#### **BOSTON** UNIVERSITY

# Boston University College of Arts & Sciences Center for Space Physics

#### **2021–2022 SPACE PHYSICS SEMINAR SERIES**

# Bridging an Observation Gap: Measuring Winds in the Upper Atmosphere with a Next-Generation Meteor Radar Network

The upper atmosphere at the "edge of space", close to 100 km altitude, is challenging to measure, particularly so for the neutral components. As a result, our current sampling of winds in the upper atmosphere is wholly insufficient to measure the highly variable (both in space and time) processes therein and make predictions on par with lower atmospheric weather. Progress on key scientific topics, such as forcing from the lower atmosphere and whole-atmosphere coupling, is hindered by poor local time coverage and severe undersampling of mesoscale spatial structures. Regular, densely-sampled measurements would be a boon to scientific understanding and modeling of the geospace system. These ideas are not new, but the technology has now arrived to make dense ground-based observations of the upper atmosphere feasible in cost and effort.

I this talk, I will describe recent developments in meteor radar technology and statistical estimation that enable observation of upper atmospheric wind fields and allow quantification of estimate uncertainty. I will also provide updates on the Zephyr project, which is currently building next-generation meteor radar networks in the areas surrounding CU Boulder and MIT Haystack Observatory. Compared to traditional meteor radars, such networks increase the density of meteor observations and provide diversity in sensing Doppler-derived wind projections. The

resulting datasets contain enough information to estimate the threedimensional wind field within the observation volume, in contrast to traditional meteor radars which must average over horizontal area to produce an estimate that is only altitude-resolved. The eventual goal is to expand to a large-scale network of similar scope to terrestrial weather radars, which could bring our capabilities for observing the upper atmosphere closer to parity with our sampling of the lower atmosphere.



### Thursday, April 7th

4:00-5:00 p.m. 725 Commonwealth Ave | Room 502 Ryan Volz Massachusetts Institute of Technology