

Development of a computational simulator for the evaluation of diffusion advection models.

by
Eduardo Mancila

Director
Dr. Emilio Cariaga López

Abstract

The city of Temuco, located in southern Chile, currently has one of the highest concentration indices of PM₁₀ and PM_{2.5} in the air in the country. This motivated a multidisciplinary team from the Catholic University of Temuco to design a network of wireless sensors, distributed throughout the city, that will measure the concentration of P M₁₀ and P M_{2.5}; which will be supported by computer simulators that will predict the behavior of these pollutants. In this sense, this document shows the design and development of a computational simulation engine that solves the distribution of a pollutant cloud by means of a mathematical model based on the advection-diffusion equation with emission and deposition components. The governing differential equation of the model will be solved on a non-regular mesh using the finite volume method for its spatial discretization and using explicit and implicit schemes to solve the discretization over time. The main objective of this work is to develop a Proof of Concept that allows obtaining an algorithm that is mathematically verified. For this, a set of tests will be developed using the method of manufactured solutions to verify the precision of the code.