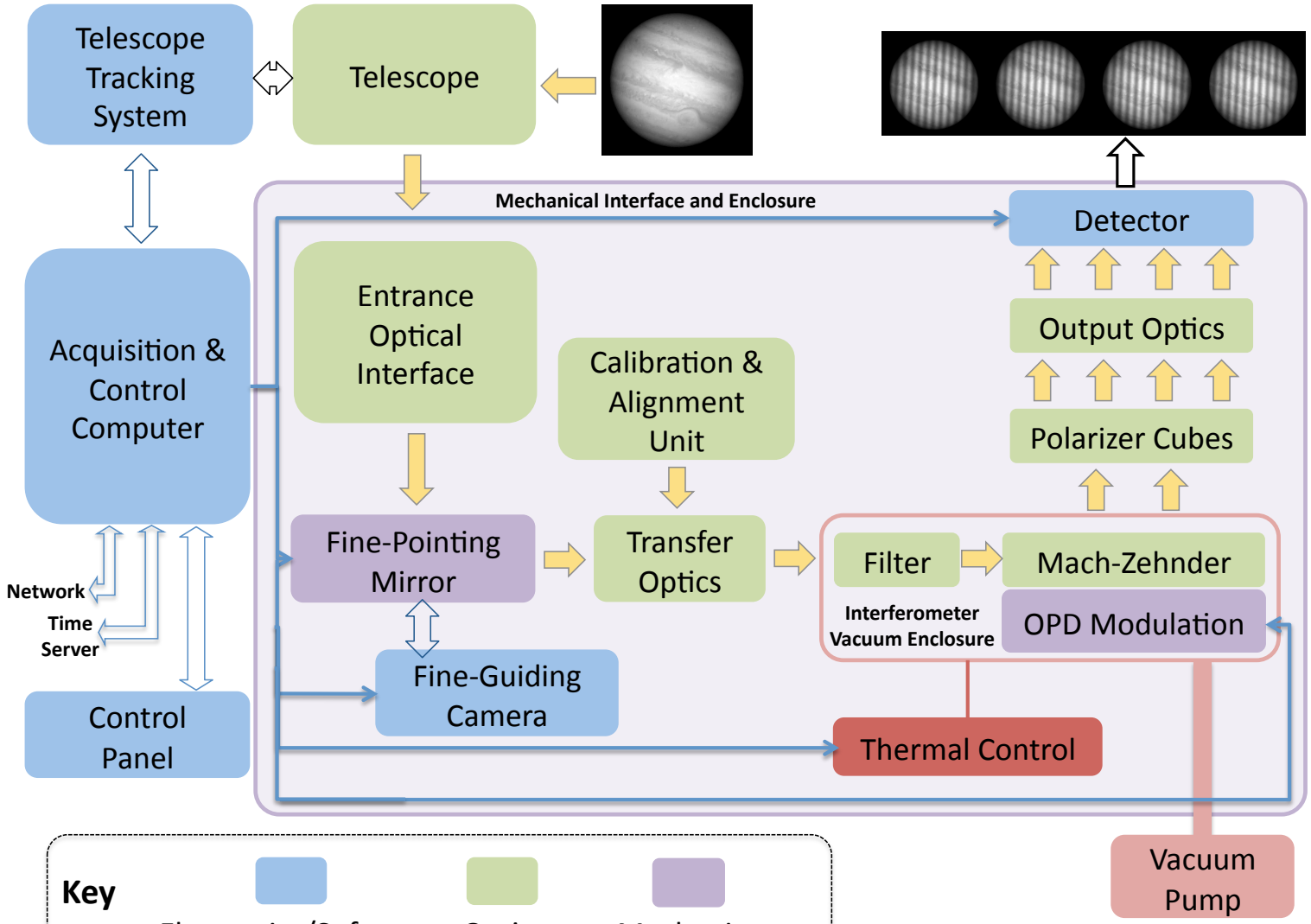
- Engage researchers in New Mexico's universities and national laboratories whose interests overlap with JIVE;
- Utilize existing collaborations with key NASA partners to strengthen the relevance of the project to NASA's scientific priorities;
- Leverage existing international collaborations with critical expertise in this area, and build the case for a future global network of similar instruments (T8).

