Evaluation and Application of the CALPUFF Model for Evaluating Deposition Impacts to Support Critical Load Analyses on a Local Scale

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The Maryland Power Plant Research Program (PPRP) has been involved with evaluating impacts of regional sources of air emissions on air quality in Maryland and effects on the Chesapeake Bay for many years. The CALPUFF model is a useful tool for conducting impact analyses of regional sources on nutrient loading to the Bay and for specific smaller water bodies. The Lagrangian form of the model is readily adaptable to "scale down" impacts to receptor areas that are no more than a few hundred meters in size; thus CALPUFF is useful in assessing impacts to sensitive lakes, streams, and coastal areas with a high degree of resolution. A concern with CALPUFF is that its underlying science is not as complete as contained in more advanced eulerian grid models such as CMAQ and CAMx. Since CALPUFF provides a resolution not achievable by the larger grid models, its use in conjunction with the grid models would seem to be a worthy objective. As a step towards this end, PPRP has conducted evaluations of CALPUFF predictions compared to measurements of nitrate deposition and concentrations of species that contribute to deposition (e.g. particulate nitrate and nitric acid), obtained from national measurement networks including CASTNET, IMPROVE, and NADP/NTN stations. This paper will provide a summary of these evaluations, illustrations for using CALPUFF to assess critical loads for selected areas, and provide insights into some possible steps to further harmonize this Lagrangian approach with the more complex grid models.

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