

Ocean Sci. Discuss., referee comment RC2
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Comment on os-2021-9

Anonymous Referee #2

Referee comment on "Global contributions of mesoscale dynamics to meridional heat transport" by Andrew Delman and Tong Lee, Ocean Sci. Discuss.,
<https://doi.org/10.5194/os-2021-9-RC2>, 2021

This paper decomposes the global heat transport into basins-scale, large-scale and mesoscale transports. The main thing is to do so using a spatial filter, rather than the more common time-mean approach. The spatial filter results in different values for eddy heat transports than the time-mean method. However, little discussion is provided on why and how this benefits future work and what the differences really mean. Also, it is stated that this work helps parameterization, but it is unclear how exactly. Overall, this paper could potentially be published, but it needs a clearer narrative, fewer figures, and improved use of symbols and names. Also, the importance of the results should be better explained and parts that are doubtful should be removed or require further argumentation.

Overall, I would recommend reducing this paper by a couple of figures and with that be more to the point about the most important results here. What is the main story and which figures do you need to prove this?

Rewrite section 2.2 to start with the most common method to define eddies as given in equation 10. From there introduce the spatial filter method. Then explain all the different types of eddies that are used in this paper (including eq 7,8,9) and more importantly, give them clear and distinct names. At this moment mesoscale is used in various different ways and definitions and it becomes very unclear.

I keep finding the MTF confusing as in such contexts M often stand for Meridional and not Mesoscale. Meridional is also part of this study. It distracted me a few times.

Specific (but still some major) comments

Eq 5&6: explain the difference.

Figure 4 – the different axis-range for the y-axis is not helpful.

L160 – This discussion is about the variability, which is as large as the transport itself. Please explain what that implies and what it says about using this filtering method.

L179 – Why these numbers for s and k_0 , and what do they mean? Are results sensitive to these choices?

L182-184 – Are you sure about this statement? If so, what is your evidence for this?

L188 – why are they opposed?

L198 – Why important in eastern boundaries?

L206 – Are you sure? Could it not also be the other way around? How does this work, what is the mechanism?

L220 – Over how long do you average? I guess you come back to that later. Perhaps refer here.

Fig 8 – Provide Title this is only Indo-Pacific. Perhaps indicate major continents or so in axis. Are all these figures needed to tell you story?

L253 – I find “time-varying” a bad choice, as they are both time varying.

Figure 10 – “mesoscale components” by now I’m so confused as to which components we

are dealing with. Temporal, spatial, variability, mean, etc. etc.

L261 – Very loose statement about Kelvin and Rossby waves. Explain the physics and provide references.

L262 – This is also a loose statement. It may be clear from the results, but it is not explained why, and why one is preferred over the other, and for what situation such preference might be true or false. In other words, it is not yet shown that spatial filter is better than temporal, nor explained exactly why the reason is behind all the differences. Only shown it is different.

Figure 12 – Which mesoscale flow is shown and how much it is smoothed?

L280 - I'm not convinced about the need of the paragraph starting at L280 and the associated Figure 13. Isn't the variation only 10-20% of the total at the peaks only. Is this important? Perhaps it is, but it is not clear here.

Figure 14 – Clarify in title that OT is removed in lower panels.

L317 – How substantial is the variability? To what are we comparing this and how much is

that percentagewise or what is the correlation factor?

Section 5.2

I'm not convinced that this section is correct. It is based on a very big IF in L340. Check papers on changing Rossby radius of deformation and temperature on short and large scales. They both vary strongly with y . I'm not convinced this part is very meaningful, without more evidence that this could work.