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Atmospheric Chemistry and Physics Discussions

Supplement of

A process-based ^{222}Rn flux map for Europe and its comparison to long-term observations

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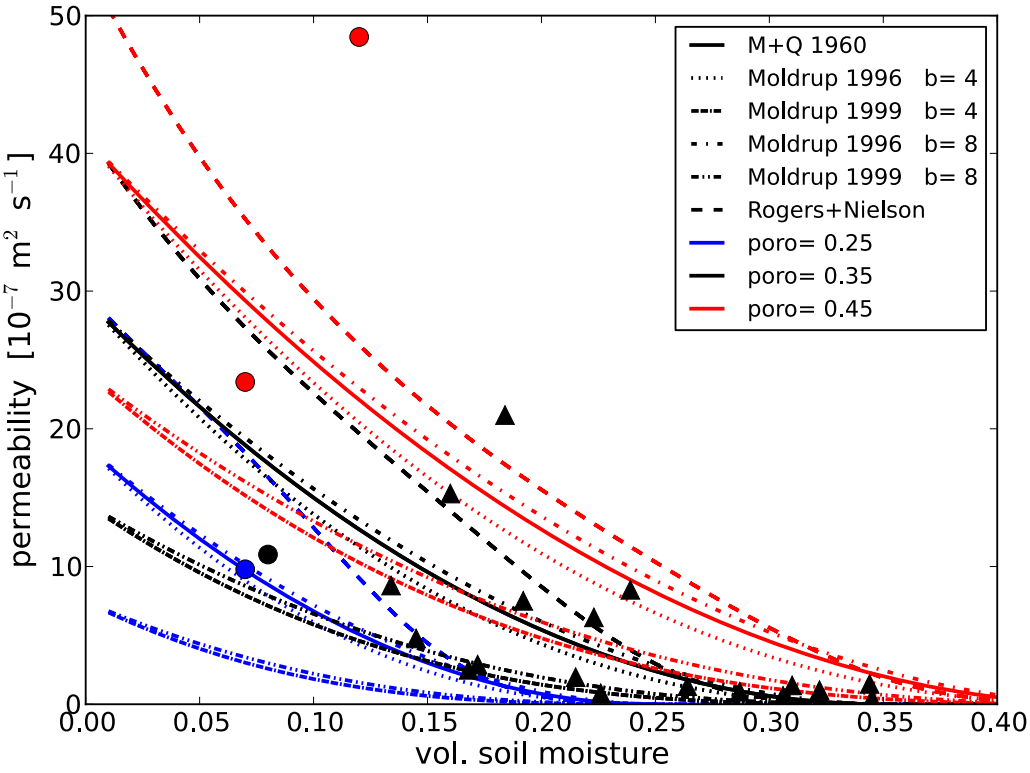

Figure S1. Dependency of soil permeability at 15°C on soil moisture as calculated with different models (Millington and Quirk, 1960; Rogers and Nielson, 1991; Moldrup et al., 1996; Moldrup et al., 1999) for different soil porosities together with measured values. Triangles correspond to individual estimates from the IUP site (Schmithüsen, 2012), while the filled circles were taken from locations close to Malaga from Dueñas et al. (1997). Colours of symbols and lines indicate mean porosity. The general shape of the Millington and Quirk (1960) and the Moldrup et al. (1996) models for typical hydraulic parameters of b=4 (sandy soils) and b=8 (clay soils) is very similar, with the curves being identical for b=6. Also included is the dependency for the Rogers and Nielson (1991) parameterization, which seems to overestimate P at low soil moisture and underestimate at high soil moisture.

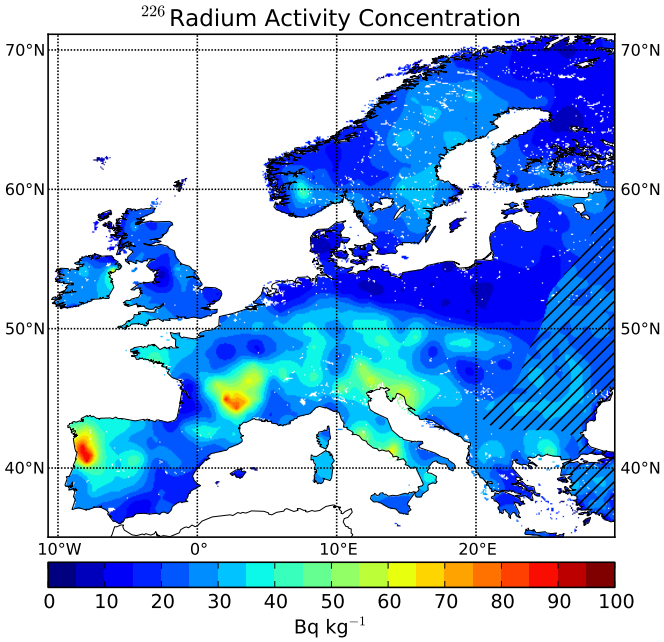

Figure S2. Distribution of the interpolated ^{226}Ra activity concentrations in the soil as derived from the Geochemical Atlas for Europe (Salminen, 2005) from their measured ^{238}U distributions at 0-0.25 m and 0.5-2.0 m of the soil. For the southeastern part of the model domain (not covered by the Geochemical Atlas), the ^{226}Ra activity concentration was extrapolated based on geological information from a global lithological map (Hartmann and Moosdorf, 2012), see Section 4.1 for more explanations.

