

Interactive comment on “One year of ^{222}Rn concentration in the atmospheric surface layer” by S. Galmarini

Anonymous Referee #1

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General comments

The author presents a study of a one-year time-series of radon ^{222}Rn measured at the surface in 1997 in the North of Italy. This paper has two main parts: the first part is the description of the time-series using Fourier Transform (FT) and the Wavelet Transform. For example the author used the WT to detail the behavior of the time evolution of the radon. Using the Morlet wavelet, he calculated the wavelet power spectrum for specific months and for different parameters with a focus on radon. The second part is the analysis of the build-up of the radon during specific periods using a simple numerical model.

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The originality of this paper is certainly the description of the radon measurements for one year and the attempt to identify the different scales which control the influence of the meteorological parameters on the radon. To do this, the author compared the results of FT and WT applied to the radon and the other meteorological parameters and used a model for reproducing four specific cases with a radon linear trend. Although there is no clear link between the results of the WT and the choice of these cases, the results of the model for one case is quite convincing. However throughout the paper, there is too often a lack of explanations with strong argument and sometimes the use of meaningless figures which do not convince the reader.

Here are some remarks and questions which need answer and clear explanations.

Specific comments

Figure 2: The Fourier spectra of wind speed, temperature, humidity, pressure, Nox and radon show pretty clearly for most of them some peaks at 6, 8, 12, and 24 h (and much more for the temperature spectrum). These even values look like harmonic numbers due to FT. Do the author has an idea about the influence of that possible artefact?. In addition, I did not see any relevant informations from the FT of precipitation and pressure in the study. The author should clarify this point and only use relevant figures, it will ease the reading of the paper.

Table 1 and p12899: I also found the arguments of the author on the wind speed and precipitation correlations with radon too short and somehow unconvincing. To me, there is almost no correlation between radon and precipitation whereas there is a weak negative correlation with the wind (similar to the temperature). For this point, I'd like the author to provide more explanations about the results of these correlation.

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p12903: I was confused about the normalization of the scalograms. The author presents the power of the signal calculated as the wavelet amplitude normalized by the global spectrum. The author should clearly define these two terms (wavelet amplitude and global spectrum). Why the author didn't normalize the time-series first by its variance before using the WT (as described by Torrence and Compo (1998)). In addition, I have two questions about the Figure 3: why sometimes the 95 % confidence isolines are not contouring the maximum of WT and sometimes are contouring some features in the COI which is an irrelevant area? In addition, by just looking at the time-series, it is clear that there is a daily timescale. The amplitude of the waves is maximum for this timescale, but why the values of the corresponding power spectrum (greenish areas) are not larger than those for fluctuations with lower periods (red areas)?. Is it due to the normalization? to me it is very confusing and the author must explain how he constructed the scalogram.

Figure 4 and 5 and p12908: The author should reconsider the use of WT for such a time-series like the precipitation ones. There is no physical meanings because the WT of a sharp peak always gives a wide range of scales. For this reason, I don't understand the sentence "The inspection of the precipitation scalogram indicates time-series". In the same way, I also find confusing the WT applied to the wind speed with zero values because for each jump (from 0) the WT will reproduce again a wide range of scales without obvious physical meaning. I think these figures do not bring any useful informations, the scalogram of radon is already on figure 3 and the other scalograms have to be taken with cautiousness. An issue to this is maybe to only analyse the "windy" part of the time-series.

Concerning the second part, the author has to give the results of his model for the other cases. It looks like the model is just working for one case (Fig 11).

Typos: **p12897** Gao and Li; Druilhet et al ; Beck and Gogolack; Marcazzan and Persico (1996); Galmarini and Attie (2000)

p12898: Leyendecker et al; Marcazzan et al (1996)

p12908: Israel and Horbert

List of references Salmond Druilhet

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 12895, 2005.

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