ID de Contribution: **145** Type: **ORAL**

# Influence of Initial poisons and clays on the criticality of Oklo natural nuclear reactors

*mardi 28 juin 2022 15:20 (20 minutes)*

In the aim to assess more the Oklo phenomenon through the numerical modelling and simulation, within the geological context based on field observations and measurements, a Python-based code is developed to automate the criticality research for a given configuration among a specific parameter, considered as the main variable of investigation. The home-made python program interacts with dedicated code for nuclear reactor criticality calculation, namely MCNP. This allowed us to investigate the asymptotical criticality occurrence, which corresponds to infinite multiplication factor k_∞ as a function of Uraninite fraction volume and total saturated porosity: k_∞ (V_UO2,Φ_C )≅1 for different situation defined with relevant parameters, namely: Initial Poisons (Gd, Sm and Nd) and Clay fraction in the Gangue part of the U-rich ore. Indeed, in the first step of the present work, a generic U-rich ore was simulated over a given interval of Uraninite volume fraction and the corresponding porosities needed (Critical Porosity Φ_C) to reach criticality were obtained. It shows that an optimal point can be defined as the minimal one on the isocritical curve k_∞ (V_UO2,Φ_C )≅1. This point, called "Inception point", is the most likely configuration to occur with low Uranium and less water defined by totally saturated porosity.

**Auteur principal:** Dr BENTRIDI, Salah-eddine (Centre Universitaire KHEMIS MILIANA)

**Co-auteurs:** GALL, Benoît (IPHC Strasbourg); Dr AMRANI, N (University of Setif, Algeria); Dr HIDAKA, H (Nagoya University, Japan, ); Dr GAUTHIER-LAFAYE6, François (LHyGeS, Strasbourg); Dr NUTTIN, Alexis (LPSC Grenoble)

**Orateurs:** Dr BENTRIDI, Salah-eddine (Centre Universitaire KHEMIS MILIANA); Dr NUTTIN, Alexis (LPSC Grenoble)

**Classification de Session:** A. Oklo, from Natural core breeding to the Oklo discovery