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Preliminary results of CRIIRAD radiation monitoring near uranium mines in Namibia / Press Release April 11th 2012

Context

As a part of the EJOLT[1] project, EARTHLIFE Namibia (Mrs Bertchen Kohrs) and CRIIRAD (Commission for Independent Research and Information about Radiation) have organised visits in areas located in the vicinity of uranium mines in Namibia, especially Rössing

CRIIRAD team (Christian Courbon and Bruno Chareyron) also conducted training activities and lectures about Radioprotection issues and the impact of uranium mining. The lectures took place in Windhoek and Swakopmund between September and October 2011.

In the course of an on site mission carried out between September 22th and October 2nd 2011, scientists from the CRIIRAD laboratory took radiation measurements in situ, and collected 14 samples of top soil, 13 samples of surface sediments of the Swakop, Gawib and Khan rivers and 11 underground water samples in the alluvium of Swakop, and Khan rivers and tap water from Arandis city.

Solid samples have been analysed at the CRIIRAD laboratory in France (measurements performed by HpGe gamma spectrometry) and water samples have been monitored for main chemicals by LDA 26 laboratory in France and for radium 226 and radon 222 at the CRIIRAD laboratory. The CRIIRAD laboratory accuracy in radiation monitoring is acknowledged by the French Nuclear Safety Authority.

Preliminary findings

The collected data will be compared later with monitoring results gathered by the mining companies and discussed at various meetings being organised next week in Swakopmund with the mining companies, Namibia radiation experts, Uranium Institute, local population and concerned NGO's.

The interpretation of all the results will require additional work, but some of the preliminary findings are summarised below. These have been brought to the attention of the National Radiation Protection Authority during a meeting that took place in Windhoek at the Ministry of Health and Social Service on April 10th 2012.

1 / The dose rate measured by CRIIRAD on the **parking of Rössing mine** is about 6 times above natural background value (0.9 µSv/h compared to 0.15 µSv/h). The measurements are shown on a video (http://youtu.be/sQvNEJu7qTU

This radiation is probably due to the use of radioactive tailings from Rössing mill as the analysis of top soil performed by CRIIRAD show a radium 226 / uranium 238 ratio of 2.5. Uranium 238 activity in the sample is 730 Bq/kg while radium 226 activity is 1 800 Bq/kg. This last value is 19 times above the natural concentrations measured in soil samples collected in Swakopmund or Etango areas.

[1] EJOLT : Environmental Justice Organizations Liability and Trade is an international project funded under FP7 program of the European Union, Mobilisation and Mutual Learning Actions.

2 / The management of **waste rock dumps** needs to be improved.

Some waste rocks are dumped on the banks of Khan river (at the intersection with Dome Gorge) without fencing and confinement. The radiological impact of this activity has to be studied in detail but preliminary measurements show various impacts on the environment.

- The finest fraction of the radioactive rocks is washed down by rain water and **contaminates the sediments** of the Khan river : uranium 238 activity is 1 200 Bq/kg and radium 226 activity is 1 400 Bq/kg These values are 10 times above those measured in sediments collected in Khan river upstream Rössing mine.
- The gamma and beta-gamma **dose rates** measured by CRIIRAD on contact with the rocks is well above background values (130 µSv/h of beta-gamma dose to the skin measured with an electronic dosimeter which is about 1 300 times above typical background values). The gamma irradiation from the waste rock dump is detected at distances exceeding 150 meters. CRIIRAD calculated that people spending only 30 minutes to 35 hours at a distance below 25 meters from the waste rock dump would receive an external irradiation dose above the trivial dose value of 10 microSieverts per year. This kind of impact has not been taken into consideration by NECSA, the Nuclear Energy Council of South Africa, that was contracted to evaluate the Radiological public hazard assessment for the Expansion of Rössing Uranium Mine (report dated 2011-05-23).
- Preliminary monitoring of **radon gas** activity in the ambient air near the waste rocks shows high readings (722 Bq/m^3 when the Alphaguard radon monitor is located on the rocks. This value is 48 times above typical mean natural radon activity in the open air). Radon inhalation is acknowledged by the WHO as the second cause of lung cancer after smoking.

3 / The finest fraction of the radioactive **tailings** dumped on Rössing tailings dam is **blown away** by the wind and contaminates the surrounding environment. The contamination of top soil with radium 226 ranges between 960 Bq/kg and 7 400 Bq/kg in samples collected up to 2 km away from the tailings dam fence. In all four samples the radium 226 / uranium 238 ratio is between 2.3 and 5.

This shows that the material dispersed by the wind is not made of natural uranium bearing rocks but consists of tailings that are radioactive waste from the mills where uranium 238 has been extracted from the ore. In this case the uranium 238 residual activity in the waste is lower than the radium 226 activity.

