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The Oklo phenomenon, discovery, first questions, first answers

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The discovery in 1972 of the natural nuclear reactors at Oklo provoked many questions among scientists, physicists and geologists. Under the leadership of R. Naudet, the CEA launched the “Franceville Project” which brought together researchers from around the world to answer the many questions raised by this discovery. The initial answers were compiled in two proceedings of two symposia held in Libreville and Paris in 1976 and 1978. This project was then followed by two European projects led by the CEA and the IRSN in 1990 and 1996.

My presentation will quickly recall the scientific adventure of the first years of work on the Oklo site: what were the hypotheses and misunderstandings to finally propose a first coherent but still incomplete scenario in 1978.

The reactors are described with emphasis on the only reactor that has been preserved in its natural state, the other 15 having been exploited. Information is given on the thousands of samples taken.

The history of the reactors is reconstructed in time and the geological context on the basis of the most recent data [1]. In particular, we show that the conditions that led to the functioning of nuclear reactions in a geological series more than 2100 million years old and having had turbulent history are quite exceptional and why they never occurred again [2].

But the great advantage of the Oklo reactors is that they can teach us a lot about the behaviour of fission products and actinides buried for two billion years in a clay environment rich in bitumen. Oklo has already shown that it is a remarkable project in this respect. Much more can be learned, but Oklo’s first lesson is to show that we still have a lot of work to do to understand and master a system for trapping nuclear waste in a natural environment.

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