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Geoscientific Model Development Discussions

Interactive comment on "A diagram for evaluating multiple aspects of model performance in simulating vector fields" *by* Zhongfeng Xu et al.

Anonymous Referee #2

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This paper introduces a counterpart to the widely used Taylor diagram that applies to vector fields. The authors define a vector similarity coefficient, Rv, and derive various properties of it. When paired with a measure of differences in vector lengths in two fields, one can construct a diagram with display features like those for scalar fields seen in Taylor diagrams. The authors provide examples that demonstrate the plausibility and utility of their construct. The diagnostic appears to be relatively straighforward to construct. Its interpretation mimics some of the properties of Taylor diagrams, which should render it accessible to viewers of the vector-based diagrams.

Other than a few comments below, the paper is well-written. I have not checked the details of the mathematics, but the mathematical development appears to be sound.

Minor comments:

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Discussion paper

Page 2, Line 25: The same shortcoming to be ascribed to the correlation of two scalar fields when a constant is added to one of them. However, in both the vector and scalar cases, the RMS difference would change, so the change would still be diagnosed.

P2, L 27-30: The same issue arises with Taylor diagrams for scalar fields – a change in a model might improve spatial correlation while increasing RMS differences. (However, the motivation to construct a vector-equvalent to the Taylor diagram still remains.)

P3m L24: The Rv definition is plausible as a measure of similarity, but it may help many readers if some motivation for it were given. For example, you are looking for a measure of similarity that recognizes how much the vectors point in the same direction; you want something that is independent of the average magnitude of the vectors; etc.

P7, L 17-18: The governing influence of longer vectors should be emphasized, for it suggests that error in determining the vector (say, an observational vector) does not undermine the Rv value when there are some vectors in the sequence that are relatively small in magnitude compared to the error, so long as the longer ones have small relative error.

P10, L10: Observations have error. If observations are used as the reference field, can the influence of that error on precise positioning of a model's mark on the diagram. If one assumes random error, can that be folded into the display on the diagram and thus illustrate when model results agree with observations to within the observational uncertainty? Or perhaps illustrate the relative size of some other "noise" quantitites, such as the ranges of values due to interannual variability.

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