Contribution ID: **23014** Type: **Paper**

Towards CFD Predictions of Radioactive Pollutants Dispersion under Arabian Peninsula Environmental Conditions

Tuesday, 14 November 2023 09:40 (5 minutes)

As demonstrated in the Fukushima catastrophe, a malfunction of a nuclear power plant may result in the release of elevated quantities of noble gases, I-131, and Cs-137. Consequently, the key components of decision-support mechanisms for emergency readiness and response to hazardous nuclear incidents entail the evaluation of the potential danger to the populace through the modeling of the dissemination of radionuclides into the surroundings. Therefore, a meticulous appraisal of the environmental repercussions of the discharge is imperative and must be determined with confidence, particularly in the vicinity of the source of the release and in the vicinity of the plant edifices, where direct consequences may impact the personnel involved in accessing the facility during exigent circumstances.
Several computational software tools for atmospheric dispersion, based on either Gaussian plume or regional Lagrangian models, have been developed to evaluate accidental scenarios involving the release of radionuclides. However, these models' predictive accuracy can be limited, especially in the near-field region. This is because the associated physics of pollutants' dispersion may not be adequately captured, as these models either partially account for the nuclear plant's buildings (e.g., Gaussian plume with building effects accounted for) or ignore them altogether (e.g., standard Gaussian plume model and regional models). Additionally, it is crucial to consider key UAE environment characteristics, including the arid ground surface topology and the atmospheric boundary layer stability regime. To address these shortcomings, the present study aims to use computational fluid dynamics (CFD) modeling methodology to accurately account for such conditions and assess their influence on the discharge and dispersion of radionuclides from the nuclear power plant to the environment. Hence, this study focuses on (i) atmospheric micro-scale (200 m to 5 km) meteorological phenomena, (ii) ground and built-in environment topologies, and (iii) undertaking parametric assessments to validate the CFD predictions.

Speaker Bio

Primary authors: ALMAZROUEI, Fatema (Khalifa University); Dr ALI, Mohamed; Dr ADDAD, Yacine

Presenter: ALMAZROUEI, Fatema (Khalifa University)

Session Classification: Day 2- Research Pitch Competition - I

Track Classification: Student competition