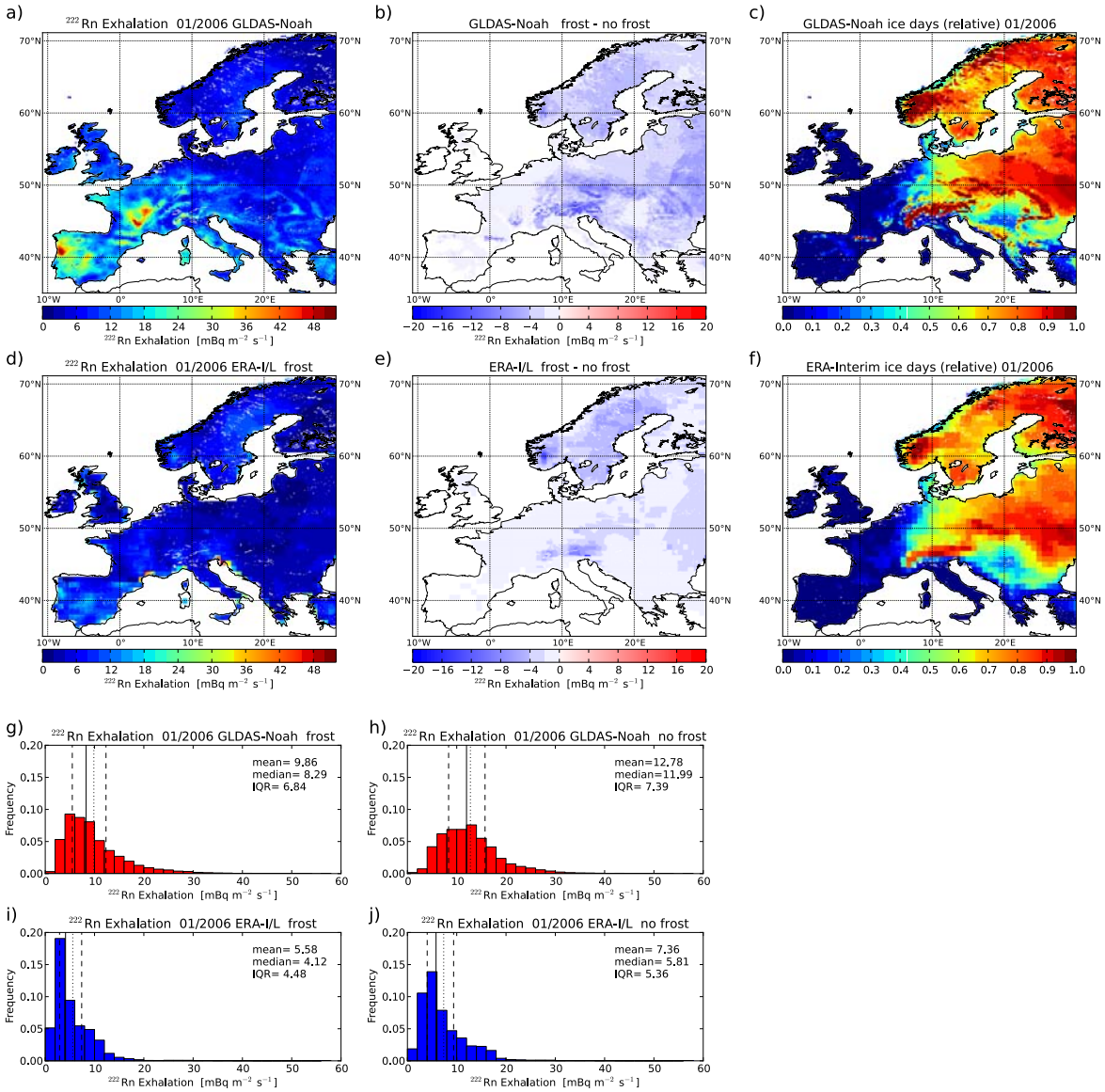

Figure S3. ^{222}Rn exhalation rate in January 2006 taking into account the influence of frost on GLDAS-Noah-based (top row) or ERA-Interim/Land-based fluxes (middle row). Flux maps with a 50% reduction of the fluxes on ice days (left) and the difference compared to unreduced fluxes (middle) are shown. The right maps show the percentage of ice days in January 2006 in the meteorological reanalysis used in the respective soil model. Normalized frequency distributions with frost influence (left panels) and without (right panels) are shown in the bottom row.

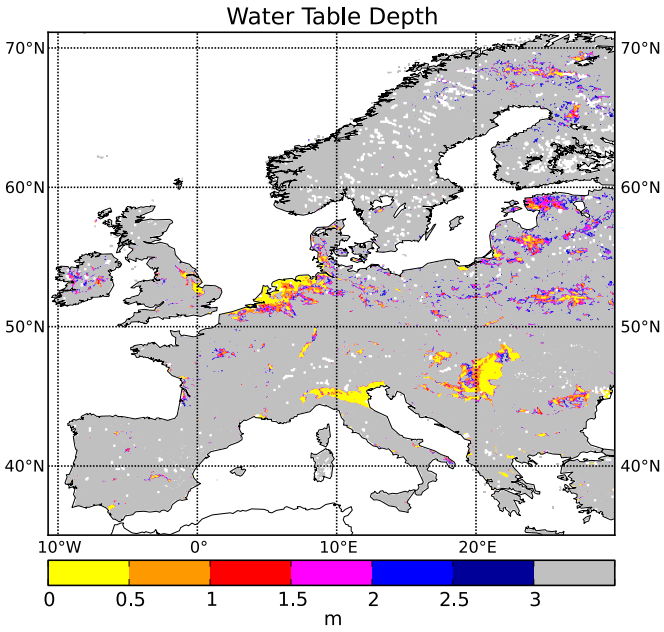

Figure S4. Distribution of water table depth in Europe (Miguez-Macho et al., 2008). Only values less than 3 m below soil surface are distinguished by colour code, areas with deeper water table are shown in gray. Note than large areas in the Netherlands, in the Po-valley and in the Great Hungarian Plain show very shallow water table of less than 50 cm.

