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RADON IN SOIL GAS AT SELECTED SITES IN HOKKAIDO, JAPAN

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Introduction

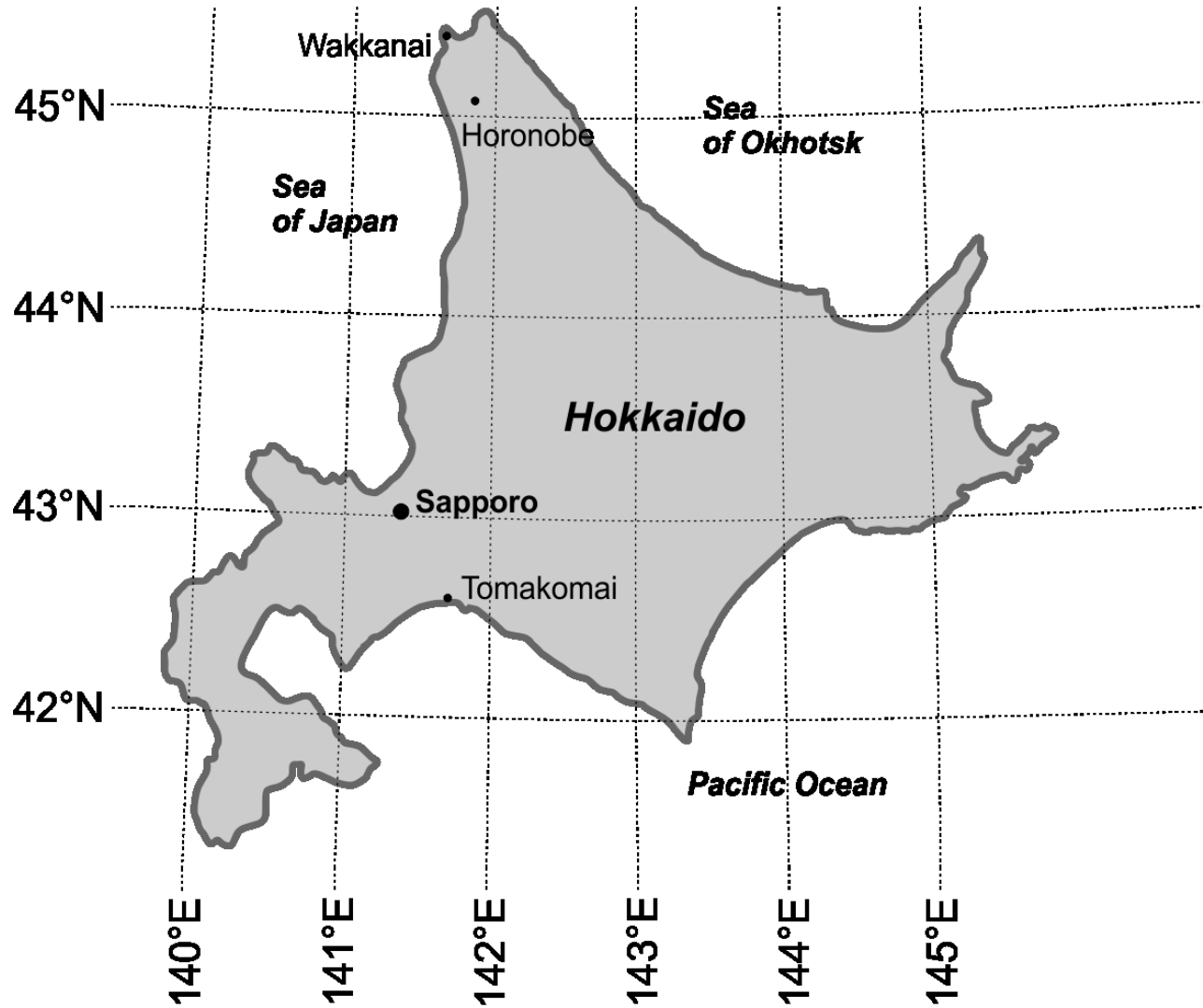
- More than a decade long radon monitoring in soil has been performed by Fujiyoshi's group in a forest in the campus of the Hokkaido University, Sapporo (Fujiyoshi et al., 2002; 2005; 2006).
 - They have shown seasonal variation of radon activity concentration in soil gas and explained its dependence on soil and air temperature, barometric pressure, and cover of water and snow.
 - They were also seeking the anomalies in radon levels presumably caused by seismic events, but not found.
 - Simultaneous monitoring of radon and CO₂ showed a negative correlation between their concentrations when air temperature drastically changed during periods of either arriving or departing of a front of low barometric pressure. In contrast, correlation was positive when the low-pressure front passed the site slowly (Fujiyoshi et al., 2010).

