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# Mean vs. event sound-level prediction: obtaining consistency between atmospheric data inputs, propagation models, and the predictand

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The following, deceptively challenging, questions are addressed: What are the most suitable atmospheric data resources and propagation models for predicting event (explosion and other short duration) sound-exposure levels? Do these differ from those most suitable for predicting mean sound levels? Atmospheric data typically consist either of single, "snapshot" samples of the vertical profiles, as from a weather balloon, or average vertical profiles, as from climatology or a numerical weather model. Recent statistical studies, based on high-resolution atmospheric simulation, demonstrate the superiority of mean profiles for prediction of *both mean and event* sound levels, even when single-sample profiles are synchronized to and collected along the path of the propagation event. Running propagation models "blind" to the nature of the atmospheric inputs is shown to be hazardous: predictions from mean profiles lack turbulent scattering, thus underestimating sound levels near the ground, whereas predictions from single-sample profiles implicitly assume the turbulence has infinite horizontal extent, thus overestimating sound levels. Some desirable consistency results from numerically solving parabolic equations (PEs) for statistical *moments* of the sound pressure, rather than conventional deterministic PEs. The moment PEs directly predict mean sound levels or the expected value and variability of event sound-exposure levels.