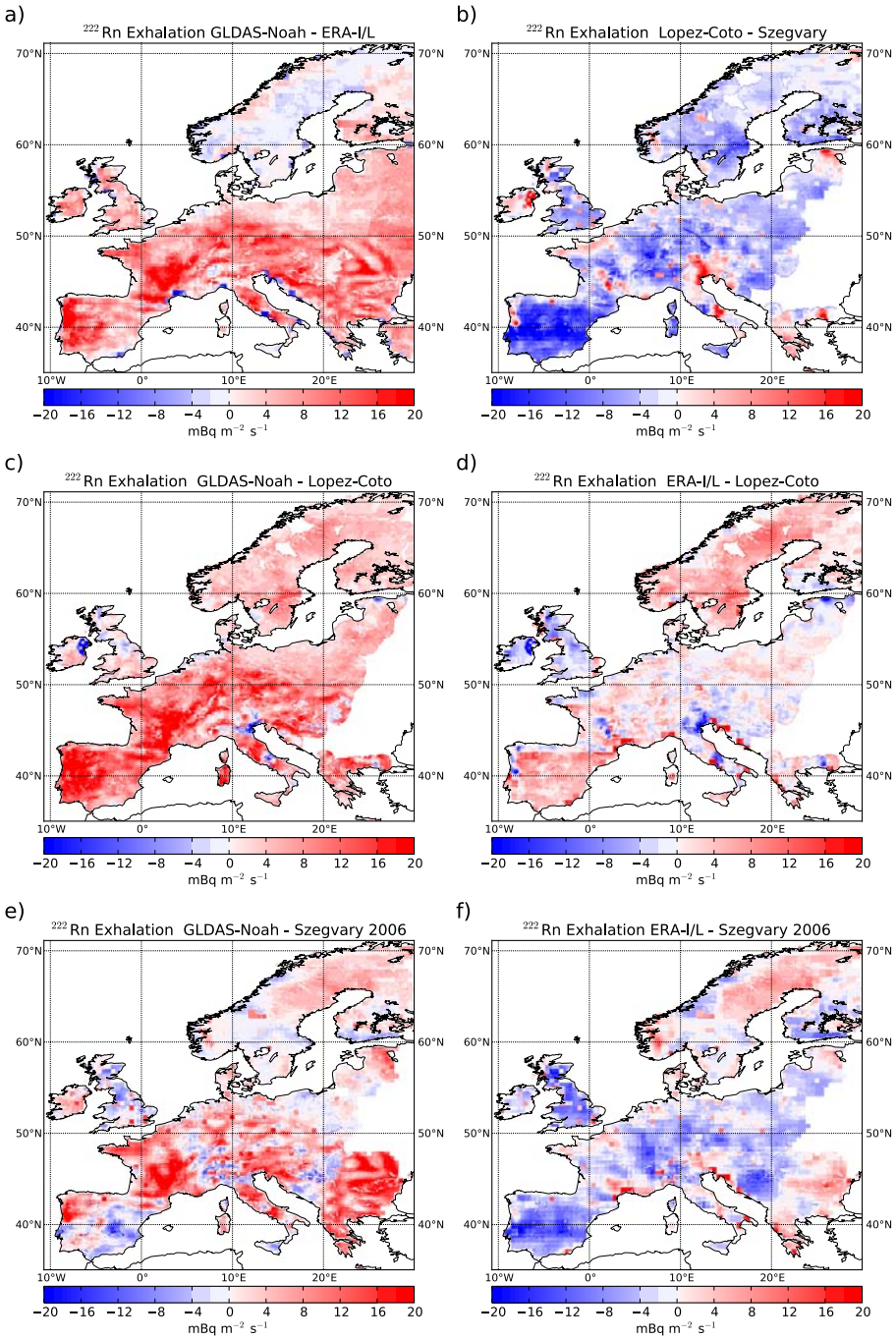

Figure S5. Differences in annual mean 2006 – 2010 climatologies of ^{222}Rn exhalation rates between our maps based on GLDAS-Noah and ERA-Interim/Land soil moisture (upper left), between our maps and the López-Coto et al. (2013) 1957-2002 climatology (middle panels), and between our maps and the Szegvary et al. (2009) fluxes for the year 2006 only (lower panels). The difference between the López-Coto et al. (2013) 1957-2002 climatology and the Szegvary et al. (2009) fluxes for 2006 is shown in the upper right panel.

Table S1. Comparison of monthly mean GLDAS-Noah and ERA-Interim/Land soil moisture with observations from the ISMN database (Doringo et al., 2011) and with observations at the stations Grenzhof, Gebesee, and Binningen. Statistics are summarized as average values for each network/station in Europe: correlation coefficient, relative difference ((reanalysis–observation)/observation) of the mean values, and normalized standard deviation ($\sigma_{reanalysis}/\sigma_{observation}$). References for the networks, number of stations (N) per network and soil depth range for the observations are given as well.

Network	N	Soil depth	Correlation		Rel. Diff. [%]		Norm. STDEV	
		[m]	Noah	ERA-I/L	Noah	ERA-I/L	Noah	ERA-I/L
CALABRIA Brocca et al. (2011)	3	0.03-0.90	0.76	0.75	-9	26	1.71	1.42
HOBE Bircher et al. (2012)	2	0.05-0.55	0.76	0.82	93	125	2.94	2.62
HYDROL-PREUGIA Morbidelli et al. (2014)	1	0.25-0.35	0.90	0.96	-19	34	1.23	0.98
MOL-RAO Beyrich and Adam (2007)	1	0.03-0.90	0.90	0.88	8	51	1.36	1.21
REMEDHUS Sanchez et al. (2012)	15	0.00-0.50	0.71	0.80	82	154	1.21	1.82
SMOSMANIA Albergel et al. (2008)	20	0.05-0.30	0.83	0.81	15	29	0.86	0.80
SWEX-POLAND Marczewski et al. (2010)	3	0.02-0.50	0.72	0.73	-12	46	2.15	1.44
UDC-SMOS Dall'Amico et al. (2012)	3	0.02-0.45	0.56	0.66	-17	7	1.71	0.79
UMBRIA Brocca et al. (2011)	6	0.35-0.45	0.86	0.89	-21	41	1.08	0.95
Grenzhof Wollschläger et al. (2009)	1	0.3-0.9	0.75	0.83	0	70	0.77	0.71
Gebesee O. Kolle (pers. comm. 2013)	1	0.32-0.64	0.53	0.60	-12	40	1.96	1.33
Binningen Szegvary et al. (2007)	1	-	*	*	-61	-24	*	*

* Not enough monthly data were available to compute statistically significant correlations and standard deviations.

Table S2. Overview of episodic radon flux measurements in Europe from different publications. The date of measurement is indicated in the table, if it was available in the particular publication. The flux measurement data are shown in Figure 8, aggregated to monthly values.

