Comment on os-2021-113
Anonymous Referee #2

Referee comment on "Potential Artifacts of Sequential State Estimation Invariants" by Carl Wunsch, Ocean Sci. Discuss., https://doi.org/10.5194/os-2021-113-RC2, 2022

The manuscript addresses an important topic that is of concern for the interpretation and use of data assimilation products. The focus of the paper is on the use of sequential assimilation products in the context of estimating trends, highlighting the potential to obtain spurious results originating from purely methodological artifacts. I personally consider the topic to be important to be addressed in the open literature, given that several papers do exactly this without sufficient critical reflection.

However, I find the paper itself still preliminary and not ready for publication and therefore suggest returning it for a major revision. Generally, it is written like a textbook and not really like a scientific publication. Moreover, the text is still in a preliminary stage, reflected, e.g., in sentences that show words twice (e.g., line 45), or figure captions that are incomplete or inconsistent (e.g., Fig. 2). I also find the structure of the paper rather unconventional.

To improve the paper, I suggest taking out Section 1.1; to make Section 1 a real introduction focusing on the essential and the question to be address; shorten also other parts so that the reader gets pointed directly toward the main messages. Now the essential points are somewhat hidden between to many textbook aspects that had been published in Carl's own books. Also, the hints toward ECCO results, while generally valid and useful, appear more anecdotal and do not ad real substance.

Will send an annotated version of the text directly and personally to the author containing more suggestions.