

The request for a five year license is needed in order to accomplish engineering and scientific research activity with two main goals: 1) Develop a prototype of next generation meteor radars with improved ability for deriving neutral winds, temperatures and individual meteor properties; 2) Develop a more accurate characterization of the global meteor flux and its effect on upper atmospheric physics. The proposed activities require the operation of a 50 MHz radar in Pennsylvania capable of observing at least two of three primary types of meteor reflection: 1) the commonly used specular meteor trails; 2) the recently understood non-specular trails, which result from plasma instability and turbulence generated field aligned irregularities (FAI); and 3) meteor head-echoes, which are a radar target moving at the speed of the meteoroid. Since the proposed system can detect and resolve in time and space at least two mechanisms, we can study the observation biases introduced by each technique. These biases plague our current characterization of the meteor input function into the upper atmosphere, introducing uncertainties in the estimates of atmospheric parameters. Additionally, the detailed radio signature produced by both head echoes and non-specular trails are far more complex than specular echoes. Yet when modeled head-echoes, this complexity reveals more precise information about both the meteor that generated the plasma and the atmosphere around it. It is critical to monitor the state of the ionosphere for at least five years in order to make meaningful scientific contributions.