Lat.	Long.	j(^{222}Rn) (mBq m^{-2} s^{-1})	Date	Reference	Location
49.42	8.68	14.44 ± 0.98	15.11.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	18.69 ± 1.19	15.11.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	19.15 ± 1.22	15.11.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	17.81 ± 1.13	24.11.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	16.29 ± 0.97	24.11.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	4.67 ± 0.32	24.11.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	12.49 ± 0.73	24.11.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	9.23 ± 0.57	02.12.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	13.03 ± 0.80	02.12.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	3.18 ± 0.19	09.12.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	3.34 ± 0.21	09.12.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	11.36 ± 0.70	14.12.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	13.65 ± 0.83	14.12.2011	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	9.46 ± 0.59	13.01.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	4.90 ± 0.31	13.01.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	5.74 ± 0.36	16.01.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	6.32 ± 0.39	16.01.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	6.39 ± 0.41	24.01.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	4.78 ± 0.32	24.01.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	5.98 ± 0.38	08.03.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	6.88 ± 0.43	08.03.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	5.68 ± 0.37	08.03.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	5.52 ± 0.34	08.03.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	8.37 ± 0.54	20.03.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	5.22 ± 0.31	20.03.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	5.73 ± 0.35	20.03.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	9.24 ± 0.55	20.03.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	26.68 ± 1.67	16.05.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	22.30 ± 1.39	16.05.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	10.30 ± 0.67	16.05.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	8.94 ± 0.55	16.05.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	3.34 ± 0.25	22.05.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	15.65 ± 0.98	22.05.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	15.75 ± 0.98	29.05.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	17.57 ± 1.09	29.05.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	9.55 ± 0.62	05.06.2012	Schmithüsen (2012)	Heidelberg (Germany)

Lat.	Long.	j(^{222}Rn) (mBq m^{-2} s^{-1})	Date	Reference	Location
49.42	8.68	13.51 ± 0.86	05.06.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	30.01 ± 1.90	19.06.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	4.19 ± 0.27	19.06.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	17.35 ± 1.10	26.06.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	18.51 ± 1.17	26.06.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	5.49 ± 0.35	10.07.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	16.49 ± 1.05	10.07.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	5.53 ± 0.35	24.07.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	18.71 ± 1.19	24.07.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	13.93 ± 0.88	08.08.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	11.96 ± 0.76	08.08.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	5.46 ± 0.35	14.08.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.68	13.78 ± 0.88	14.08.2012	Schmithüsen (2012)	Heidelberg (Germany)
49.42	8.66	29.57 ± 1.80	05.09.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	40.22 ± 2.43	05.09.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	15.66 ± 0.97	19.09.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	20.07 ± 1.25	19.09.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	24.18 ± 1.50	02.10.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	38.71 ± 2.40	02.10.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	10.03 ± 0.63	08.10.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	19.92 ± 1.23	08.10.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	6.28 ± 0.40	16.10.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	23.33 ± 1.45	16.10.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	24.68 ± 1.53	23.10.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	24.24 ± 1.50	23.10.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	5.77 ± 0.36	06.11.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	16.29 ± 1.01	06.11.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	15.47 ± 0.92	26.11.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	20.89 ± 1.36	26.11.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	12.05 ± 0.75	04.12.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	34.01 ± 2.11	04.12.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	27.28 ± 1.70	14.12.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	28.48 ± 1.78	14.12.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	18.48 ± 1.15	18.12.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	17.65 ± 1.10	18.12.2012	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	20.71 ± 1.30	08.01.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	17.57 ± 1.10	08.01.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	4.62 ± 0.30	17.01.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	15.29 ± 0.93	25.01.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	18.63 ± 1.16	25.01.2013	Schwingshackl (2013)	Heidelberg (Germany)

Lat.	Long.	j(^{222}Rn) (mBq m^{-2} s^{-1})	Date	Reference	Location
49.42	8.66	10.83 ± 0.69	15.02.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	11.06 ± 0.70	15.02.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	19.34 ± 1.21	07.03.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	14.70 ± 0.92	07.03.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	18.98 ± 1.57	23.07.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	19.62 ± 1.32	23.07.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	18.40 ± 1.51	04.10.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.42	8.66	20.38 ± 1.35	04.10.2013	Schwingshackl (2013)	Heidelberg (Germany)
49.50	8.59	23.19 ± 1.84	17.07.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	11.51 ± 0.90	17.07.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	15.63 ± 1.25	20.08.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	15.24 ± 1.19	20.08.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	22.07 ± 1.77	27.08.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	10.04 ± 0.82	27.08.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	19.29 ± 1.54	02.09.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	35.75 ± 2.77	02.09.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	12.74 ± 1.02	24.09.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	10.89 ± 0.86	24.09.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	13.57 ± 1.10	30.09.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	7.99 ± 0.64	30.09.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	6.67 ± 0.54	08.10.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	27.64 ± 2.15	08.10.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	10.09 ± 0.81	14.10.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	12.61 ± 0.99	14.10.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	11.98 ± 0.97	05.11.2013	Schwingshackl (2013)	Heddesheim (Germany)
49.50	8.59	12.90 ± 1.02	05.11.2013	Schwingshackl (2013)	Heddesheim (Germany)
48.72	2.17	4.97 ± 0.52	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	7.29 ± 0.61	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	11.07 ± 1.06	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	11.93 ± 1.14	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	4.48 ± 0.47	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	9.71 ± 0.93	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	7.63 ± 0.69	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	5.93 ± 0.50	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	4.78 ± 0.40	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	8.14 ± 0.63	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	4.14 ± 0.35	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	4.43 ± 0.44	10.07.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	9.58 ± 0.75	06.08.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	8.91 ± 0.73	06.08.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)