Introduction

- In our work, spatial distribution of radon activity concentration in soil gas was investigated at three sites in Hokkaido, primarily in the campus forest of the Hokkaido University in Sapporo.

Scientific Research Cooperation between Japan and Slovenia from March 2010 to February 2012 (No. BI-JP/10-12-002).

Measurement sites



Measuring procedure

Period of measurements: August 4–24, 2011

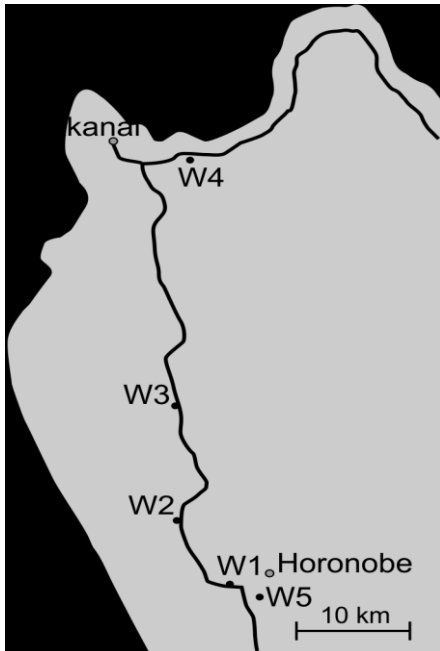
Sampling: Neznals' probe at depth of 1 m

Detection: set of alpha scintillation cells (Quindós L. S., Cantabria Univ., Spain) with alpha counter PRM-145 (AMES, Slovenia)



Radon in soil gas / Horonobe – Wakkanai

Low-lying coastal plain of Quaternary alluvial and terrace deposits resting on Neogene rocks. The Neogene strata comprise a thick sequence of sandstones, mudstones and shales deposited within the Mesozoic Tempoku Basin.



Sampling point	Latitude °N	Longitude °E	Date, time August 12	C_{Rn} Bq m ⁻³
W1	45.0048	141.8049	9:09	15300 ± 500
W2	45.0632	141.7481	10:11	31600 ± 600
W3	45.1711	141.7445	11:36	8500 ± 300
W4	45.3959	141.7584	15:36	21300 ± 500
W5	44.9973	141.8349	18:16	402 ± 77

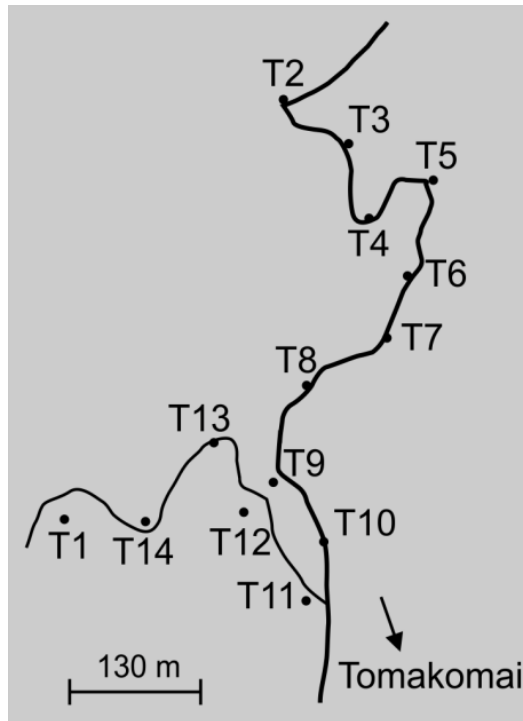
Radon in soil gas / Horonobe – Wakkanai



Point	Date, time August 8	C_{Rn} Bq m ⁻³
W4 a	14:34	8 ± 53
W4 b	14:47	22 ± 43
W4 c	15:24	11700 ± 400
W4 d	15:36	21300 ± 500

