Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Models for grains and gas ejection dynamics from a silo YIXIAN ZHOU, PASCALE AUSSILLOUS, Univ Aix-Marseille I&II, PIERRE RUYER, Institut de radioprotection et de surete nucleaire (IRSN), IUSTI/GEP TEAM, SEMIA/LIMAR TEAM — In the hypothetical conditions of a reactivity initiated accident in a nuclear power plant, some of the fuel rods could break. If fuel fragmentation occurs, hot fuel particles and pressurized gas could interact with the surrounding fluid. The violence of this interaction depends on the discharge rate toward the fluid. In the present work, we study the discharge dynamics and identify the parameters governing this flow. In this paper, we focus on the experimental study of the discharge of a silo composed of spherical glass beads, with an orifice either lateral or at the bottom, with or without air flow. The measured parameters are the mass flow rate and the pressure along the silo, whereas the controlled parameters are the size of particles, the size of orifices, and the flow rate of air. For the case without air flow we found that the flow rate of particles ejected from the bottom orifice is 3 times greater than from the lateral orifice. For the case of a lateral orifice, when the form of the orifice is rectangular with width W and height D, we identify two regimes which depend on the ratio of width to height W/D. For the case with air flow, we found that the flow rate increases with the air flow. A simple physical model is proposed to describe the grains and gas ejection.

Yixian Zhou
Univ Aix-Marseille I&II

Date submitted: 22 Jul 2015 Electronic form version 1.4