Interactive comment on "Statistical optimization for passive scalar transport: maximum entropy production vs. maximum Kolmogorov–Sinay entropy" by M. Mihelich et al.

This paper is not easy to understand. There is a mixture of turbulence (passive scalar transport), of maximum entropy production, of Kolmogorov Sinai entropy and of zero range process. I suggest to reject this paper since the content is too narrow and far from geosciences, thus not adapted to NPG.

Major points:
1) The title is not adapted to the content: the title mentions passive scalar transport in turbulence, but in fact the manuscript is dealing only with a 1D toy model of passive scalar, called ASEP (asymmetric exclusion Markov process).

The title does not mention turbulence. Moreover this article is not about the ASEP model, which is cited only twice (p1693 l29 and p1696 l17) in reference to previous works. This article addresses problem of passive scalar transport for which the Zero Range Process (ZRP) is a simple but very insightful model. The expression "Statistical Optimization" naturally implies the discussion of MEP and other optimization principles like the Maximum Kolmogorov Sinai Entropy Principle (MKSEP). Therefore we believe that the title is appropriate to the content of the paper since i) MEP and MKSEP are the physical principles discussed. ii) Passive scalar transport via the ZRP model is the object of the study.
Since both the passive scalar and the MEP are widely discussed and published in the geoscience literature, we believe our paper is appropriate to NPG. Moreover, as recognized below by the referee, we establish a clear link between our results and geosciences in the discussion section.

With such restriction, the topic of the present paper seems rather far from geosciences. The link with ASEP and numerical models used in the geosciences is not obvious, and only justified in the perspectives and conclusion of this manuscript.

As previously said, the paper is not at all about ASEP model. It is about the ZRP, a toy model which both exactly mimics the general approach to MEP in geophysics and enables exact analytical calculation that allow to explore the validity of such principle in a simple case. The link between the ZRP and, e.g., Paltridge's work is explained not only in the introduction and in the perspectives but also in the main body of the paper, where the meaning of the terms introduced in the ZRP are linked with general thermodynamic quantities used in geophysics. See specifically Page 1695, lines 4-8.

While the mathematical content of the paper seems correct [compute analytically the heat flux f for maximum entropy production and for Kolmogorov Sinai entropy, equations (19) and (20), consider for which cases the maximum coincides in both analytical expressions], its scope seems very narrow [to show that a toy model has two ways to estimate the heat flux corresponding to a maximum entropy situation] to be useful for geosciences applications.

The passive scalar transport Eq. 1 modelled via the ZRP is one of the fundamental equation of any geophysical models as transport in ocean, soils, atmospheres is

understood in terms of Eq. 1. Therefore, saying that the results obtained both analytically and numerically here do not have implications on geosciences application is neglecting the role of Eq. 1 in the dynamics of geophysical systems. The result of the paper is to provide a theoretical explication for MEP (which has been successfully used in several applications in geophysics), via a simple exact model where all the calculations can be performed analytically. This provides firmer ground to the use of this maximization tools to more complicated systems, and open new perspectives as to how to perform it in the more efficient way. We do not understand why this should not be relevant to geosciences.

2) The paper is not self-contained and it is very difficult to understand the point without reading other papers. The model ASEP cannot be understood by reading this manuscript.

As we have already pointed out, this paper is not about the ASEP model but the Zero Range Process. This model itself is very simple, and is described in the first section and via the Figure 1. The paper is self-contained, in the sense that the calculations presented do not require any further knowledge or material. So there is no need to read other papers to understand the calculations, nor the model.

Equation (2) uses z, the fugacity, which is not precisely defined. One is lost at this point. The maximum entropy production concept is used in the title and in many places in the manuscript, but its meaning is not recalled.
Other points: The review paper Martyushev and Selesnev (Maximum entropy production principle in physics, chemistry and biology, Physics Report 426 (2006) 1-45) should be cited since it nicely and clearly introduces the MEP.

We agree with the referee and we provide further explications on the fugacity, the concept of MEP and further references including Martyushev and Selesnev's work.

Typos: line 4 page 1695 -> passive scalar; line 11 same page: decor related jumps ->

We fixed the typos