Radon in soil gas / Tomakomai

Hokkaido University
Experimental forest



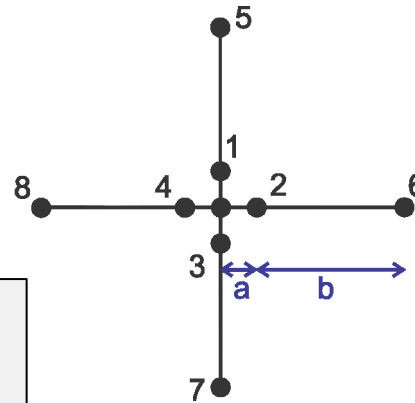
Immature volcanic soil derived from the Mt. Tarumae active volcano located about 20 km towards north-west from the Tomakomai city.

Sampling point	Latitude °N	Longitude °E	C_{Rn} Bq m ⁻³
T1	42.7098	141.5660	36 ± 22
T2	42.7138	141.5687	1440 ± 120
T3	42.7133	141.5696	280 ± 56
T4	42.7126	141.5698	185 ± 50
T5	42.7129	141.5707	110 ± 43
T6	42.7120	141.5703	97 ± 42
T7	42.7114	141.5700	121 ± 47
T8	42.7110	141.5690	109 ± 48
T9	42.7101	141.5686	79 ± 52
T10	42.7096	141.5692	92 ± 45
T11	42.7091	141.5689	470 ± 72
T12	42.7099	141.5682	199 ± 51
T13	42.7105	141.5678	123 ± 39
T14	42.7098	141.5670	244 ± 52

