



# SSERVI Monthly Report

## NESS/PI Burns - May, 2018



### Progress Report

- **Meeting planning:** (1) American Astronomical Society (AAS) Meeting-in-a-Meeting (MiM), June 5-6, Denver, Colorado, “Low Frequency Radio Observations from Space”; (2) NESS Steering Committee Meeting, June 7-8, Denver, Colorado.
- **News and media with quotes from NESS team members:** (1) [“Physicists in Earth’s Remotest Corners Race to Reproduce ‘Cosmic Dawn’ Signal”](#) by D. Castelvecchi, Nature news, April 27, correction May 2; (2) [“Private Companies Took Over Rocket Launches. Can They Do the Same For Moon Landers?”](#) by J. Bennett, Popular Mechanics, May 1; (3) [“China’s Moon Mission will Probe Cosmic Dark Ages”](#) by D. Clery, Science, May 16.
- **Meetings:** *Triennial Earth-Sun Summit* in Leesburg, VA (May 20-24): (1) **MacDowall** presented on “Complex Type III radio bursts and Their Correlation with Solar Energetic Particle Events”; (2) **Hegedus & Kasper** presented on lunar radio arrays applied to tracking Type II & III bursts out to .5 AU. *URSI AT-RASC* in the Canary Islands, Spain (May 28-June 1): (3) **Rapetti** presented papers on “Spaced-based Extraction of the Global 21-cm Spectrum” and “SVD/MCMC pipeline for separating the global 21-cm signal from foregrounds/systematics”; (4) **Monsalve** talked about “Extracting the Global Cosmological 21-cm Signal from EDGES Data Using MCMC”; (5) **Bowman** described “The Dawn of 21cm Cosmology with EDGES”. *PICO Collaboration Science Meeting* in Minneapolis, MN (May 1-2): (6) **Furlanetto** led a discussion on synergies between low-frequency radio and cosmic microwave background measurements. *Dark Matter Detection and Detectability: Paradigm Confirmation or Shift?* in Santa Barbara, CA (April 30-May 4): (7) **Mirocha** presented on “The first highly-redshifted 21-cm detection from EDGES: implications for dark matter and galaxy formation”.

### Upcoming Events

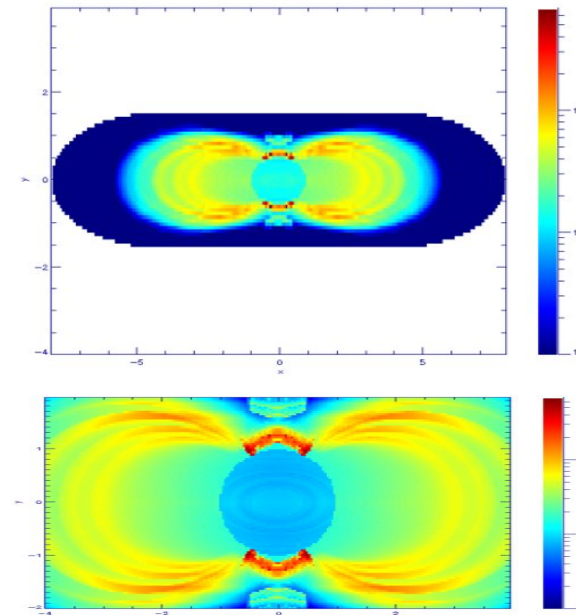
- **AAS MiM:** (1) **Kasper** will present on “Sun Radio Interferometer Space Experiment (SunRISE)”, (2) **Falcke** on “The Netherlands-China Low Frequency Explorer on the Chinese Chang’e 4 Lunar Mission”, (3) **MacDowall** on “Low frequency Radio Observatory on the Lunar Surface (LROLS)”, (4) **Hallinan** on “Optimized Strategies for Detecting Extrasolar Space Weather”, (5) **Burns** on “Space-based Observational Strategy for Characterizing the First Stars and Galaxies Using the Redshifted 21-cm

Global Spectrum”, (6) **Rapetti** on “Pattern Recognition and Experimental Design for Hydrogen Cosmology”, (7) **Bowman** on “Toward a Cosmic Dawn Mapper”.

- **NESS Steering Committee meeting:** Presenters will include: Burns, MacDowall, Rapetti, Furlanetto, Bowman, Tauscher, Bradley, Kasper, Hegedus, Hallinan, Cichan/Norman, Sandoval, Kumar, Walker, Szafir, Fong.
- **NASA Exploration Science Forum:** June 26-28, NASA Ames Research Center, numerous NESS talks and posters accepted.

### Moment of Science: Revealing Earth’s Radiation Belts

Simulated 100 kHz emission from radiation belts for all of geospace (top) and zoomed in near Earth (bottom).



There is currently no method for observing the 3D time dependent structure of Earth’s radiation belts. The twin Van Allen Probes provide the state of the art with two point measurements.

Synchrotron emission from electrons in the radiation belt could reveal the time dependent spatial and energy distribution of the belts, but is at wavelengths below 2 MHz and absorbed by Earth’s ionosphere. A lunar radio array would transform our understanding of radiation belt dynamics by allowing us to image the emission.

The simulations at the left are of the radiation belt at 100 kHz developed by Kasper & Hegedus through collaboration with French partners Quentin Nenon and Angelica Sicard (ONERA) based on a high resolution, time dependent radiation belt model. Next steps are to simulate observations of this emission from a lunar radio array on the near side and to see if dependence on wavelength can be related to energy spectra of the electrons as a function of location.