Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
https://doi.org/10.5194/hess-2021-206-RC2, 2021

Comment on hess-2021-206 (Reviewer)

Anonymous Referee #2

Referee comment on "Dynamical forcings in heavy precipitation events over Italy: lessons from the HyMeX SOP1 campaign" by Mario Marcello Miglietta and Silvio Davolio, Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-206-RC2, 2021

The manuscript deals a challenging task of systematizing knowledge learned from 10 years of the Hymex experiment related research over Italian region, including dedicated SOP in 2012. The overview is given for three sub-regions in Italy which are known for heavy precipitation: northeastern Italy (NEI), Liguria-Tuscany (LT) and central Italy (CI) which were studied during the experiment.

The overview of dynamical forcings of HPE is sound and based on recent literature. However, there are a few relatively minor issues which need to be tackled before the manuscript can be deemed publishable:

- 14: Abstract specifies intensity of the impinging flow (i.e., the Froude number). Intensity of the flow and Froude number are related but are not directly associated, as Froude number (e.g. apart from orography) depends on the cross-mountain component of the flow. Please revise formulation or remove text in parenthesis.
- 108: Authors implicitly consider that Alps increase predictability and in theoretical context this is true. However, this is also model resolution dependent. Therefore I suggest to write "…thus, provided the sufficient numerical weather prediction resolution, they are adequately forecasted at least at short leading time.

- 112-115: Low-level jet stream is also well known factor contributing to HPE. Consider stating explicitly here.
- 201: With this synoptic setup, due to flow splitting of northwesterly cold over the Alps, NE winds (bora) in the northern Adriatic are quite frequent. To include barrier wind into conceptual model, a clear demarcation between barrier wind and NE bora wind needs to be made on several IOPs in NEI region. Please discuss this explicitly in text, and list IOPs which satisfy conditions for barrier wind without any signs of northeasterly bora winds resulting from flow splitting over the Alps. Please discuss whether early phase of

bora can reinforce barrier winds which are typically preceding bora onset? Please discuss this also in context of situation when blocked flow situation persists, resulting in low-level convergence well upstream of the orography. The interaction of southeasterly and northeasterly bora flow in the northern Adriatic is known to stimulate convection, so demarkation between barrier winds and bora is necessary.

- 211: Please include definition of the Froude number. In classical definition (U/NH), nearly neutral N mentioned in the first part of the sentence would lead to high Froude number and not low values such as specified in the second part of the sentence. Please clarify.
- 220: Specify explicitly for which flow you mean to have high Froude number
- 234: Figure 3. In text first type of event corresponds to event shown on Fig 3.b. Please harmonize.
- 251: Please consider demarcation between low-level jet and low-level jet stream as synoptically forced LLJ is usually termed "low-level jet stream" (Stensrud 1996).
- 275: Figure 4, caption. Please provide more information on the "run"
- 365: Figure 7. Please improve the readability of the figure.
- 452: Please reformulate "internal area" to enhance text clarity.
- 461: Please discuss what caused the sudden increase of IWV which occurs prior to HPC in CI