Radon in soil gas / Sapporo

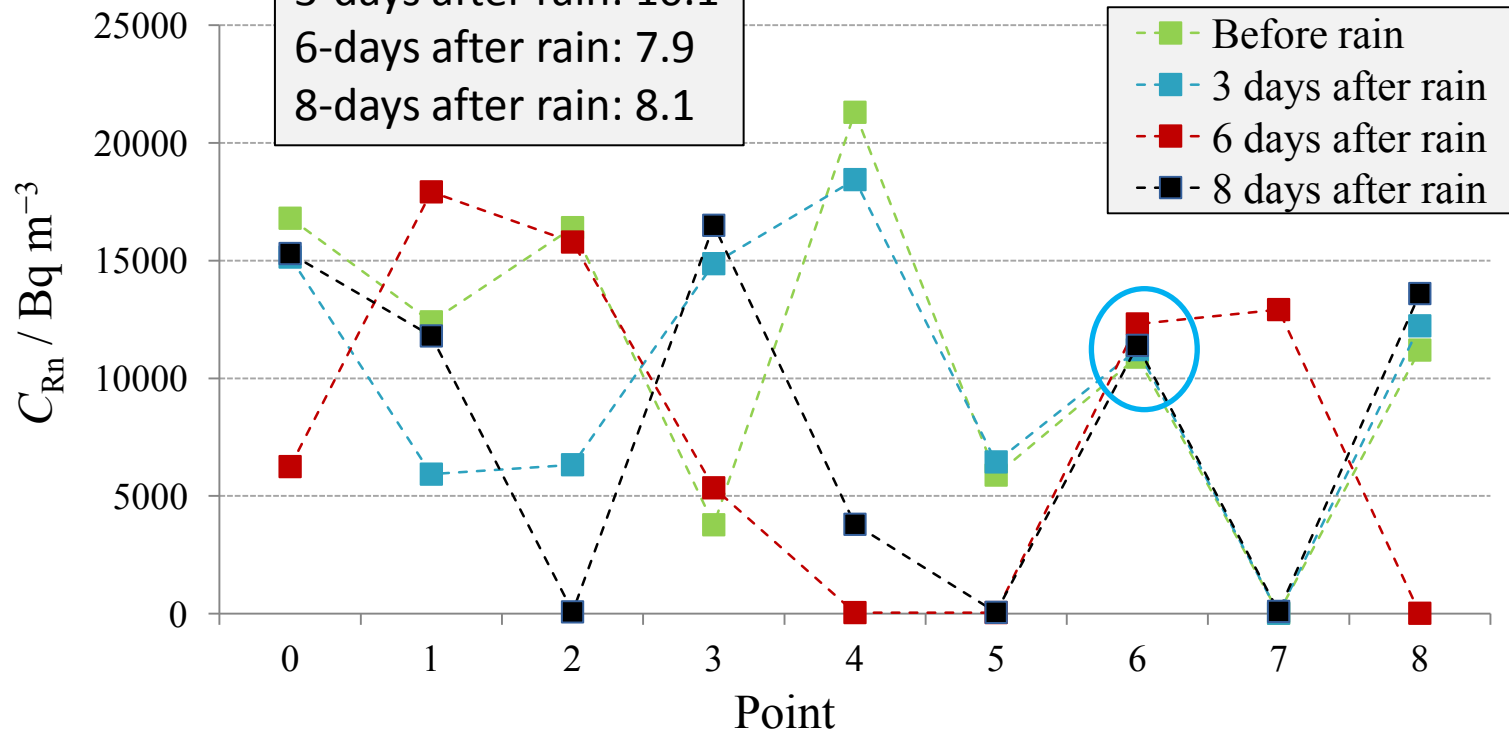
Hokkaido University campus

Alluvial sediment derived
from the Kotoni River



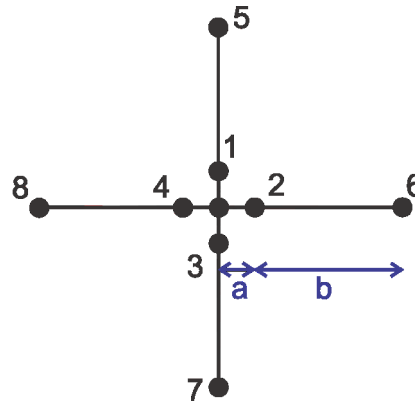
regular grid

AM (kBq m^{-3})
 Before rain: 11.0
 3-days after rain: 10.1
 6-days after rain: 7.9
 8-days after rain: 8.1

