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Wind tunnel experiment for visible plume from mechanical draft cooling tower TAKENOBU MICHIOKA, AYUMU SATO, KOUICHI SADA, Central Research Institute of Electric Power Industry, ENVIRONMENTAL SCIENCE RESEARCH LABORATORY TEAM — As moist air leaves a wet cooling tower, it mixes with cooler atmospheric air. This mixing generates a visible plume, which is the condensation of a fraction of the water vapor, and the visible plume produces some significant atmospheric effects, such as the obstruction to visibility and ice formation on the ground. It is therefore of importance to predict the visible plume region from the mechanical draft cooling tower in environmental impact assessment. We developed a method for a wind tunnel experiment to predict a visible plume region from a mechanical-draft cooling tower. The diffusions of water vapor and heat emitted from the cooling tower in the wind tunnel are estimated using a tracer gas. A moist plume-induced fog is assumed to be generated whenever the instantaneous water vapor mixing ratio estimated using the concentration of the tracer gas at measured points is larger than the inferred saturation water vapor mixing ratio. To confirm the validity of the present method, the results in the wind tunnel experiments are compared with the observations obtained at the mechanical draft cooling tower of the Benning Road plant. The results show that the visible plume length and height are nearly in agreement with the observations and the present method has capability to predict the visible plume region from the cooling tower.

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