Reply on CC4
Francisco Beron-Vera

Community comment on "Characteristics of Robust Mesoscale Eddies in the Gulf of Mexico" by Yingli Zhu and Xinfeng Liang, EGUsphere, https://doi.org/10.5194/egusphere-2022-789-CC5, 2022

Dear Xinfeng,

You might consider okay that other authors call "eddy" a flow region instantaneously filled with closed streamlines of the SSH field such that U/c > 1. But the problem is that when they do that, they are immediately implying consequences for transport. In fact, the U/c > 1 criterion was included by Chelton in an attempt to distinguish between flow-invariant structures of the elliptic type (not in these words, clearly) and anything else (call this linear waves, if you like). You yourself by invoking the U/c > 1 criterion are doing just that. However, as colleagues and I have shown many times over the last decade, U/c > 1 is a simple-minded heuristics that in general fails to isolate elliptic Lagrangian coherent structures. In Andrade-Canto et al. (2020) we show, for the case of LCRs, clearly relevant to your work, that Eulerian, streamline-based vortex detection is incapable of distinguishing conception from birth of LCRs. Moreover, they also tend to track past their decease dates vortex-like features unrelated to the LCRs in question. In other cases, material initially inside SSH eddies simply disperse rather quickly after a week or so - cf. references in Andrade-Canto et al. (2020). There you go! You can call your Eulerian coherent structures SSH eddies and omit any reference to advection, or transport, or material, and then the reader will understand the scope of your work or what to expect from it.

Best,
Francisco