Timeline so far

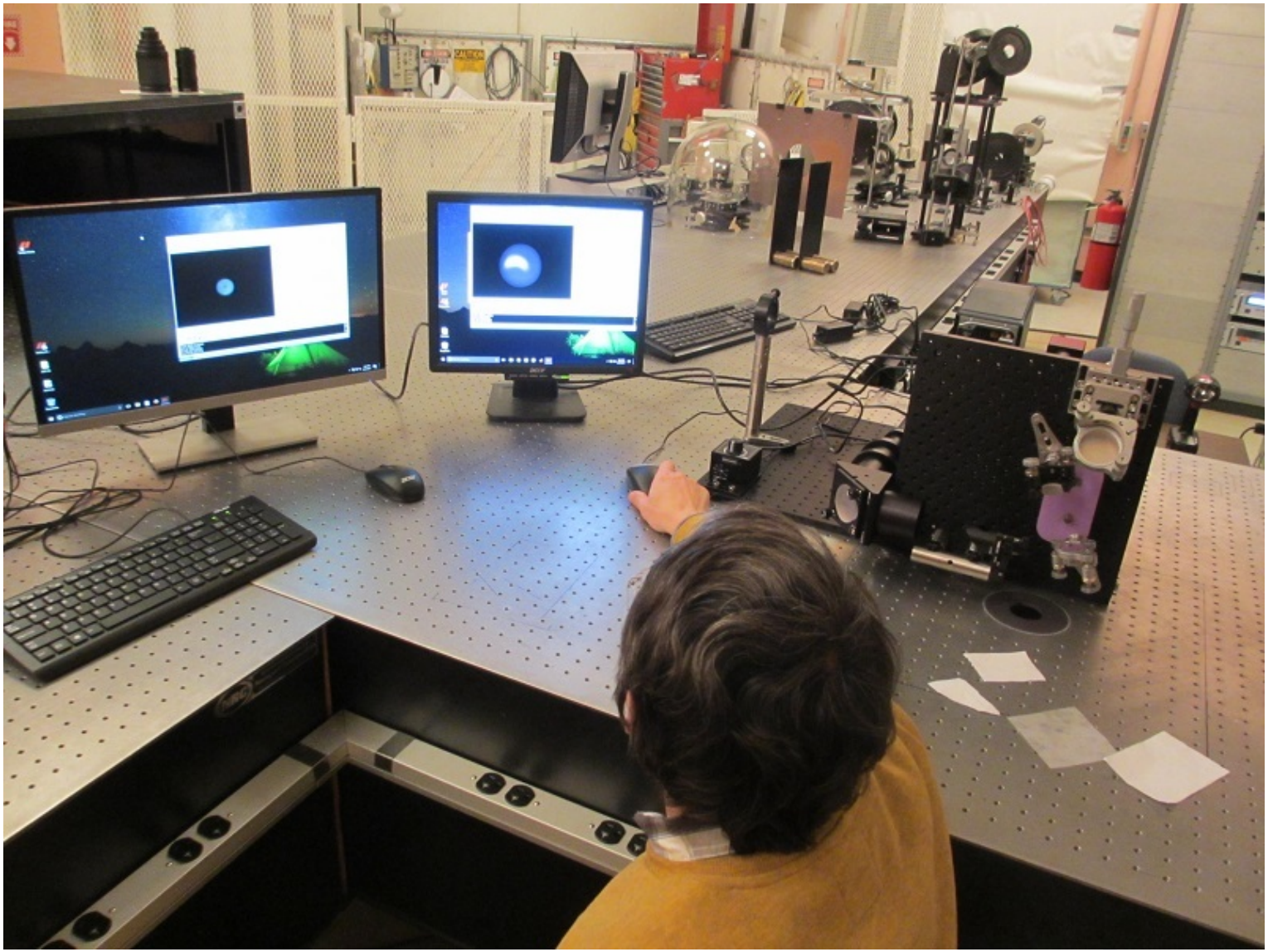
- NASA EPSCoR funding: $750k, 3 years
- October 2014: Project start date
- October 2014: First visit to Nice, Calern Obs.
- December 2014: JIVE Kickoff meeting
- Mid-2015: Telescope decision for DST
- April 2016: JOVIAL Kickoff meeting
- February 2017: Interface installation
- June 2017: Tests (T4)
- June 2017: NASA Review
- September 2017: Tests with DSI
- April 2018: Science observations with JIVE
- July 2018: End date