Lat.	Long.	j(^{222}Rn) (mBq m^{-2} s^{-1})	Date	Reference	Location
48.72	2.17	10.26 ± 0.73	06.08.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	10.90 ± 0.81	06.08.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	7.89 ± 0.59	06.08.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	10.49 ± 0.74	06.08.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	8.37 ± 0.62	23.09.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	17.05 ± 1.19	23.09.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	12.46 ± 0.92	23.09.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	15.39 ± 1.08	23.09.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	5.71 ± 0.40	30.10.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	6.29 ± 0.46	30.10.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	4.25 ± 0.32	30.10.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	6.02 ± 0.42	30.10.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	4.63 ± 0.34	19.11.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	2.45 ± 0.20	19.11.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	3.82 ± 0.29	19.11.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	5.72 ± 0.43	19.11.2013	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	5.98 ± 0.43	10.03.2014	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	8.90 ± 0.66	10.03.2014	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	6.41 ± 0.48	10.03.2014	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	6.52 ± 0.47	10.03.2014	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	8.39 ± 0.75	24.03.2014	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	4.34 ± 0.41	24.03.2014	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	5.83 ± 0.45	24.03.2014	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	4.04 ± 0.34	24.03.2014	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	5.64 ± 0.55	24.03.2014	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.72	2.17	6.87 ± 0.51	24.03.2014	Schwingshackl (2013)	Gif-sur-Yvette (France)
48.52	5.25	30.07 ± 2.48	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	62.00 ± 5.31	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	32.29 ± 2.62	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	20.92 ± 1.56	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	76.16 ± 6.52	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	23.69 ± 1.77	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	13.49 ± 1.22	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	15.27 ± 1.37	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	54.77 ± 4.33	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	35.10 ± 2.64	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	13.02 ± 1.08	01.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	15.97 ± 1.08	19.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	20.72 ± 1.73	19.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	14.88 ± 1.01	19.08.2013	Schwingshackl (2013)	Bure (France)

Lat.	Long.	j(^{222}Rn) (mBq m^{-2} s^{-1})	Date	Reference	Location
48.52	5.25	12.97 ± 1.09	19.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	13.46 ± 1.14	26.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	16.00 ± 1.34	26.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	15.88 ± 1.09	26.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	11.16 ± 0.84	26.08.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	18.81 ± 1.26	02.09.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	20.43 ± 1.37	02.09.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	14.91 ± 1.24	02.09.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	14.52 ± 1.08	23.09.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	14.32 ± 1.08	23.09.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	7.82 ± 0.71	23.09.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	7.99 ± 0.73	23.09.2013	Schwingshackl (2013)	Bure (France)
48.52	5.25	6.59 ± 0.60	04.03.2014	Schwingshackl (2013)	Bure (France)
48.52	5.25	12.56 ± 0.84	04.03.2014	Schwingshackl (2013)	Bure (France)
48.52	5.25	4.62 ± 0.39	04.03.2014	Schwingshackl (2013)	Bure (France)
48.52	5.25	9.14 ± 0.62	04.03.2014	Schwingshackl (2013)	Bure (France)
48.52	5.25	4.07 ± 0.35	04.03.2014	Schwingshackl (2013)	Bure (France)
48.52	5.25	17.66 ± 1.39	17.03.2014	Schwingshackl (2013)	Bure (France)
48.52	5.25	8.38 ± 0.81	17.03.2014	Schwingshackl (2013)	Bure (France)
48.52	5.25	8.10 ± 0.71	17.03.2014	Schwingshackl (2013)	Bure (France)
48.52	5.25	15.27 ± 1.07	17.03.2014	Schwingshackl (2013)	Bure (France)
48.52	5.25	16.01 ± 1.12	17.03.2014	Schwingshackl (2013)	Bure (France)
48.52	5.25	11.39 ± 1.02	17.03.2014	Schwingshackl (2013)	Bure (France)
51.42	-0.57	5.20 ± 0.45	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	4.36 ± 0.38	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	3.52 ± 0.38	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	3.12 ± 0.29	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	17.33 ± 2.34	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	2.96 ± 0.27	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	11.92 ± 1.62	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	10.45 ± 1.42	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	3.49 ± 0.28	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	8.59 ± 1.13	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	2.41 ± 0.25	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.42	-0.57	4.00 ± 0.33	16.09.2013	Schwingshackl (2013)	Egham (United Kingdom)
51.10	10.92	24.45 ± 7.14	26.09.2003	Schell (2004)	Gebesee (Germany)
51.10	10.92	22.70 ± 3.50	20.10.2003	Schell (2004)	Gebesee (Germany)
51.10	10.92	21.91 ± 13.03	04.11.2003	Schell (2004)	Gebesee (Germany)
51.10	10.92	19.60 ± 14.52	14.01.2004	Schell (2004)	Gebesee (Germany)
51.10	10.92	20.08 ± 10.37	11.02.2004	Schell (2004)	Gebesee (Germany)

