P2.3-847

Temporal Trends Assessment of Atmospheric Radionuclides in Kuwait: A Long-Term Study

M. S. Al-Rashidi[1] and A. N. Al-Dabbous[2]

[1]Quality, Health, Safety, and Work Environment Department, Science and Technology Sector
[2]Environmental and Climate Change Program, Environment and Life Sciences Research Center
Kuwait Institute for Scientific Research (KISR), P.O. Box 24885, 13109 Safat, Kuwait

INTRODUCTION AND MAIN RESULTS

The Middle East faces negative impacts from dust fallout, which includes both natural and man-made radionuclides. This study thoroughly analyses long-term (2013–2022) atmospheric radionuclide levels for Cesium-137 (^{137}Cs), Beryllium-7 (^{7}Be), and Potassium-40 (^{40}K) in Kuwait. The average concentrations found were 10.51 ± 2.04 μBq/m³ for ^{137}Cs, 11.8 ± 3.7 mBq/m³ for ^{7}Be, and 161.7 ± 3.8 μBq/m³ for ^{40}K. Dust resuspension, influenced by northwesterly winds during summer, likely transported ^{137}Cs-laden particles from surrounding areas. The frequent detection of ^{137}Cs indicates that increased dust storms and less rainfall may have helped maintain its presence in Kuwait's atmosphere.

SnT 2025 CTBT: SCIENCE AND TECHNOLOGY CONFERENCE
8 SEPTEMBER ONLINE DAY
9 TO 12 SEPTEMBER AT HOFBURG PALACE, VIENNA & ONLINE

Temporal Trends Assessment of Atmospheric Radionuclides in Kuwait: A Long-Term Study

M. S. Al-Rashidi and A. N. Al-Dabbous

P2.3-847

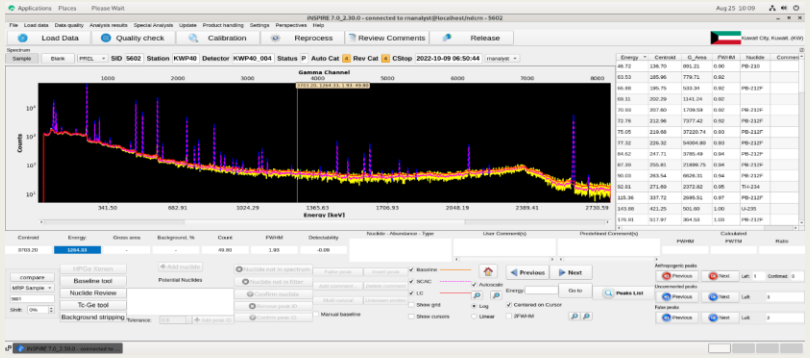
Introduction/Objectives

The State of Kuwait has a well-established administrative, operational, and maintenance plan to run the CTBTO facility (i.e., RN40, located on the KISR main campus, Kuwait). In this long-term study, the radionuclide aerosol sampler/analyzer (RASA) system at the RN40 station was utilized to assess the temporal variations for Cesium-137 (137Cs), Beryllium-7 (7Be), and Potassium-40 (40K) radionuclides along with meteorological parameters, in ground surface air, and identify their sources in Kuwait. Air filter samples were collected using a high-volume air sampler (HVAS) within the RASA system at a specified flow rate of around 600 m^3 hr^{-1} for a period of 24 hrs, resulting in a sampling volume of around 14,400 m^3 d^{-1}. These features are advantageous because the high sample volume allows for a lower detection limit of the radioactive samples.

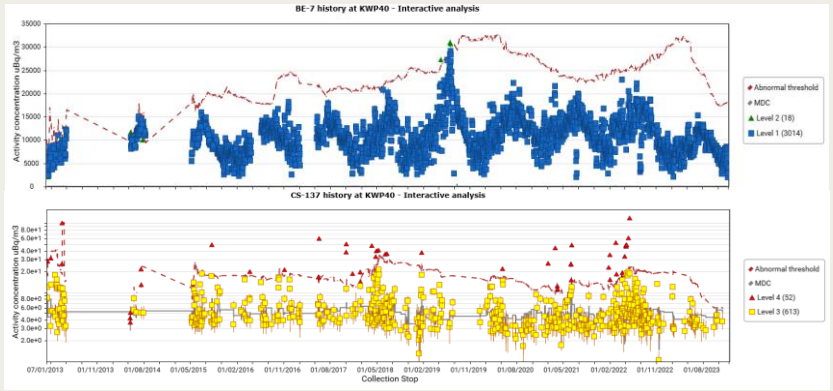
RASA System-RN40 (KWP40) Station, Kuwait.

