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Influences of source condition and dissolution on bubble plume in a stratified environment SHIGAN CHU, Johns Hopkins University, ANDREA PROSPERETTI, University of Houston — A cross-sectionally averaged model is used to study a bubble plume rising in a stratified quiescent liquid. Scaling analyses for the peel height, at which the plume momentum vanishes, and the neutral height, at which its average density equals the ambient density, are presented. Contrary to a widespread practice in the literature, it is argued that the neutral height cannot be identified with the experimentally reported intrusion height. Recognizing this difference provides an explanation of the reason why the intrusion height is found so frequently to lie so much above predictions, and brings the theoretical results in line with observations. The mathematical model depends on three dimensionless parameters, some of which are related to the inlet conditions at the plume source. Their influence on the peel and neutral heights is illustrated by means of numerical results. Aside from the source parameters, we incorporate dissolution of bubbles and the corresponding density change of plume into the model. Contrary to what's documented in literature, density change of plume due to dissolution plays an important role in keeping the total buoyancy of plume, thus alleviating the rapid decrease of peel height because of dissolution.

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