Meteor radar detection height distributions can be used as an indicator of atmospheric density scale height. A theoretical examination of the equations governing the energy budget of micro-meteoroids ablating in the upper atmosphere shows that the vertical component of a meteor’s detectable ionization path length is primarily governed by the atmosphere’s density gradient in the meteor ablation zone. Simulations of ensembles of meteors’ ablation in a model atmosphere demonstrate a nearly linear relationship between the density scale height and the height range over which underdense meteors are detected. This result is supported by observational data collected by VHF meteor radars operating throughout Australia and in Antarctica. A comparison of daily meteor detection zone widths with model data displays an almost linear relationship. This provides a new tool for characterizing the upper atmosphere and will allow new estimates of mesospheric density scale to be made using existing data sets.