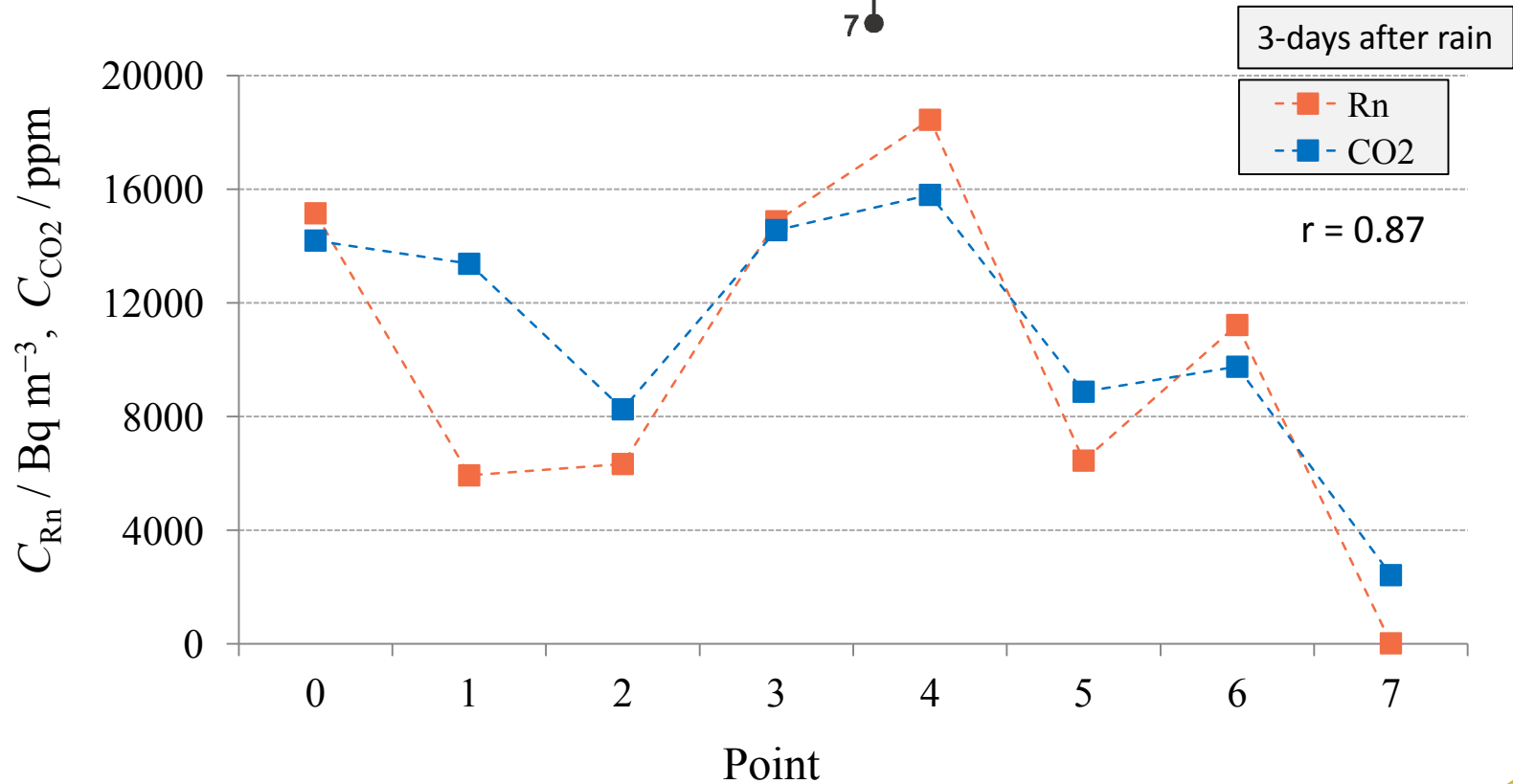


Radon in soil gas / Sapporo

Hokkaido University campus

