Reviewer comments are provided in blue. Author responses are given in black text, and changes made are provided with red for removals and blue for additions, where reasonable. Line numbers for the changes are given with respect to the line numbers in the actual manuscript.

Response to the editor

Dear Luca Lelli,

Thank you for being the handling editor for this manuscript, and for taking the time to thoroughly read and understand the work.

Below are listed your comments and the changes we have implemented in the manuscript.

1. To reviewer#1 "What would you do if the difference in mutual information between the two solutions was negligible?" you correctly answer that it is an independent choice of the researcher what scenario to choose. And this aspect must not be overlooked. I'd suggest to be as clear as possible and add a concise sentence explaining this, thereby leaving the door open to one's independent reasoning.
   This is a good suggestion, and we have included a sentence after describing the process of how we determine candidate optimised co-location parametrisations.

L346–L348
If two parametrisations yield negligibly different mutual information values, it is up to the researcher to decide which parametrisation they should use, considering any trade-offs between the use of additional data and any increased computational costs the additional data may incur.

2. I think the reviewer is right when he points to the possibility that unimodality is not proven. In the spirit of mathematical rigor, the observation that funcion I decreases from p0 in all directions identifies p0 as a local maximum, but is not sufficient to establish unimodality, as per its formal definition.

   To call it unimodal one must additionally guarantee, either by structural assumptions (function's concavity or by topology of the sample space – ie the domain is compact and concave) or by global analysis, that p0 is the unique global maximum and that no other local extrema (saddle points or maxima) exist in the sample space. In the absence of such guarantees, the function may still be multimodal despite the local decrease condition being satisfied.

   An immediate counterexample would be

   I(p) = sin(|| p ||^2) where the sample space is R^2

The function decreases in all radial directions from a local maximum, yet it is multimodal with several singular maximum values.

So, please remove the claim of unimodality.

We have removed the claim of unimodality. This occurred in the following three locations in the manuscript:

L430

The mutual information surface is unimodal, with has a ridge of higher values where the global maximum is found.

L449-451

Qualitatively, all three sites show a similar structure of a unimodal surface, surface with a ridge of higher mutual information values that contains a single global maximum.

L463

At Ny-Ålesund, the ˆIKSG(p) surface (see Fig. 6d) shares some qualities with the mutual information surfaces seen at the other Cloudnet observatories – the surface is unimodal has a single ridge of larger values, with ˆIKSG(p) decreasing as p moves away fromˆp,...

We have also expanded the acknowledgments section to recognise both the reviewers and editor of the manuscript for their efforts in reading, understanding and critiquing the manuscript:

L949–951

The authors would like to thank the two reviewers of the manuscript and the handling editor, for their in depth reading and understanding of the manuscript, and for their insightful comments and suggestions which have improved the work.