Dear Reviewer,

Thank you very much for your very positive evaluation and comments on our manuscript. We took your comments into account in the revised version of the manuscript. Please find below our detailed replies on your comments.

Reviewer#2

Lines 53-55: the sentence "this concept assumes that the random field is locally homogeneous, which is the spatial equivalence of a random process with stationary increments" is misleading: the notion of the structure function exists for any random process, not necessarily for those with stationary increments. In return, for the real-valued process with stationary increments, the structure function is one of its two main characteristics (see for example Yaglom, 1987 or Kolmogorov, 1940). I would first instroduce D(ρ) via Eq. 1, call it variogram and would give the reference to Wackernagel for details, than would explain its link to the structure functions, which are already covered by previous papers of the first author.

Authors:

Thank you for your suggestion. We modified the paper according to your suggestion and added more references and explanations (according to comments by Reviewer #1).

Reviewer #2

- Fig. 1. The red curve touching the ρ=0 line is misleading: if in eq.1 one writes ρ1=ρ2, the D(ρ) is zero. Either the line should stop shortly before touching the coordinate line, or you should precise that the value of the estimated variability at ρ=0 is obtained by prolongation by continuity. The first solution would keep in line with general concise style of the paper, the second would be compliant with the formulation of your summary.

Authors: We have corrected the figure by separation of the red curve from zero. In the paper text, we mentioned that there is a discontinuity at zero.

Reviewer #2

- Line 98: it would be better to align the term "pseudo-random error" with the terminology of (von Clarmann et al, 2020)

Authors: In the revised version, we noted that such errors belong to "model errors" in the terminology of (von Clarmann et al., 2020).

Reviewer#2

- Lines 123-124: what is the minimal separation distance of your sample, and of which size is corresponding subsample?

Authors: The smallest bin for evaluation of the structure function is 5x5 km^2, and the corresponding sub-sample contains over 14 000 pairs. This information is added in the revised version of the paper.

Reviewer #2

Language / formulation comments:

- line 31: are - > is
- line 36 : " … in the linearized model" can be thrown away
- Line 67: "1D" better to be written in words.
- line 101: "… to select ozone data…" -> "in which we select ozone data …"
- line 134: detail the abbreviation "rms"
- line 166: "… might especially BE useful…"

Authors: Corrected.