## Progress Report

- **Papers:** (1) Hooey, Toy, Carvalho, Fong, Gore, 2017, "Modeling operator workload for the Resource Prospector lunar rover mission", in Proceedings of the Applied Human Factors and Ergonomics Society Annual Meeting, Los Angeles (appears in Advances in Intelligent Systems and Computing, Springer); (2) Tauscher, Rapetti, Burns, Switzer, 2018, "Global 21-cm Signal Extraction from Foreground and Instrumental Effects I: Pattern Recognition Framework for Separation Using Training Sets", accepted in the Astrophysical Journal.
- **Meetings:** (1) Monsalve presented on "Characterizing the 21-cm Signal from Neutral Hydrogen in the IGM at Redshifts 27>z>6 with EDGES" at the *American Astronomical Society* (AAS) meeting in Washington, D.C., 8-12 January, 2018. (2) Burns presented on "SVD/MCMC Data Analysis Pipeline for Global Redshifted 21-cm Spectrum Observations of the Cosmic Dawn and Dark Ages" at the AAS meeting in Washington D.C., 8-12 January, 2018; (3) CU Graduate student Tauscher presented on "Separating the global 21-cm signal from strong foregrounds and instrument systematics using an SVD/MCMC pipeline" at the *International Union of Radio Science* meeting in Boulder, CO, 4-7 January, 2018.
- **Seminars:** Rapetti gave the Royal Observatory Edinburgh (ROE) colloquium on "Hydrogen cosmology: global 21-cm experiments and data analysis" on January 10, as well as a Lensing Lunch talk the same day on "Separating signals from systematics with an SVD/MCMC pipeline".
- **Outreach:** Burns was interviewed last month by the BBC radio program 'The Inquiry' about space and lunar exploration on the episode titled 'How Do We Rule The Universe?': http://www.bbc.co.uk/programmes/w3csvsyg; Burns was then interviewed on this same topic by the American Institute of Aeronautics and Astronautics for an article that should be published this year.
- **Awards:** CU graduate student Bang Nhan received an American Astronomical Society's Honorable Mention Chambliss Prize for a poster presenting new results from his dissertation. Nhan's poster revealed preliminary results on the first detection of the foreground polarization signal using the Cosmic Twilight Polarimeter. Nhan is jointly supervised by PI Burns and Co-I Bradley at NRAO.

Upcoming Event

- Several NESS members will be presenting at the upcoming Aspen meeting on "Cosmological Signals from Cosmic Dawn to the Present": (1) Burns on "Extraction of the Global 21-cm Signal from Foregrounds Using Dynamic Polarimetry and Pattern Recognition", (2) Tauscher on "Using training sets and SVD to separate global 21-cm signal from foreground and instrument systematics", (3) Bowman on "Latest Results from EDGES", (4) Mebane on "The Persistence of Population III Star Formation", (5) Monsalve on "Constraints on the Global Redshifted 21-cm Signal with EDGES Data Over 90-190 MHz", (6) Mirocha on "Metrics for Disentangling PopII and PopIII Contributions to the 21-cm Background".

Moment of Science:
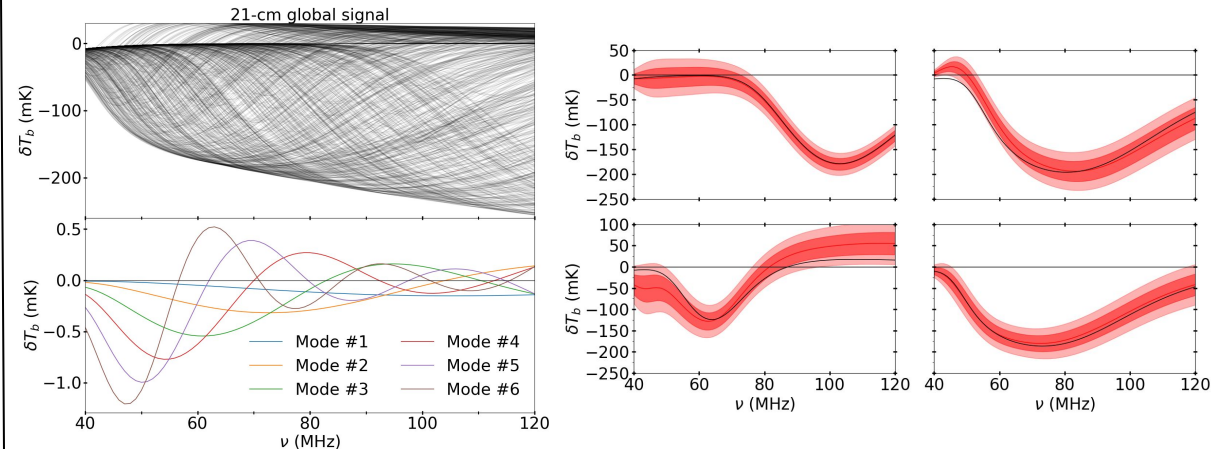
Caption: A new technique using Pattern Recognition was developed to extract 21-cm cosmological signals from bright foregrounds. The left panel shows the training set of signals and the most important derived eigenmodes. Equivalent training sets and modes exist for the foregrounds and instrumental systematics. The right panel shows results from simulated data made from the training sets and randomly generated noise. The black and red curves show the input and retrieved signals, respectively, and the dark (light) red bands indicate 68% (95%) confidence intervals. From Tauscher et al. (2018).