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Type : **Poster**

The impact of nearby soil conditions on the MIST global 21-cm experiment

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Global 21-cm experiments are designed to capture the sky-averaged 21-cm signal emitted by neutral hydrogen and use it to probe the conditions present during the earliest epochs of the universe. Other experiments, such as EDGES and SARAS 3, probe the signal produced during the era of cosmic dawn; however, their reported results are in tension with each other. One proposed explanation for the EDGES feature is systematic effects associated with the finite metal ground plane beneath the antenna.

The Mapper of the Intergalactic Medium (IGM) Spin Temperature (MIST) is a global 21-cm experiment located in the radio-quiet Canadian High Arctic. MIST is designed to provide an independent probe of the cosmic dawn signal without a fixed ground plane, relying on careful electrical modeling of the soil beneath the antenna. Past work for MIST has treated the soil as laterally homogeneous and extending infinitely horizontally. We will present an overview of the MIST experiment, along with results from new simulations focusing on the impact of soil surface features on the recovered global signal. Three cases will be examined: individual rocks on the surface, a selection of rocks scattered across the surface, and undulating soil mimicking smooth Arctic surface conditions. Each case will be examined using soil parameter combinations spanning representative Arctic soil conditions around the antenna.

The findings presented have applicability beyond the MIST experiment and the global 21-cm community, informing more traditional experiments about the behavior of soils beyond the edges of their ground planes.

Did you give a contributed talk at CASCA 2026?

No

If you are selected for a poster, would you be interested in giving a short flash talk on your work?

Yes

What is your career level?

PhD

Which keyword describes the area of focus of this talk?

Cosmology

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Session Classification : Transients & Cosmology