Data Processing and Interpretation

Over 3,070 samples were collected and analyzed from 2013 to 2022 using CTBTO iNSPIRE for interactive analysis of particulate spectra. The station's actual availability was 84%, determined by the presence of ^{7}Be on the filter. The detection rates at RN40 for ^{137}Cs, ^{7}Be, and ^{40}K were 10.33%, 100%, and 65.3%, respectively. .

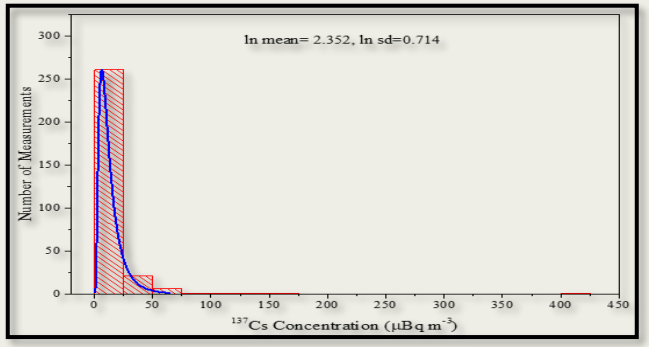


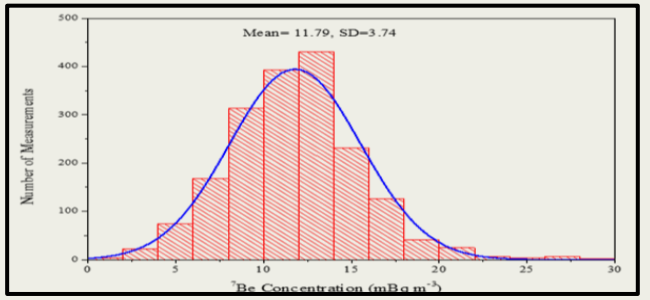
NDC-in-Box Interactive Analysis of Particulate Spectra.

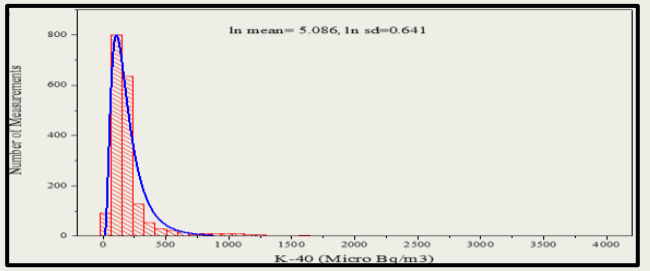


RNToolkit Time Development for ^{7}BE and ^{137}Cs.

Result & Conclusion







KISR
معهد الكويت للأبحاث العلمية
KUWAIT INSTITUTE FOR SCIENTIFIC RESEARCH

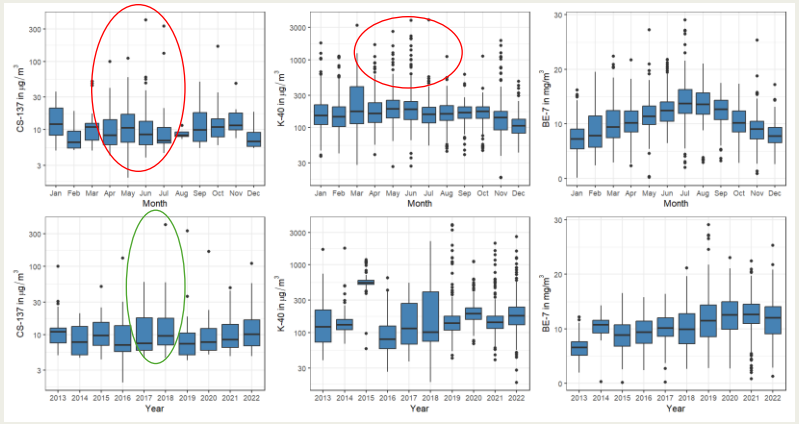
SnT 2025
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE
8 SEPTEMBER ONLINE DAY
9 TO 12 SEPTEMBER AT HOFBURG PALACE, VIENNA & ONLINE

Temporal Trends Assessment of Atmospheric Radionuclides in Kuwait: A Long-Term Study