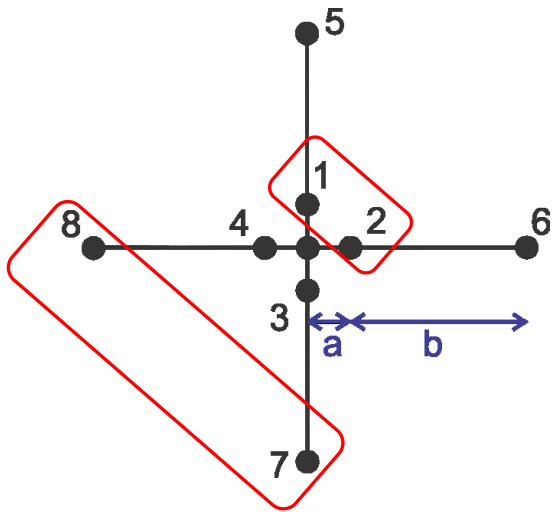


regular grid

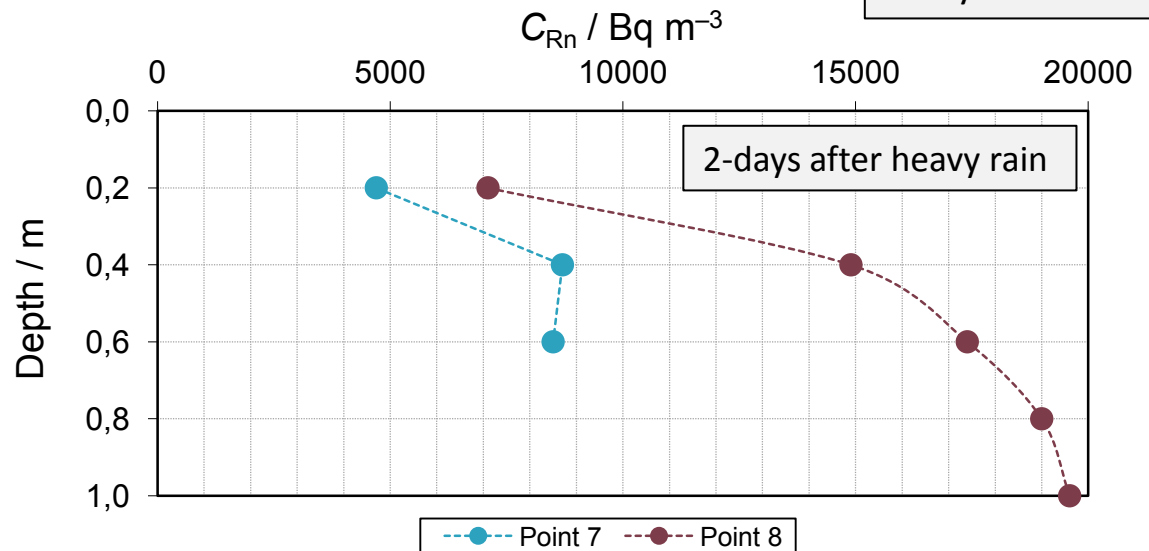
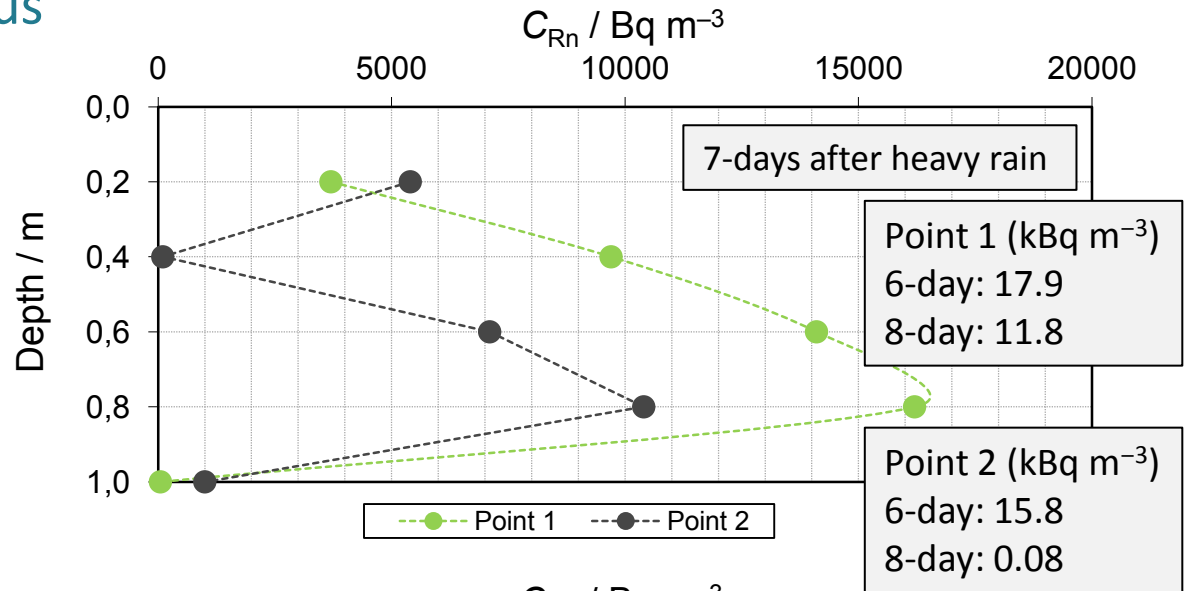