Dunn Solar Telescope

Instrument Components



Feb. 2017 at DST



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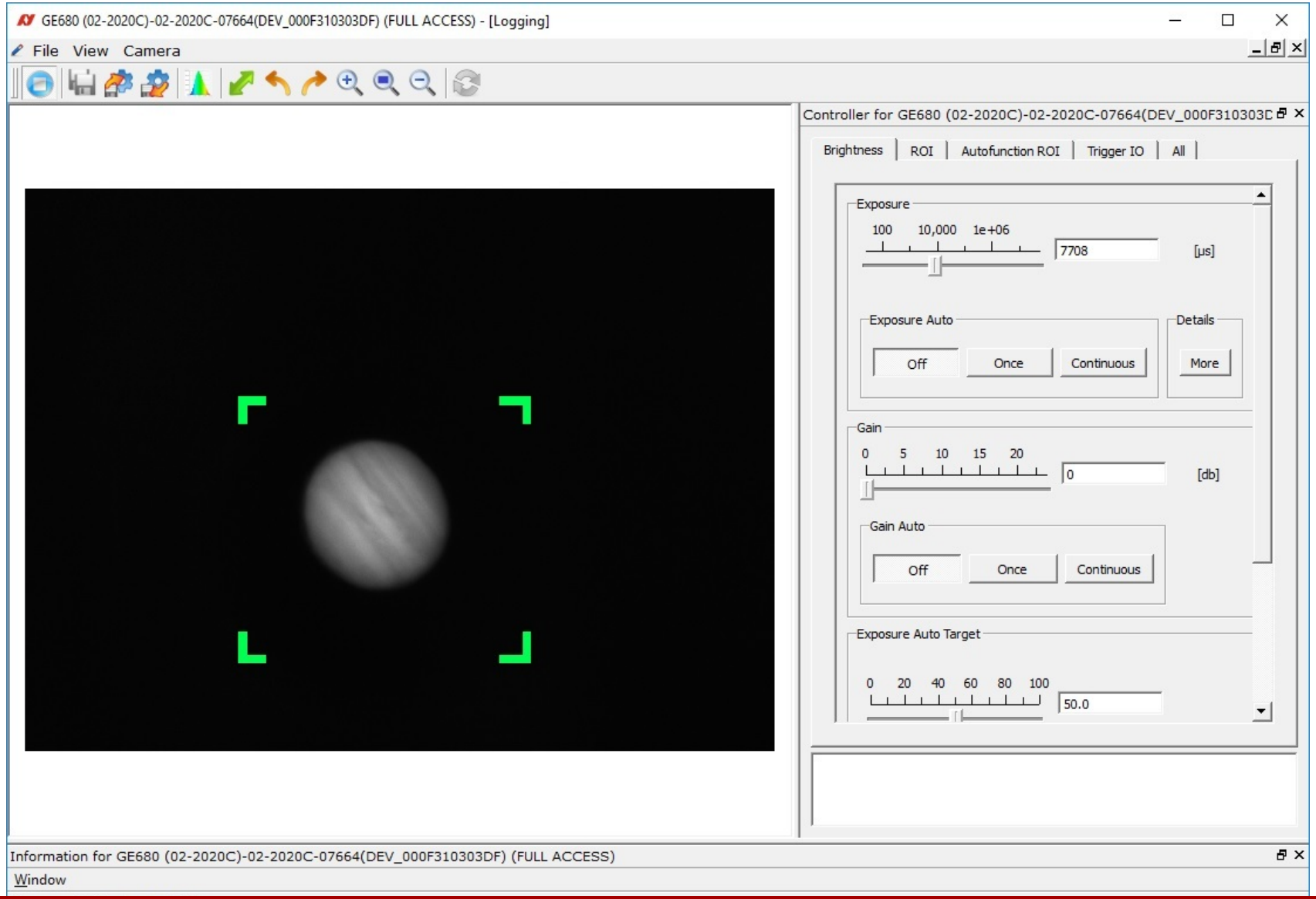
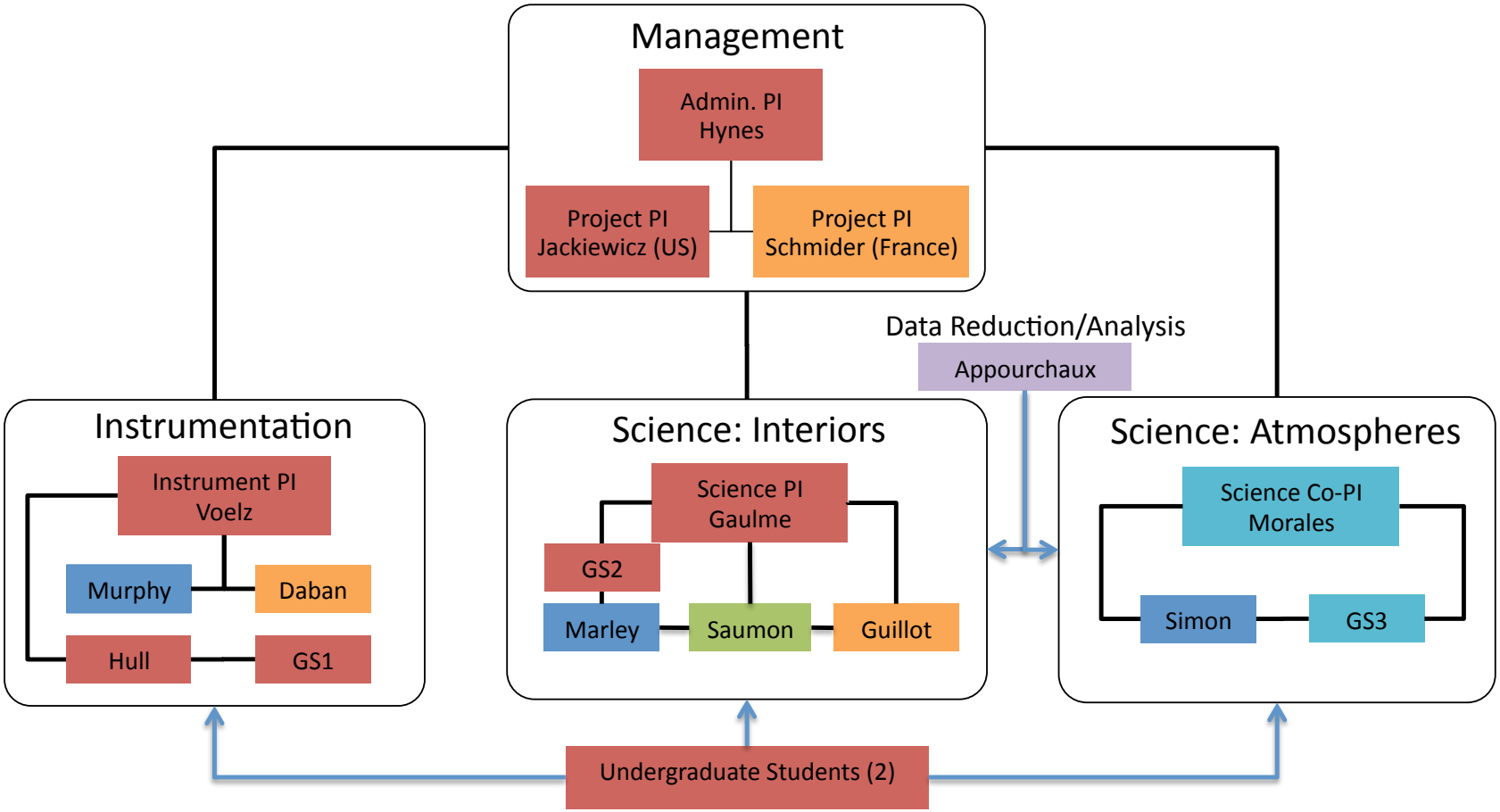