Lat.	Long.	j(^{222}Rn) (mBq m^{-2} s^{-1})	Date	Reference	Location
51.10	10.92	21.11 ± 6.57	11.03.2004	Schell (2004)	Gebesee (Germany)
51.10	10.92	23.83 ± 2.70	15.04.2004	Schell (2004)	Gebesee (Germany)
51.10	10.92	22.55 ± 3.30	12.05.2004	Schell (2004)	Gebesee (Germany)
51.10	10.92	24.35 ± 5.74	19.07.2004	Schell (2004)	Gebesee (Germany)
51.10	10.92	27.92 ± 8.17	19.08.2004	Schell (2004)	Gebesee (Germany)
51.10	10.92	37.50 ± 12.74	15.09.2004	Schell (2004)	Gebesee (Germany)
36.72	-4.46	12.00 ± 8.00		Dueñas et al. (1997)	Málaga (Spain)
36.67	-4.47	25.00 ± 13.00		Dueñas et al. (1997)	Málaga (Spain)
36.69	-4.44	3.00 ± 1.60		Dueñas et al. (1997)	Málaga (Spain)
36.73	-4.46	10.00 ± 4.00		Dueñas et al. (1997)	Málaga (Spain)
40.45	-1.06	7.22 ± 1.63	July 2008	Grossi et al. (2011)	Teruel (Spain)
39.47	-0.97	11.32 ± 1.56	July 2008	Grossi et al. (2011)	Los Pedrones (Spain)
39.79	-3.54	15.76 ± 1.50	July 2008	Grossi et al. (2011)	Q. de la Orden (Spain)
40.58	-3.62	25.97 ± 5.99	July 2008	Grossi et al. (2011)	Madrif (Spain)
37.10	-6.70	1.36 ± 0.64		Grossi et al. (2012)	El Arenosillo (Spain)
48.72	2.16	7.40 ± 0.74	April 1958	Servant (1964)	Gif-sur-Yvette (France)
48.72	2.16	17.76 ± 0.74	May 1958	Servant (1964)	Gif-sur-Yvette (France)
48.72	2.16	22.20 ± 0.74	June 1958	Servant (1964)	Gif-sur-Yvette (France)
48.72	2.16	17.76 ± 0.74	July 1958	Servant (1964)	Gif-sur-Yvette (France)
48.72	2.16	17.02 ± 0.74	September 1958	Servant (1964)	Gif-sur-Yvette (France)
48.72	2.16	14.80 ± 0.74	October 1958	Servant (1964)	Gif-sur-Yvette (France)
48.72	2.16	11.84 ± 0.74	November 1958	Servant (1964)	Gif-sur-Yvette (France)
48.72	2.16	10.36 ± 0.74	December 1958	Servant (1964)	Gif-sur-Yvette (France)
48.72	2.16	9.25 ± 0.74	February 1959	Servant (1964)	Gif-sur-Yvette (France)
48.72	2.16	14.80 ± 0.74	March 1959	Servant (1964)	Gif-sur-Yvette (France)
48.72	2.16	13.69 ± 0.74	April 1959	Servant (1964)	Gif-sur-Yvette (France)
54.43	12.73	1.39 ± 0.83	April 1997	Schmidt (1999)	Zingst (Germany)
54.43	12.73	2.08 ± 0.19	August 1997	Schmidt (1999)	Zingst (Germany)
54.43	12.73	1.11	March 1998	Schmidt (1999)	Zingst (Germany)
54.43	12.73	1.25	July 1998	Schmidt (1999)	Zingst (Germany)
53.17	13.03	18.89 ± 3.47	May 1997	Schmidt (1999)	Neuglobsow (Germany)
53.17	13.03	17.22 ± 2.64	August 1997	Schmidt (1999)	Neuglobsow (Germany)
53.17	13.03	13.06 ± 3.33	March 1998	Schmidt (1999)	Neuglobsow (Germany)
53.17	13.03	18.19 ± 5.69	July 1998	Schmidt (1999)	Neuglobsow (Germany)
54.35	12.68	6.53	April 1997	Schmidt (1999)	Zingst (Germany)
54.35	12.68	8.89 ± 2.22	March 1998	Schmidt (1999)	Zingst (Germany)
54.35	12.68	8.89 ± 3.89	July 1998	Schmidt (1999)	Zingst (Germany)
53.75	13.12	10.83 ± 4.86	March 1998	Schmidt (1999)	Altenhagen (Germany)
53.75	13.12	4.03 ± 1.67	July 1998	Schmidt (1999)	Altenhagen (Germany)
53.39	6.36	1.04 ± 0.22	January	Manohar et al. (2015)	Lutjewad (Netherlands)

Lat.	Long.	j(^{222}Rn) (mBq m^{-2} s^{-1})	Date	Reference	Location
53.39	6.36	2.76 ± 0.46	February	Manohar et al. (2015)	Lutjewad (Netherlands)
53.39	6.36	2.00 ± 0.20	March	Manohar et al. (2015)	Lutjewad (Netherlands)
53.39	6.36	3.20 ± 0.33	April	Manohar et al. (2015)	Lutjewad (Netherlands)
53.39	6.36	4.30 ± 0.39	May	Manohar et al. (2015)	Lutjewad (Netherlands)
53.39	6.36	4.37 ± 0.40	June	Manohar et al. (2015)	Lutjewad (Netherlands)
53.39	6.36	2.73 ± 0.27	July	Manohar et al. (2015)	Lutjewad (Netherlands)
53.39	6.36	2.58 ± 0.16	August	Manohar et al. (2015)	Lutjewad (Netherlands)
53.39	6.36	4.56 ± 0.77	September	Manohar et al. (2015)	Lutjewad (Netherlands)
53.39	6.36	4.33 ± 0.68	October	Manohar et al. (2015)	Lutjewad (Netherlands)
53.39	6.36	3.57 ± 0.95	November	Manohar et al. (2015)	Lutjewad (Netherlands)
53.39	6.36	2.66 ± 0.56	December	Manohar et al. (2015)	Lutjewad (Netherlands)
43.50	-1.00	4.58 ± 0.89	1990	Eckhardt (1990)	Dax-Sebastopol (France)
53.05	11.35	5.61	1990	Eckhardt (1990)	Gorleben (Germany)
49.52	8.52	8.97 ± 1.25	1990	Eckhardt (1990)	Mannheim (Germany)
49.58	8.50	10.75 ± 1.67	1990	Eckhardt (1990)	Mannheim (Germany)
49.27	8.60	11.72 ± 0.69	1990	Eckhardt (1990)	St. Leon (Germany)
48.85	13.20	4.17 ± 1.11	1990	Eckhardt (1990)	Deggendorf (Germany)
49.88	8.65	4.72	1990	Eckhardt (1990)	Darmstadt (Germany)
47.73	9.63	5.50	1990	Eckhardt (1990)	Ravensburg (Germany)
49.43	8.72	5.50 ± 0.33	1990	Eckhardt (1990)	Strangwasem (Germany)
49.23	8.72	14.17	1990	Eckhardt (1990)	Östringen (Germany)
49.37	8.72	17.58	1990	Eckhardt (1990)	Leimen (Germany)
49.38	8.70	36.39 ± 13.42	1990	Eckhardt (1990)	Heidelberg (Germany)
49.17	8.72	23.00 ± 1.67	1993-1995	Schüßler (1996)	Weiherbachtal (Germany)
51.85	6.62	4.81 ± 3.00	1990	Eckhardt (1990)	Bocholt-Liedern (Germany)
49.35	8.65	22.31	1990	Eckhardt (1990)	Bruchhausen (Germany)
49.30	8.57	10.69	1990	Eckhardt (1990)	Reilingen (Germany)
47.05	8.30	10.83 ± 1.25	1990	Eckhardt (1990)	Luzern (Switzerland)
49.38	8.57	13.97	1990	Eckhardt (1990)	Schwetzingen (Germany)
45.32	8.42	8.56 ± 0.89	1990	Eckhardt (1990)	Vercelli (Italy)
49.20	7.95	26.39	1990	Eckhardt (1990)	Erfweiler (Germany)
49.27	8.87	28.97 ± 9.86	1990	Eckhardt (1990)	Sinsheim (Germany)
49.38	8.82	29.44	1990	Eckhardt (1990)	Wiesenbach (Germany)
46.07	7.78	5.09		Eckhardt (1990)	Täsch (Switzerland)
52.25	21.00	7.18	1968	Pensko et al. (1968)	Warschau (Poland)
47.28	11.42	12.31 ± 3.80	1935	Zeilinger (1935)	Innsbruck (Austria)
47.08	15.37	14.63 ± 5.37	1935	Kosmath (1935)	Graz (Austria)
50.77	6.10	16.90	1970	Israel et al. (1970)	Aachen (Germany)
53.33	-6.25	27.41	1912	Smyth (1912)	Dublin (Ireland)
49.60	8.59	7.20 ± 0.72	1984	Dörr (1984)	Hüttenfeld (Germany)