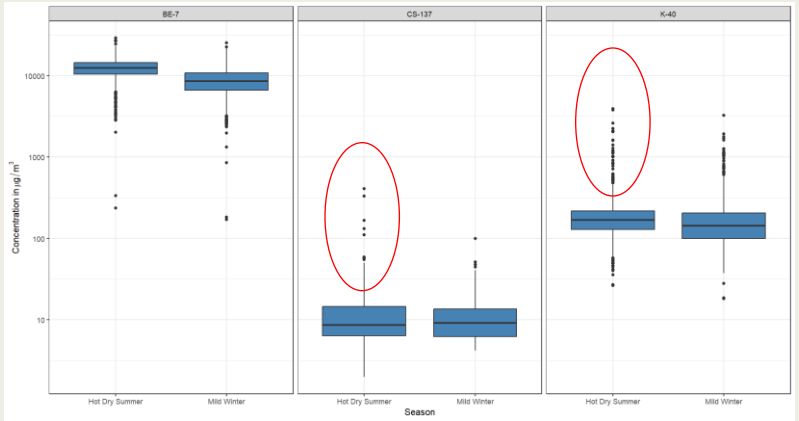
M. S. Al-Rashidi and A. N. Al-Dabbous

P2.3-847

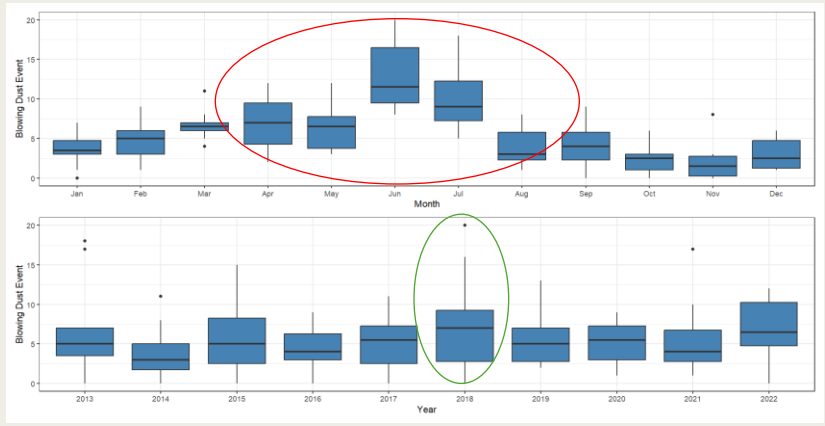
Result & Conclusion



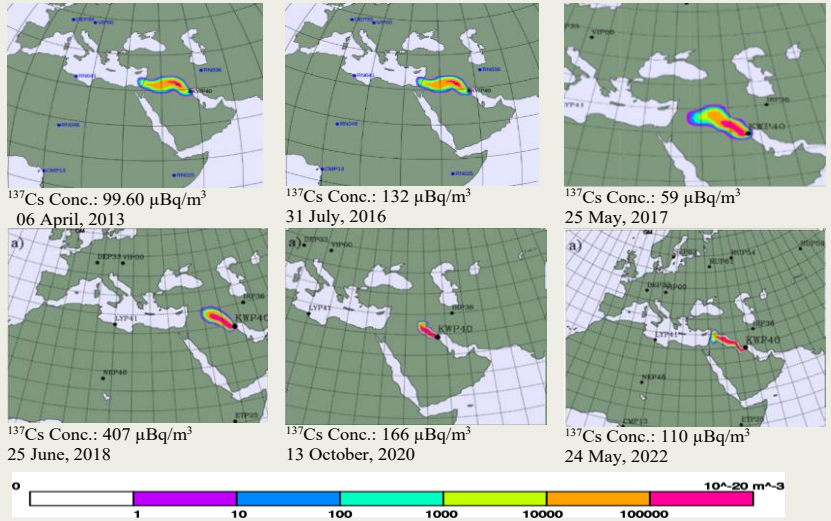
Cs-137, K-40, and BE-7 Yearly & Monthly Temporal Trend.



Cs-137, K-40, and BE-7 Seasonal Trend.



Blowing Dust Event Temporal Trend.



24 Hour CTBTO-ATM Back-Trajectory for CS-137 Detection Events for the Highest Concentrations

- The detection frequency of 137Cs (10.33%) was similar to that reported previously by Biegalski (10.38%), even though it was expected to decrease due to radioactive decay. This suggests another factor is affecting the presence of 137Cs in the ground surface air, such as the increase in dust storms and the decreased rainfall over the past decade.
- ATM back trajectory model patterns for the identified ^{137}Cs samples in the years 2013, 2016, 2017, 2018, and 2022 generally exhibit a consistent trend. These events were detected during the summer months (i.e., April, May, June, and July) in Kuwait, coinciding with frequent dust events.
- The estimated total annual DEs from inhalation were 3.7, 3.93, and 1.34 nSv for adults, children of 10, and 1 years old of the public, respectively. These values were significantly below the annual dose limit of 1 mSv for members of the public, adopted by ICRP, indicating negligible health effects.

KISR
معهد الكويت للأبحاث العلمية
KUWAIT INSTITUTE FOR SCIENTIFIC RESEARCH