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Numerical modelling of passive tracer dispersion from a continuous point source in a steady thermally driven slope wind

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An Eulerian model for the dispersion of a passive tracer over a simplified slope driven by a thermally driven circulation is presented here. The source of the tracer is point-like and the emission continuous, the local circulation is a pure anabatic flow modelled following Prandtl's (1942) steady-state model. The eddy diffusivity is considered constant along the vertical direction. The incapability of a classical Gaussian model to forecast the concentration field is shown through a comparison between the results of the Gaussian and Eulerian models. A study of the sensitivity of the concentration field to the position of the source and to the characteristics of the wind field is proposed. Moreover, a relationship between the position and the intensity of the ground concentration field, together with its dependence on the environmental parameters is found.

Prandtl L. 1942. Führer durch die Strömungslehre, Chapter 5. Vieweg und Sohn: Braunschweig, Germany. [English translation: Prandtl L. 1952. Mountain and valley winds in stratified air, in Essentials of Fluid Dynamics: 422–425. Hafner Publishing Company: New York, NY]