Natural Background Radiation Across the Navajo Sandstone in Utah

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ABSTRACT
Data from aerial gamma-ray surveys are an important tool for analyzing the variation of background radiation for nuclear disaster response and homeland security purposes. Existing background surveys data were collected at a 5-20km interval and thus leaves a lot of area open for interpretation. Potassium (K), Uranium (U), and Thorium (Th) are the three natural gamma-ray emitting isotopes and the source of the radioactivity measured during an aerial gamma-ray survey. This project focuses on the variation of natural background radiation across some of the largest exposure of the Navajo Sandstone in Utah.

INTRODUCTION
- Gamma rays: energy that can penetrate 30 cm of rock and 100s m of air
- K, U, and Th are naturally occurring, long lived (large half lives), and produce enough gamma rays to be detected
- Exposure Rate: The amount of gamma ray exposure per unit time

- NURE Data: National Uranium Resource Evaluation Survey
- Covers most of continental US
- Gives K, U, and Th concentrations
- Aerial gamma ray survey done by AEC

AREA OF STUDY

METHODS AND ANALYSIS
- Extraction of NURE data for the desired area of study
- Acquisition of free 30’x60’ quadrangles shapefiles
- Separation of the Navajo Sandstone from all other geologic units
- Use of ArcMap (GIS) program to manipulate and analyze the NURE data
- Use of Microsoft Excel program to analyze data

RESULTS

CONCLUSIONS
- The east side of the unit has a much higher exposure rate than the west side and thus a higher concentration of K, U, and Th
- Exposure rate is driven primarily by K up to approximately 6 microR/hr
- Th and K are somewhat related except that we do not observe high concentrations of Th when the concentration of K is low

FUTURE QUESTIONS
- What is causing the variations in the radiation across the unit?
- Can we describe the variations in a stratigraphic matter (upper/lower member)?
- Does the provenance of the sand affect the variation?
- Why does the east side of the unit have a higher exposure rate and higher concentrations of K, U, and Th than the west side?
- Analyzing background radiation across other geologic units in Utah, Nevada, and Northern Arizona.

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