4 / The high **uranium concentration in underground water** collected downstream Rössing uranium mine in the Khan river and Swakop river alluvium raises the question of the origin of this uranium.

In Khan river uspstream Rossing Mine and in Swakop river upstream the confluence with the Gawib river (Langer Heinrich mine potential influence), the uranium 238 concentrations are quite low (0.2 µg/l and 7.8 µg/l respectively).

In the Khan river alluvium immediately downstream Dome Gorge waste rocks dump the uranium[2] concentration is 430 µg/l. This may be due to the fact that a fraction of the uranium contained in the waste rocks is dissolved by rain water and eventually reaches the groundwater.

The impact of the leakages occurring below the tailings dam also has to be studied in detail. The uranium concentration in the underground water samples collected by CRIIRAD downstream the tailings dam is high (554 to 3 174 µg/l). Rössing has a network of "dewatering wells" and trenches designed to allow pumping back these contaminated waters to the tailings dam. But the question of the efficiency of this system and its durability in the future has to be studied.

Written by Bruno Chareyron, nuclear physics engineer Director of the CRIIRAD laboratory.

[2] The WHO guideline for drinking water is 15 µg/l (recently changed to 30 µg/l as a provisory value).

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Waste rock dump at Dome Gorge / CRIIRAD technician is sampling contaminated sediments

