Comments to the Associate Editor

Raunak Raj & Anirban Guha

July 21, 2019

Dear Prof. Grimshaw

Thank you for the valuable comments and constructive criticisms. We have tried to take all of these into consideration while revising our paper. Your comments appear in blue and our replies in black.

Referee 2 has recommended accept as is, but referee 1 has said the presentation remains confusing, and needs further editing. I agree, and ask that you work over the text and in particular avoid repitition.

We have tried to make minor edits in the paper (since we are not sure exactly which parts of the presenation referee 1 found confusing.

I would contest the statement that explosive instability can arise even with a uniform flow, as any unirom flow can be removed by a Galilean transformation

We would politely disagree with this comment. A uniform flow creates a velocity difference between the fluid and the bottom (which is at rest). Thus, it is not merely an absolute velocity U of the fluid, but it is also the relative velocity $\Delta U = U$ between the bottom ripple and the fluid. Galilean transformation cannot remove any relative velocity. In other words, if we start moving with a velocity U, then yes, we will see the fluid at rest. But, we will also see the bottom ripples moving with a velocity $-U$. So, even though the flow is uniform, even a uniform flow will create a velocity difference between a bottom ripple and the waves in the fluid (say at the surface). As we have already discussed in the paper, this instability deals with the situation when one of the 'waves' in the system involved is the bottom ripple.

It might also be noted, if the bottom ripple was not involved i.e. if this was an instability between three 'actual' waves, then a uniform flow wouldn't make a difference.

Finally, in the paper, we had also mentioned the reason briefly-

"We emphasize here that, although the actual velocity profile is of some relevance, what matters the most is the Doppler shift between the bottom ripples and the surface. Therefore,even a uniform current would have worked just fine."

Also I would that negative energy concepts are best understood using wave action and averaged Lagrangians, which makes it clear that negative energy waves can only arise when there is a background flow. I take the liberty of referring to my review article on this, which gives the key references, Ann. Rev. Fluid Mech., vol 16, 1986, 11-44

Thank you for the explanation and the reference. We have added it in the text and it is colored in red.

Sincerely

Raunak and Anirban.