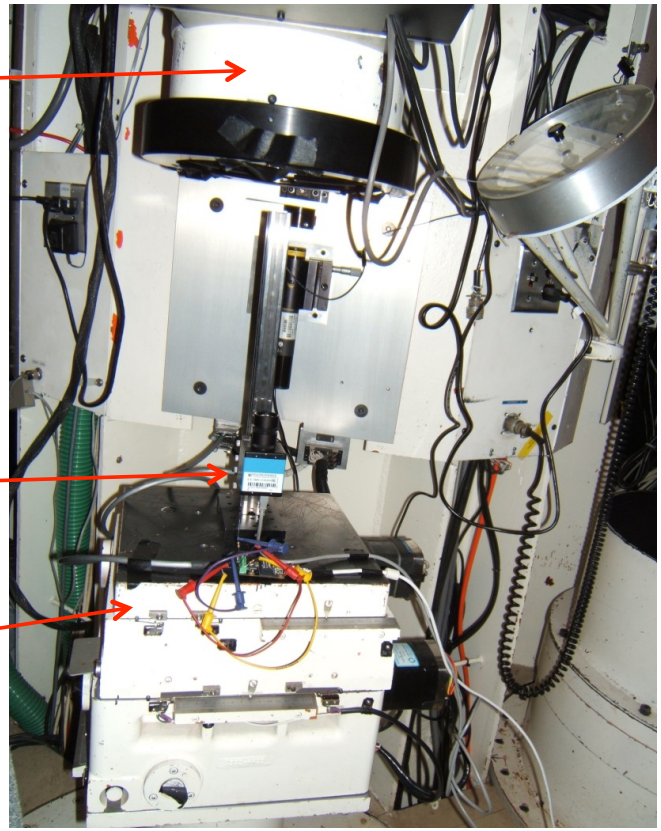
Structure

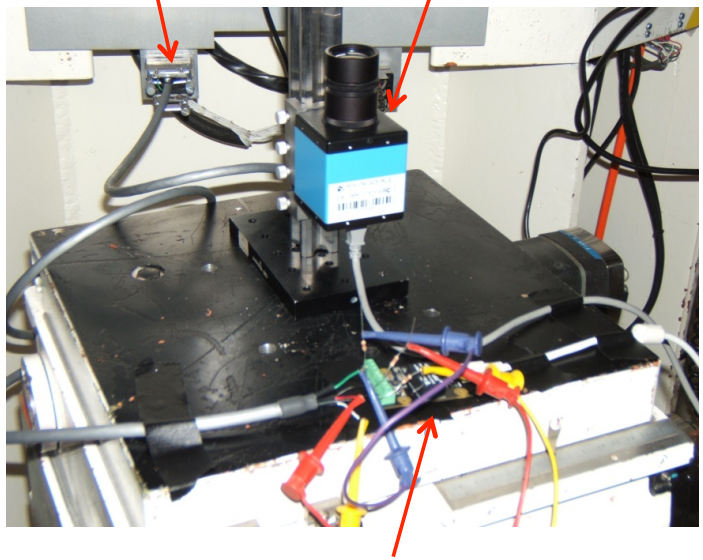

Management
Admin. PI
Hynes
Project PI
Jackiewicz (US)
Project PI
Schmider (France)
Data Reduction/Analysis
Appourchaux
Instrumentation
Instrument PI
Voelz
Murphy
Daban
Hull
GS1
Science: Interiors
Science PI
Gaulme
GS2
Marley
Saumon
Guillot
Science: Atmospheres
Science Co-PI
Morales
Simon
GS3
Undergraduate Students (2)

Accomplishments so far

- 5 graduate students involved in project
- Several engineering undergraduate students
- 4 papers published in refereed journals
- 3 papers in preparation
- Fruitful collaboration

Challenges - nighttime guiding (T3, T4)





Challenges remaining

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- Data analysis of multi-site observations