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49.53	8.62	19.01 ± 1.90	1984	Dörr (1984)	Muckensturm (Germany)
49.54	8.58	7.97 ± 0.80	1984	Dörr (1984)	Viernheim (Germany)
49.54	8.60	3.83 ± 0.38	1984	Dörr (1984)	Viernheim (Germany)
49.46	8.56	15.26 ± 1.53	1984	Dörr (1984)	Seckenheim (Germany)
49.35	8.65	5.09 ± 0.51	1984	Dörr (1984)	Sandhausen (Germany)
53.13	-8.45	4.10 ± 0.50	10.10.2000	Jutzi (2001)	Kylebrack (Ireland)
53.13	-8.45	5.84 ± 0.80	10.10.2000	Jutzi (2001)	Kylebrack (Ireland)
53.17	-8.37	16.38 ± 2.14	10.10.2000	Jutzi (2001)	Tynagh (Ireland)
53.17	-8.37	21.68 ± 2.80	10.10.2000	Jutzi (2001)	Tynagh (Ireland)
53.17	-8.83	17.32 ± 2.23	10.10.2000	Jutzi (2001)	Ardrahan (Ireland)
53.17	-8.83	8.22 ± 1.04	10.10.2000	Jutzi (2001)	Ardrahan (Ireland)
52.92	-9.25	1.28 ± 0.16	10.10.2000	Jutzi (2001)	Ennismon (Ireland)
52.92	-9.25	0.47 ± 0.21	10.10.2000	Jutzi (2001)	Ennismon (Ireland)
53.23	-8.25	13.80 ± 1.80	11.10.2000	Jutzi (2001)	Kiltomer (Ireland)
53.23	-8.25	5.46 ± 0.69	11.10.2000	Jutzi (2001)	Kiltomer (Ireland)
53.47	-8.17	2.55 ± 0.32	11.10.2000	Jutzi (2001)	Dysart (Ireland)
53.47	-8.17	3.37 ± 0.46	11.10.2000	Jutzi (2001)	Dysart (Ireland)
53.77	-8.08	4.30 ± 0.60	11.10.2000	Jutzi (2001)	Strokestown (Ireland)
53.77	-8.08	7.83 ± 1.10	11.10.2000	Jutzi (2001)	Strokestown (Ireland)
53.97	-7.85	4.67 ± 0.60	12.10.2000	Jutzi (2001)	Mohill (Ireland)
53.97	-7.85	5.36 ± 0.70	12.10.2000	Jutzi (2001)	Mohill (Ireland)
53.83	-7.05	0.49 ± 0.07	12.10.2000	Jutzi (2001)	Virginia (Ireland)
53.33	-6.88	4.68 ± 1.11	13.10.2000	Jutzi (2001)	Innfield (Ireland)
53.33	-6.88	1.78 ± 0.18	13.10.2000	Jutzi (2001)	Innfield (Ireland)
53.20	-7.38	8.22 ± 1.08	13.10.2000	Jutzi (2001)	Tullamore (Ireland)
53.20	-7.38	2.55 ± 0.35	13.10.2000	Jutzi (2001)	Tullamore (Ireland)
53.07	-7.97	8.27 ± 1.07	13.10.2000	Jutzi (2001)	Carrig (Ireland)
53.07	-7.97	9.94 ± 1.30	13.10.2000	Jutzi (2001)	Carrig (Ireland)
53.13	-8.45	2.09 ± 0.31	14.10.2000	Jutzi (2001)	Kylebrack (Ireland)
53.13	-8.45	3.97 ± 0.49	14.10.2000	Jutzi (2001)	Kylebrack (Ireland)
53.17	-8.37	3.78 ± 0.50	14.10.2000	Jutzi (2001)	Tynagh (Ireland)
53.17	-8.37	5.95 ± 0.80	14.10.2000	Jutzi (2001)	Tynagh (Ireland)
53.17	-8.83	18.53 ± 2.40	14.10.2000	Jutzi (2001)	Ardahan (Ireland)
53.17	-8.83	1.33 ± 0.20	14.10.2000	Jutzi (2001)	Ardahan (Ireland)
53.23	-8.37	2.92 ± 0.37	15.10.2000	Jutzi (2001)	Kiltomer (Ireland)
53.23	-8.37	5.46 ± 0.69	15.10.2000	Jutzi (2001)	Kiltomer (Ireland)
53.52	-8.68	1.84 ± 0.27	15.10.2000	Jutzi (2001)	Lerally (Ireland)
53.52	-8.68	1.29 ± 0.13	15.10.2000	Jutzi (2001)	Lerally (Ireland)
53.77	-8.08	9.69 ± 1.30	15.10.2000	Jutzi (2001)	Strokestown (Ireland)
53.77	-8.08	4.82 ± 0.65	15.10.2000	Jutzi (2001)	Strokestown (Ireland)

