

# Radon and thoron daughters activities in environment of the King George Island (West Antarctica)

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**Abstract.** Results of 253 gamma spectrometric analyses of radon daughters in soil and bedrocks of the King George Island (West Antarctica) have been presented. Extremely low values ranging from 0 to 58.4 Bq/kg, and from 4.9 to 75.5 Bq/kg for  $^{214}\text{Bi}$  and  $^{208}\text{Tl}$  respectively, are connected with predominantly basaltic character of geological basement. Obtained gamma spectrometric data correspond well to very low soil gas radon content measured by means of Kodak LR115 being below 454 Bq/m<sup>3</sup>. Low soil gas radon content and characteristic type of architecture is responsible for low indoor radon activity in Arctowski Station being as low as 10–15 Bq/m<sup>3</sup>. The highest 105 Bq/m<sup>3</sup> indoor Rn activity has been measured in the greenhouse bungalow of the station. This increased value was probably connected with the presence of about 1000 kg of imported soil material in the greenhouse room of the bungalow.

## 1 Introduction

253 gamma spectrometric measurements of radon daughters,  $^{214}\text{Bi}$  and  $^{208}\text{Tl}$  have been performed using Explo-ranium GR-320 gamma radiation spectrometer with the standard NaI (Tl) GPX-21A detector of 0.35 L volume, during the austral summer 2002/03 on the outcrops of magmatic-sedimentary succession of the Admiralty Bay (King George Island) (Fig. 1). Area under investigation is a part of the Shetland microplate which originated at the subducting Pacific margin of Gondwana and contains Cretaceous-Early Miocene island arc extrusives (mainly basalts and andesites) and intrusives (gabros, diorites, monzonites) (Birkenmajer et al., 1991).

## 2 Results

Average measured bedrock radon daughters activity was 14.6 and 18.9 Bq/kg for  $^{214}\text{Bi}$  and  $^{208}\text{Tl}$ , respectively, reaching its

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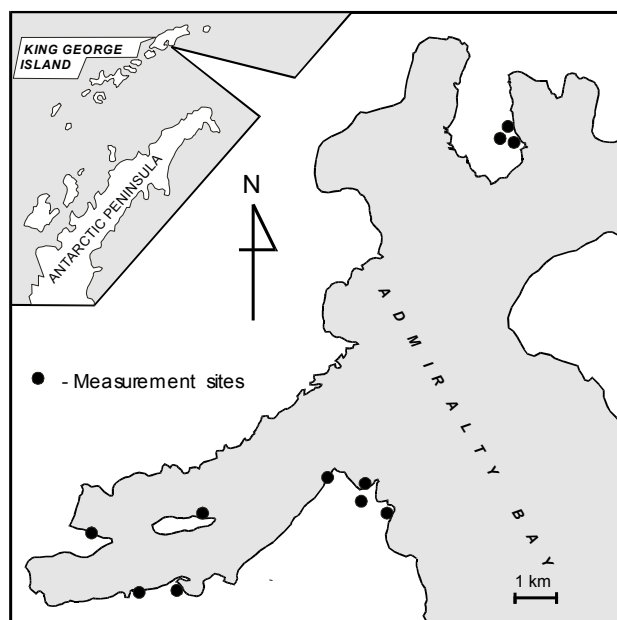
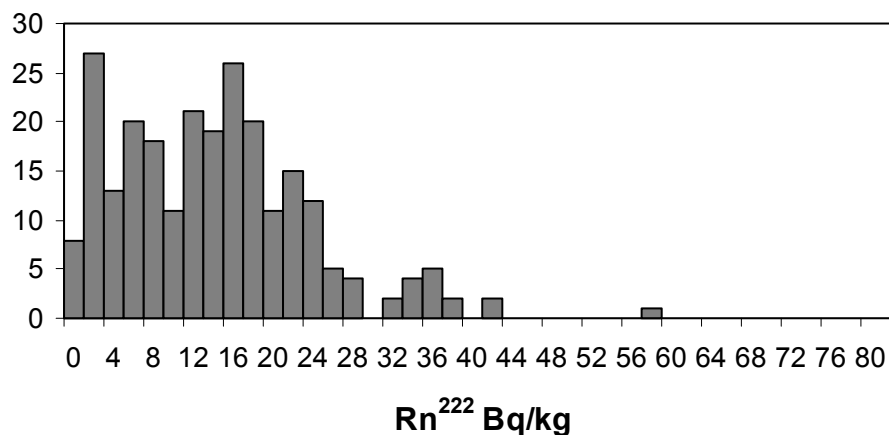


