EGUsphere, referee comment RC1
https://doi.org/10.5194/egusphere-2022-942-RC1, 2022

Comment on egusphere-2022-942

Anonymous Referee #1

Referee comment on "The rate of information transfer as a measure of ocean–atmosphere interactions" by David Docquier et al., EGUsphere,
https://doi.org/10.5194/egusphere-2022-942-RC1, 2022

In physical oceanography it is believed that wind stress drives the ocean, while in dynamical
meteorology the ocean surface is treated as a bottom boundary that influences the atmosphere. The interaction between the sea surface temperature (SST) and wind stress, respectively characterizing the sea and the atmosphere at the interface, has become of enormous interest. In this paper, the authors applied a causality analysis which is built on a
firm physical ground, in contrast to other statistical formalisms, to the study of this problem,
and obtained intriguing new results. Specifically, they found that that the ocean surface (SST
and SST tendency) strongly drives changes in the lower atmosphere (THF) and that the lower
atmosphere also has an important influence on the ocean surface in many regions of the world, different from the traditional view that ocean-driven regimes largely exist in western
boundary currents and atmospheric-led regimes dominate in the open ocean. In recognition of
the importance of the finding, I hence recommend publication of this manuscript. The following are just some points that the authors may pay some attention.

l.1ï¼□ l.13, True. But in this paper, the usage of information transfer/information flow (IF) in
studying the interaction is actually more fundamental. It is the exchange of entropy/information rather than energy. In statistical physics, entropy plays a role in distributing energy.

l.97, the last term may also represent the effect from unobserved processes.

l.100, While mathematically this is correct in terms of Shannon entropy, you may want to be more cautious in interpreting the sign, as it actually may not be explained using the well-known physics.

ll. 130-135.). “This suggests that SST variability generally increases THF variability, while THF variability mainly constrains SST variability.” This is good. But be cautious.

ll.189-190. To include more additional variables, make sure they are not nearly parallel; otherwise the singularity of the covariance matrix could numerically deteriorate the result.

Section 3.3. In studying lagged transfer of information, be careful that only the IF in one way
makes sense—Causality cannot be from the future to the past.

ll.226-229. Indeed ocean-atmosphere interactions become more pronounced at larger time
scale. So these results do make sense.