Soil contaminated by radioactive dust from the Rössing tailings dam

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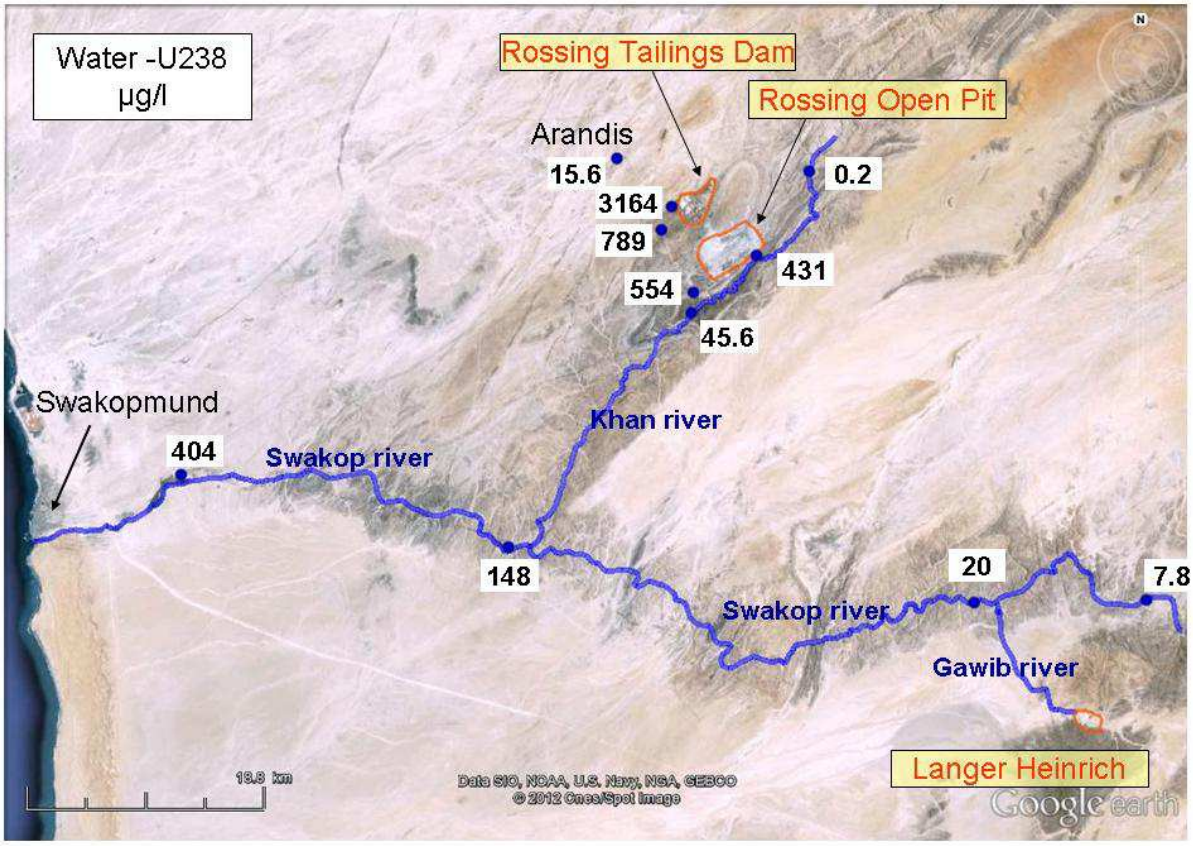
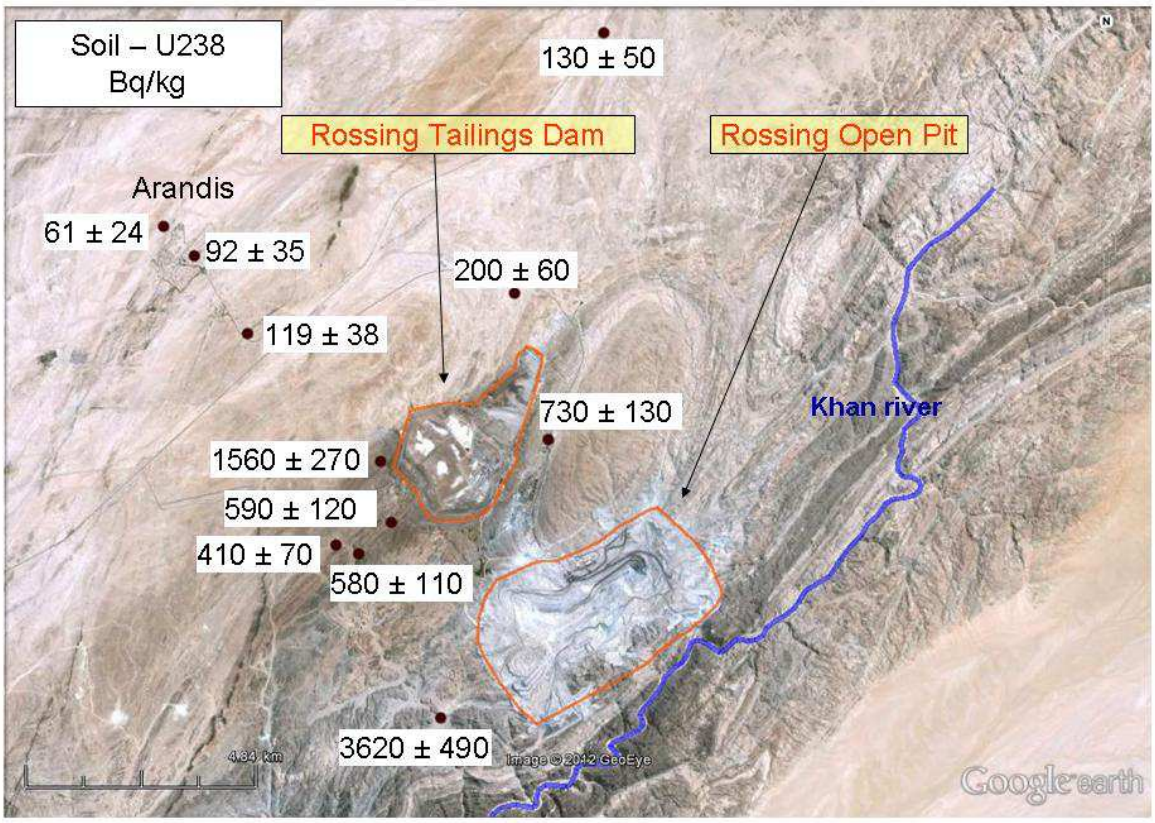
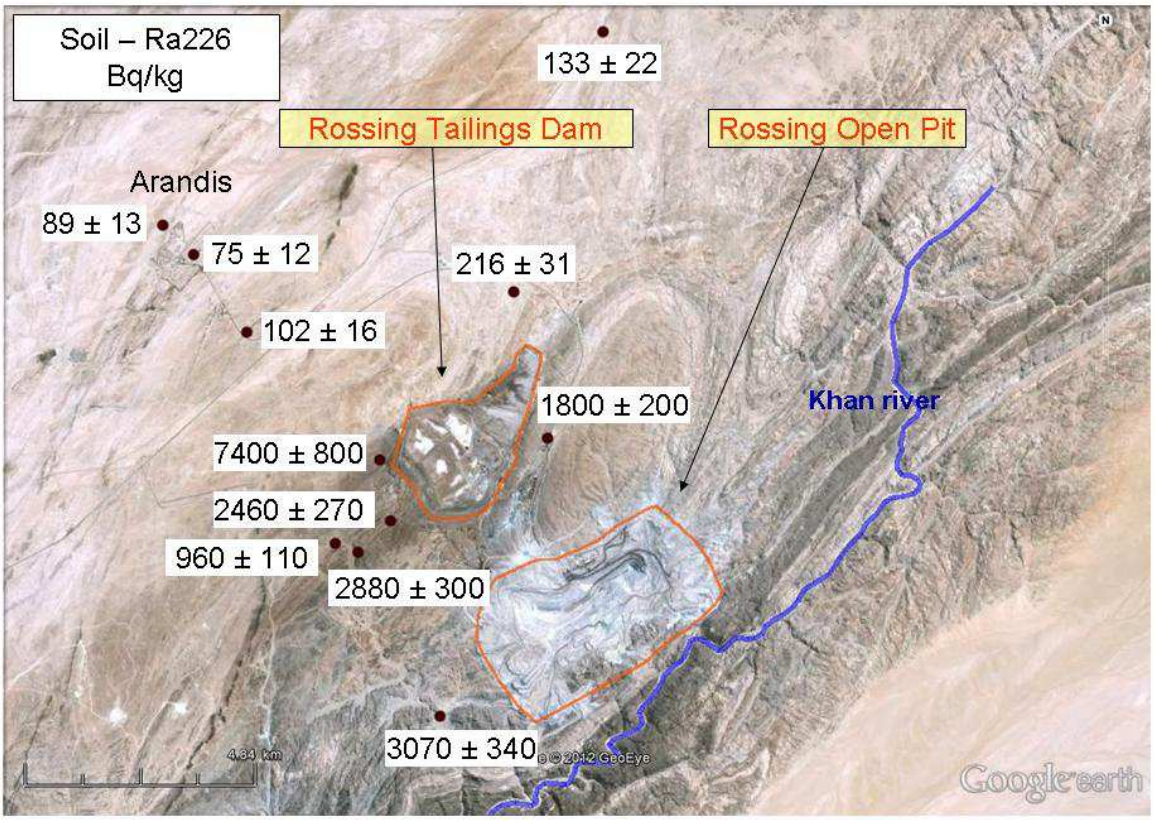
Uranium 238 concentration in underground water samples



