# CHEMICAL PERSPECTIVE ON RADIONUCLIDE EMISSIONS AS ATMOSPHERIC CONTAMINANTS FROM NUCLEAR REACTORS

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**Abstract.** This study investigates the radionuclide emissions from nuclear power plants (NPPs), focusing on the gas-aerosol emissions from reactors such as VVER-440. The radionuclide composition of these emissions is analyzed to determine the biological hazards they pose, particularly focusing on isotopes such as tritium and radiocarbon. The research highlights the patterns of radionuclide accumulation in fuel assemblies using "rank-size" coordinates, which provide a more visual and informative method compared to traditional atomic weight dependency analyses. The study introduces the Zipf-Mandelbrot type rank distributions and proposes that the emissions can be effectively monitored by measuring only a few key radionuclides, thereby simplifying the process. This method is validated across different reactor types, indicating its broad applicability. The research underscores the potential of using these patterns for more efficient regulation and control of radionuclide emissions from NPPs.

**Keywords:** radionuclide, NPP gas-aerosol emission, Zipf distribution, rank distribution, identification of the radioactive emission, fingerprint criterion.