Reply

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We state in our paper that the atmospheric stability parameter which appears in the energy equation must be modified for condensing plumes because of the difference between dry adiabatic and saturated adiabatic processes. As Briggs and Hanna have noted, this difference is accounted for by the λS term in the energy equation. However, we omit this term in our subsequent discussion: the change in the stability parameter compensates for this omission.

That the λS term has been omitted is apparent from the statement (Wigley and Slawson, p. 336) that a condensing plume in a neutral atmosphere would behave much like a dry plume in an unstable atmosphere in which the lapse rate was given by

$$\Gamma = \Gamma^* = \Gamma_{ad} + (\Gamma_{ad} - \Gamma_{as}).$$

This is only possible if one used the form

$$U\frac{dF}{dx} = -MN_s^2$$

for the energy equation. This is precisely the form of the energy equation which arises if N_s^2 is used instead of N_d^2 and the λS term is omitted. Using such a form facilitates a direct comparison with dry plume theory which was the main purpose of our paper.

Contrary to the conclusions reached by Briggs and Hanna our conclusions remain valid. That a wet plume should be more unstable than a dry plume is a most reasonable result since the release of latent heat demands that, at *all* stages of growth, the buoyancy of a wet plume will exceed that of a dry plume.