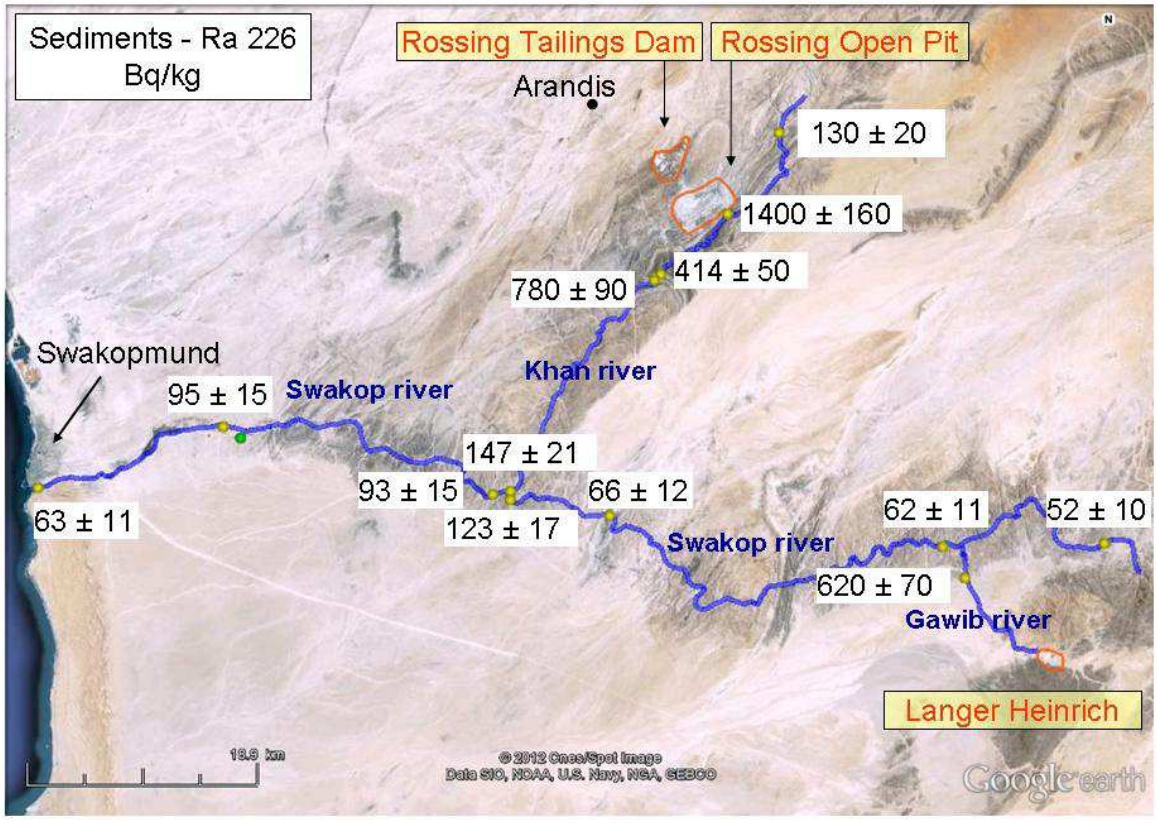
Uranium 238 activity in top soil samples (zoom near Rossing mine)



Radium 226 activity in top soil samples (zoom near Rossing mine)



Radium 226 activity in sediments of the Swakop, Gawib and Khan rivers



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