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52.83	-9.03	5.10 ± 0.70	16.10.2000	Jutzi (2001)	Ennis (Ireland)
52.83	-8.75	1.95 ± 0.20	16.10.2000	Jutzi (2001)	Tulla (Ireland)
52.42	-8.17	3.59 ± 1.62	17.10.2000	Jutzi (2001)	Tipperary (Ireland)
52.42	-8.17	4.46 ± 0.60	17.10.2000	Jutzi (2001)	Tipperary (Ireland)
52.42	-7.92	42.68 ± 0.20	17.10.2000	Jutzi (2001)	Cashel (Ireland)
52.42	-7.92	1.62 ± 0.20	17.10.2000	Jutzi (2001)	Cashel (Ireland)
52.08	-8.03	2.14 ± 0.29	18.10.2000	Jutzi (2001)	Lismore (Ireland)
52.08	-8.03	2.38 ± 2.41	18.10.2000	Jutzi (2001)	Lismore (Ireland)
47.54	7.58	18.33		Szegvary et al. (2007)	(Switzerland)
47.43	7.88	3.89		Szegvary et al. (2007)	(Switzerland)
46.51	6.67	25.28		Szegvary et al. (2007)	(Switzerland)
47.29	7.74	24.17		Szegvary et al. (2007)	(Switzerland)
46.93	7.42	23.33		Szegvary et al. (2007)	(Switzerland)
46.93	7.42	18.33		Szegvary et al. (2007)	(Switzerland)
46.33	6.92	10.28		Szegvary et al. (2007)	(Switzerland)
46.33	6.92	3.61		Szegvary et al. (2007)	(Switzerland)
46.30	7.84	13.89		Szegvary et al. (2007)	(Switzerland)
46.84	6.58	13.61		Szegvary et al. (2007)	(Switzerland)
47.08	6.79	18.61		Szegvary et al. (2007)	(Switzerland)
46.40	6.23	25.56		Szegvary et al. (2007)	(Switzerland)
46.81	9.84	5.00		Szegvary et al. (2007)	(Switzerland)
46.53	9.88	10.28		Szegvary et al. (2007)	(Switzerland)
46.34	10.07	27.22		Szegvary et al. (2007)	(Switzerland)
47.26	7.79	23.06		Szegvary et al. (2007)	(Switzerland)
46.50	8.31	16.94		Szegvary et al. (2007)	(Switzerland)
47.48	8.90	26.67		Szegvary et al. (2007)	(Switzerland)
47.43	9.40	12.22		Szegvary et al. (2007)	(Switzerland)
47.03	9.07	20.56		Szegvary et al. (2007)	(Switzerland)
47.13	9.52	10.83		Szegvary et al. (2007)	(Switzerland)
47.06	8.46	1.94		Szegvary et al. (2007)	(Switzerland)
47.59	7.64	30.28		Szegvary et al. (2007)	(Switzerland)
47.76	7.81	43.61		Szegvary et al. (2007)	(Germany)
47.66	8.00	8.33		Szegvary et al. (2007)	(Germany)
47.59	8.14	9.17		Szegvary et al. (2007)	(Germany)
47.56	7.95	16.11		Szegvary et al. (2007)	(Germany)
47.56	7.78	27.22		Szegvary et al. (2007)	(Germany)
47.65	7.82	24.72		Szegvary et al. (2007)	(Germany)
60.39	25.29	52.50		Szegvary et al. (2007)	(Finland)
60.46	26.22	23.33		Szegvary et al. (2007)	(Finland)
60.44	26.05	34.44		Szegvary et al. (2007)	(Finland)

Lat.	Long.	j(^{222}Rn) (mBq m^{-2} s^{-1})	Date	Reference	Location
61.51	23.79	15.28		Szegvary et al. (2007)	(Finland)
61.27	24.04	16.67		Szegvary et al. (2007)	(Finland)
60.89	24.29	14.17		Szegvary et al. (2007)	(Finland)
60.45	22.37	37.22		Szegvary et al. (2007)	(Finland)
60.47	23.98	30.00		Szegvary et al. (2007)	(Finland)
66.14	28.14	3.33		Szegvary et al. (2007)	(Finland)
66.37	26.76	26.39		Szegvary et al. (2007)	(Finland)
66.51	25.79	13.61		Szegvary et al. (2007)	(Finland)
65.40	26.91	1.67		Szegvary et al. (2007)	(Finland)
65.95	26.47	1.67		Szegvary et al. (2007)	(Finland)
67.41	26.64	9.72		Szegvary et al. (2007)	(Finland)
66.72	27.33	0.56		Szegvary et al. (2007)	(Finland)
66.12	24.85	14.72		Szegvary et al. (2007)	(Finland)
47.71	17.67	8.06		Szegvary et al. (2007)	(Hungary)
47.56	18.41	30.00		Szegvary et al. (2007)	(Hungary)
47.94	19.14	22.22		Szegvary et al. (2007)	(Hungary)
48.10	19.54	12.22		Szegvary et al. (2007)	(Hungary)
48.05	19.79	13.06		Szegvary et al. (2007)	(Hungary)
47.10	17.89	21.94		Szegvary et al. (2007)	(Hungary)
47.35	17.47	6.94		Szegvary et al. (2007)	(Hungary)
47.73	20.27	6.39		Szegvary et al. (2007)	(Hungary)
48.10	20.77	30.83		Szegvary et al. (2007)	(Hungary)
48.23	20.26	20.28		Szegvary et al. (2007)	(Hungary)
47.76	18.61	13.89		Szegvary et al. (2007)	(Hungary)
47.55	18.80	14.44		Szegvary et al. (2007)	(Hungary)
55.92	-3.17	35.40		Robertson (2004)	Edinburgh (United Kingdom)
55.91	-3.22	17.20 ± 13.70		Robertson (2004)	Edinburgh (United Kingdom)
55.17	-2.05	1.00 ± 0.90		Robertson (2004)	Harwood (United Kingdom)
56.60	-3.80	9.70 ± 4.10		Robertson (2004)	Griffin (United Kingdom)

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