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Chasing the Galactic structure using VLBI and Gaia

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Citation
Quiroga-Nunez, L. H., Langevelde, H. J. van, Reid, M., Sjouwerman, L., Pihlstrom, Y., Lewis, M., … Tirimba, K. (2020). Chasing the Galactic structure using VLBI and Gaia. *The 35Th Annual New Mexico Symposium*, 4. Retrieved from https://hdl.handle.net/1887/3304394

Version:	Publisher's Version
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Downloaded from:	https://hdl.handle.net/1887/3304394

Note: To cite this publication please use the final published version (if applicable).

Session #1, 10:05–10:20

Studying Meteor Radio Afterglows with the Long Wavelength Array and the Widefield Persistent Train camera

Savin Shynu Varghese[1] (speaker), Kenneth Steven Obenberger[1], Jayce Dowell[1], Gregory B. Taylor[1], J. M. Holmes
[1] University of New Mexico

Meteoroid particles from the solar system enter the Earth's atmosphere at high velocities and ablate due to friction producing meteors and an associated turbulent plasma trail. Some of these bright plasma trails produce radio emission between 20–60 MHz known as meteor radio afterglows (MRAs). These were first detected in 2014 using the LWA1 station. The observed emission is non-thermal, broadband, and have characteristic light curve patterns with a fast rise of a few tens of seconds and a slow decay which can be up to few minutes. Follow-up observations with LWA1 and the recently commissioned LWA-SV station revealed that the emission is isotropic. Even though different mechanisms have been proposed, the emission mechanism is still a mystery.

Currently a new broadband imager is running continuously at LWA-SV which can image the sky every 5 seconds with a bandwidth of 20 MHz. In the first part of the talk, I will discuss on how the broadband imager is used to collect the spectrum of meteor radio afterglows and study their spectral properties. Like MRAs, bright meteors also occasionally produce long lasting emission (minutes to hours) in optical and Infrared known as persistent trains (PT). The PTs are thought to be powered by an exothermic chemical reaction between ablated meteoric material and atmospheric oxygen. In the second part of the talk, I will describe an optical camera, the Widefield Persistent Train camera deployed at LWA-SV to study the association between MRAs and PTs and some new insights into the emission mechanism that are emerging.

Session #2, 11:00–11:15

Chasing the Galactic structure using VLBI and Gaia

Luis Henry Quiroga-Nunez[1,2] (speaker), Huib van Langevelde[3,4], Mark Reid[5], Lorant Sjouwerman[1], Ylva Pihlstrom[2], Megan Lewis[1,2], Anthony Brown[3], Keith Tirimba[6], BeSSeL & BAaDE collaborations
[1] National Radio Astronomy Observatory, [2] University of New Mexico, [3] Leiden University, [4] Joint Institute for VLBI in Europe, [5] Harvard-Smithsonian Center for Astrophysics, [6] University of Florida

The Bar and Spiral Structure Legacy (BeSSeL) survey and the Bulge Asymmetries and Dynamical Evolution (BAaDE) project target maser stellar emission from young massive stars and evolved stars, respectively. Follow-up radio-astrometric measurements are complementary to Gaia results since the inner plane of the Galaxy is obscured at optical wavelengths. We are constructing a cross- match sample between Gaia sources and BAaDE targets. This resulting sample provides important clues on the intrinsic properties and population distribution of evolved stars in the Galactic plane, but especially at the Galactic Bulge. For the BeSSeL targets, which are heavily obscured, we are investigating whether they can be associated with clusters of massive young stars detectable at optical wavelengths, and how such can contribute to improving the accuracy of the fundamental Galactic parameters and the Galactic spiral structure distribution.

Session #2, 11:15–11:30

Predicting the performance of future pulsar timing arrays using population synthesis

Tyler Cohen[1] (speaker), Paul Demorest[2]
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Pulsar surveys and timing observations of millisecond-period pulsars (MSP) must be optimized to get the highest timing precision of as many MSPs as possible. Planning such observations requires an understanding of the expected galactic MSP population. Since the full MSP population is not known, I model a galactic population of MSPs.