



Title: A Sensitivity Study of the Validation of Three Regulatory Dispersion Models

Author: Keith D. Harsham and Michael Bennett

Source: American J. of Environmental Sciences 4(1): 63-76 , 2008

Abstract: Lidar measurements were made of the dispersion of the plume from a coastal industrial plant over three weeks between September 1996 and May 1998. 67 experimental runs were obtained, mostly of 30 min duration, and these were analysed to provide plume parameters (i.e. height, vertical and lateral spreads). These measurements were supplemented by local meteorological measurements at two portable meteorological stations and also by radiosonde measurements of wind, temperature and pressure profiles. The dispersion was modelled using three commercial regulatory models: ISC3 (EPA, Trinity Consultants and Lakes Environmental), UK-ADMS (CERC) and AERMOD (EPA, Lakes Environmental). Where possible, each model was run applying all choices as between urban or rural surface characteristics; wind speed measured at 10 m or 100 m; and surface corrected for topography or topography plus buildings. We have compared the range of output from each model with the Lidar measurements. In the main, the models underestimated dispersion in the near field and overestimated it beyond a few hundred m. ISC tended to show the smallest dispersion, while AERMOD gave the largest values for the lateral spread and ADMS gave the largest values of the vertical spread. Buoyant plume rise was modelled well in neutral conditions but rather erratically in unstable conditions. The models are quite sensitive to the reasonable input choices listed above: the full range of sensitivity is comparable to the difference between the median modelled value and the measured value.