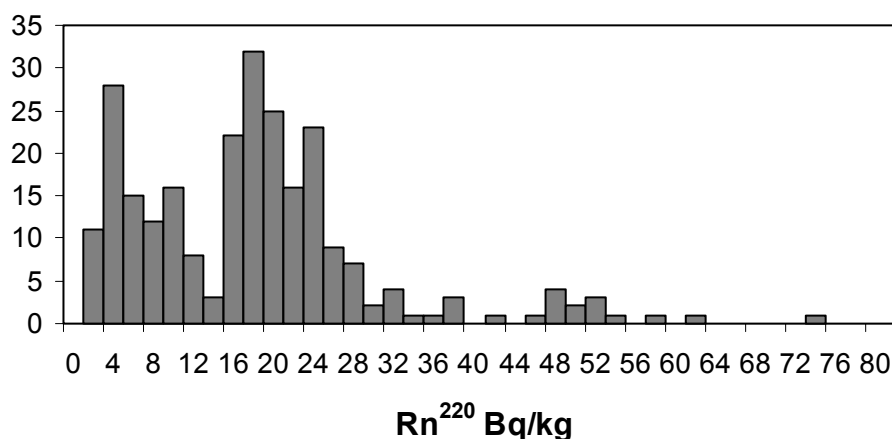
Fig. 1. Localisation of the study area.

maximum values 58.4 and 75.5 Bq/kg for granodioritic drop-stone (Table 1). In the case of basalts,  $^{214}\text{Bi}$  activity was often below detection limit, while for  $^{208}\text{Tl}$  the lowest recorded value was 4.9 Bq/kg. Trimodal distribution of the obtained data is especially well visible in the case of thoron activity (Fig. 3). Three groups of radon activities: 4, 16 and 36 Bq/kg visible in the Fig. 2 correspond to basement composed of: basalts, andesites and granodioritic quartz lode, respectively. The same rocks in the case of thoron activity data yield three maximas: 4, 20 and 52 Bq/kg (Fig. 3).

Rn indoor and soil gas activity has been measured by means of Kodak LR115 detectors. The highest Rn soil gas activity 454 Bq/m<sup>3</sup> was measured in the weathered volcanoclastic-zeolitic material of 21 and 26 Bq/kg for  $^{214}\text{Bi}$  and  $^{208}\text{Tl}$  respectively. Indoor values obtained were as low



**Fig. 2.** Histogram of radon activity distribution.



**Fig. 3.** Histogram of thoron activity distribution.

as 10–15 Bq/m<sup>3</sup> in social rooms of Polish Henryk Arctowski Station. The highest 105 Bq/m<sup>3</sup> indoor Rn activity has been measured in the greenhouse bungalow of the station. This increased value was probably connected with the presence of about 1000 kg of imported soil material in greenhouse room of the bungalow.

### 3 Summary

Obtained results indicate that King George Island area is of extremely low Rn potential due to low uranium and thorium content and low emanation coefficient of the chemically unweathered bedrock material. Measured values are slightly lower than those based on 22 gamma-spectrometric measurements published by Evangelista and Pereira (2002), but much better fit to Godoy et al. (1998) data and world scale data for areas of such a geology.

*Acknowledgements.* Author would like to thank Prof. S. Rakusa-Suszczewski and other Colleagues from the Department of Antarctic Biology Polish Academy of Sciences for their kind support, help and companionship in remote area of West Antarctica. Research was

partly founded by grant No. 2022/W/ING of the Institute of Geological Sciences Wrocław University.

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