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A model for droplet condensational growth in a turbulent, axisymmetric jet RYAN KEEDY, ALBERTO ALISEDA, University of Washington — Droplet growth at the edge of clouds is strongly influenced by the non-linear saturation field produced by mixing of warm, wet air inside the cloud with cold, dry air outside. This, together with the high intermittency of the turbulent at these geological scales, leads to uncertainty in the modeling of this process. We use experiments in a turbulent, axisymmetric jet to study this problem and develop a model. Although the distribution of a passive scalar in a turbulent jet is a classic problem, with a well-established solution, little attention has been devoted to heterogeneous nucleation, condensational growth and evaporation within a turbulent mixing layer where local supersaturation values may exceed unity. By leveraging the well-characterized self-similar behavior of a scalar (temperature, humidity) within a turbulent jet, we use a stochastic model for the instantaneous values from the statistics of the distribution to determine the super-saturation profile. Taking into account the high intermittency of the supersaturation field allows us to predict the droplet size at various stages of the flow. A Phase Doppler Particle Analyzer (PDPA) is used to collect statistics of velocity statistics, droplet growth and frequency that are used to inform the development and validation of the model.

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