

USING SF₆ TRACER TO QUANTIFY VERTICAL MIXING WITHIN THE STABLE BOUNDARY LAYER

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ABSTRACT

A 2-year program is proposed that will obtain measurements of SF₆ during a series of tracer experiments for the next VTMX field campaign. Tracer measurements provide the integrated effect of various transport and mixing processes associated with the valley circulations that cannot be obtained in any other way. By measuring concentrations of SF₆ and several trace gases at the surface and aloft, the overall effect of these processes on pollutant transport and mixing will be quantified. These tracer experiments are to support a companion proposal by Jerome Fast of PNNL that will 1) quantify the relative role of vertical advection and turbulent motions on the vertical mixing of trace gases during stable conditions and 2) determine how multi-scale flows interact to either enhance or suppress the mixing of trace gases within the valley atmosphere at night. Together with PNNL, we hypothesize that mean vertical velocities and turbulent motions in a valley at night are large enough to transport a significant amount of pollutants from surface sources above the strongly stable layer. An accurate representation of the four-dimensional dynamic and thermodynamic fields in areas of complex terrain is needed to examine this issue. The proposed research effort requires several types of supporting instrumentation and the joint efforts of many researchers, including the measurements we describe.

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