Radon in soil gas / Sapporo

Hokkaido University campus

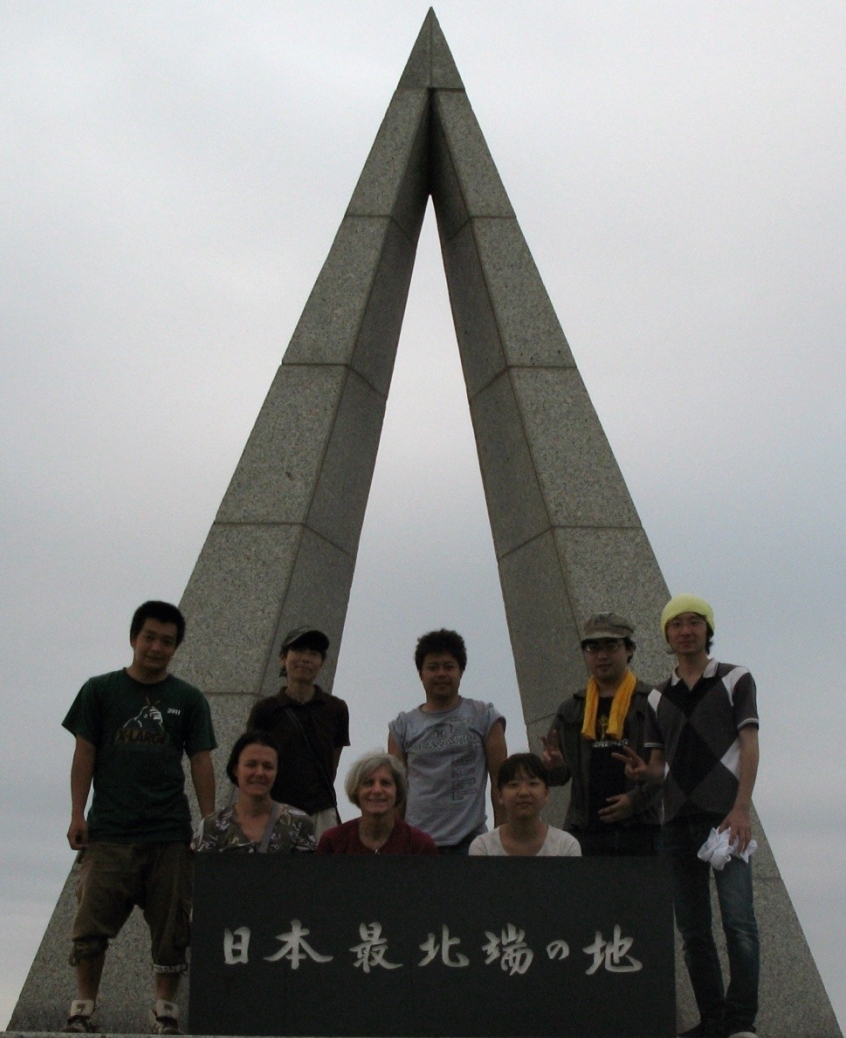


vertical radon profiles



Conclusions

- Radon activity concentrations ranged from several tens Bq m⁻³ to several tens kBq m⁻³ in Sapporo and by the Horonobe–Wakkanai road, and were several hundred Bq m⁻³ in Tomakomai.
- In Sapporo, considerable spatial variation between the points in the grid has been observed. Also the effect of rain on radon levels differed from point to point.
- The results show that in order to estimate and report a reliable radon concentration in soil gas for a selected site, related to its radon potential, measurements should be carefully designed and carried out.
- This has been the first attempt in Hokkaido to characterise a selected ground with respect to its radon potential, and to show spatial distribution of radon in soil on different geological basis.



日本最北端の地

Souya Misaki

Thank you for your attention!