SSERVI Monthly Report
NESS/PI Burns - December, 2017

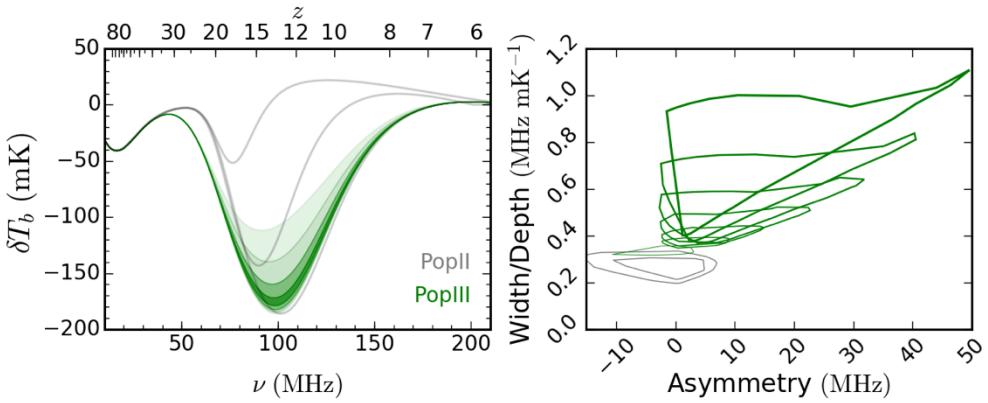
Progress Report

- **New Research:** The UCLA group led by Co-I **Furlanetto** has begun to incorporate their models of the first stars into "semi-numeric" simulations, which will allow detailed predictions of the radio background generated by these objects. This "21-cm signal" is an important science goal for lunar radio observatories. See 'Moment of Science'.
- **Meetings:** (1) Monsalve talked on "Recent Progress by the EDGES Global 21-cm Experiment" at 'Science at Low Frequencies IV' in Sydney; (2) **Hallinan** talked at the same meeting on "The OVRO-LWA: Status and Early Science" and (3) Anderson spoke on "Probing the low frequency transient sky with the OVRO-LWA".
- **Organization:** (1) **Hallinan** was part of the Scientific Organising Committee of the 'Science at Low Frequencies IV' meeting in Sydney, Australia, on Dec 12-15. (2) **Burns, Bowman, Hallinan, & Kasper** received approval from the AAS for 3 special sessions on *Low Radio Frequency Observations from Space* for the June 2018 AAS meeting in Denver; this meeting will be sponsored by SSERVI NESS.
- **Visits: Fong** visited CU on Dec 8 to collaborate with the CU and Lockheed Martin telerobotics groups, and also interacted with the CU hydrogen cosmology group.
- **Outreach:** During Fong's and Lockheed Martin group's visits at CU, together with CU and Fiske groups and a professional filmmaker, we had a meeting at the Fiske planetarium to discuss the production of a new planetarium show on human space Exploration and Science to be distributed nationally.
- **Inter-team collaboration: Burns** and **Kring** submitted slides on Exploration-related activities for the two SSERVI teams to be shared with the leadership in HEOMD and demonstrate Exploration-relevant research from SSERVI teams, with particular emphasis on Surface Telerobotics and the advent of the Deep Space Gateway (DSG).
- **Mission:** NESS members led by **Burns** submitted an RFI response for an Astrophysics SmallSat concept, the 'Dark Ages Polarimeter Pathfinder' (DAPPER).
- **Abstracts:** Submitted to the DSG Science Workshop: (1) **Burns** et al, "Space Science and Exploration on the Lunar Farside Facilitated by Surface Telerobotics from the Deep Space Gateway"; (2) **Bowman** et al, "Lunar Farside Radio Array Pathfinder Enabled by the Deep Space Gateway"; (3) **Rapetti** et al, "Hydrogen Cosmology from the Deep Space Gateway: Data Analysis Pipeline for Low-Frequency Radio Telescopes"; (4) Tauscher et al, "The Gateway to Cosmic Dawn: A Low Frequency Radio Telescope for the Deep Space Gateway"; (5) Monsalve et al, "Telerobotic Deployment and Operation of a Lunar Farside Low Radio Frequency Cosmology Telescope from the Deep Space Gateway"; (6) **MacDowall** et al, "Importance of a Low Radio Frequency Interference Environment for the DSG"; (7) **Kasper** et al, "Heliophysics radio observations enabled by the Deep Space Gateway"; (8) **Cichan** et al, "Communications Relay and Human-Assisted Sample Return from the Deep Space Gateway"; (9) Mellinkoff et al, "Operational Constraints of Low-Latency Telerobotics from the Deep Space Gateway Due to Limited Bandwidth"; (10) Walker et al, "VR Simulation Testbed: Improving Surface Telerobotics for the Deep Space Gateway**".**

Upcoming Event

- Monsalve will present on "Characterizing the 21-cm Signal from Neutral Hydrogen in the IGM at Redshifts 27>z>6 with EDGES" at the American Astronomical Society meeting in Washington, D.C., occurring January 8-12, 2018.

Moment of Science:



NESS team members have shown that signatures of the exotic "first stars" can be robustly identified using the global 21-cm signal, a prime science goal from lunar radio observatories. *Left:* Example 21-cm signals from "normal" star formation histories (gray), and from scenarios in which these first stars are important (green), with opacity indicating the strength of X-rays from the remnants of the first stars. *Right:* Comparison of the shape of the global 21-cm signal, as measured by its width/depth ratio and asymmetry, for a large grid of models with and without exotic "first stars." In this space, the exotic models stand out clearly, especially if they have strong X-ray heating (upper right, in green). Credit: J. Mirocha (UCLA).

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