SIMULATION OF RADIATIVE TRANSFER THROUGH A WATER SPRAY IN A SMALL SCALE TUNNEL

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ABSTRACT. A 2D simulation is presented for a water spray used as a radiative shield in a tunnel, aimed at attenuating a strong incident radiation. The numerical treatment involves droplet injection in a lateral air flow induced by a ventilation device. Convection, turbulent diffusion, vaporization and radiation are taken into account in a combined form. Geometrical data and surrounding conditions have been chosen in a preliminary analysis, corresponding to a possible small tunnel that could be built in order to study the present problem experimentally. Radiative transfer is considered as a major concern of the present simulation. The spray is treated as a non gray medium, absorbing and scattering radiation anisotropically. Incident radiation is supposed to come from a high temperature source and radiation transmission through the spray is studied comparing radiative fluxes computed with the spray off or on. The behavior of the radiative shield is then explained linking the observation of the flow dynamics - related to the water flow rate and the velocity field of air - to the radiative properties of the spray.

Keywords : water spray, thermal shielding, tunnel, radiation attenuation