Modeling the Effect of Turbulence on Specular Meteor Echoes: Preliminary results

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The Earth's atmosphere is continuously bombarded by small-size meteoroids. This interaction meteoroid-atmosphere produces a column of ionized plasma behind the meteoroid at altitudes around 100 km, with considerable electron content. This trail of plasma is currently used by radar systems to derive atmospheric parameters such as temperature, pressure and drifts; under the assumption of a non-turbulent diffusion rate. In this paper, we present: 1) underdense specular meteor echoes whose decays do not follow the classical approach, and 2) a numerical model to investigate the effect of neutral turbulence on the decay of underdense specular meteor echoes. We certainly believe that turbulence plays an important role during the expansion of trails and as a result of this effect, the diffusion coefficient suddenly changes its value during the evolution of an underdense specular meteor trail. Consequently, an underdense specular meteor echo will not show the expected classical decay behavior. We introduce a specular meteor model that includes the effect of turbelence for the analysis of the specular meteor physics. This new tool is particularly useful to infer more accurate mesospheric temperatures from trail diffusion rates and their usage for meteor scatter communication systems. Our preliminary simulation results are compared with underdense specular meteor echoes detected with two different radar systems, both sinstruments operating at a frequency of 50 MHz, and with peak powers of 30 kW and 5kW. By comparing data from the different meteor systems, our preliminary studies illustrate the significant effect that turbulence plays on the evolution of underdense specular meteor echoes.