The preprint paper (#nhess-2020-359), submitted to EGU's journal *Natural Hazards and Earth System Sciences (NHESS)*, presents an effort to review several aspects of the flood generating mechanism in Venice city center, i.e., by superposition of astronomical tides, seiches, storm surges, meteotsunamis, etc. All these factors are reviewed in terms of individually and/or cooperatively contributing to intense and/or extreme sea level elevation events, respectively. The main outcome of the review focuses on the following findings:

Extreme sea level events are mostly related to storm surges due to Sirocco winds, revealing a characteristic seasonal cycle, with the most important events occurring from November to March. The most intense historical events have been produced by western Mediterranean cyclogenesis, e.g., the Gulf of Genoa. Only a few extreme events of sea levels are caused by atmospheric circulation patterns deriving from the Euro-Atlantic sector. Tidal effects of the 11-year solar cycles appear to mildly contribute to sea level extremes, hidden by the rest of the factors. Relative sea level rise seems to drive a frequency increase of extreme sea levels 1850. Consecutively, it is assessed that the intensity and duration of flood events on Venice in the 21st century, will be affected by possible regional mean sea level rise (MSLR) equalizing and even overcoming the probable enfeeblement of extremes due to the projected storminess attenuation until 2100. High uncertainty of the evolution of global-scale factors inducing MSLR, such as mass contributions in the Mediterranean due to Antarctica and Greenland ice melting, does not help in robustness of future projections. Extreme value analysis based on RCP climate projections provides estimations of increase up to 65% and 160% in 2050 and 2100, respectively, for the 100-year return level events at the North Adriatic coast. Geological and geotechnical factors, such as local subsidence due to tectonics or coastal aquifer drainage or overexploitation, are not discussed at all in terms of future increase of extreme flooding.

This is an interesting overall review endeavor of a very significant scientific and social issue with particular local interest, but the paper in its current form does not support scientific innovation, as it does not add new knowledge of permanent value on the subject of coastal flooding in general; it presents only a few new insights on previous findings for the Venice study area. The paper mainly recapitulates and tries to interblend existing knowledge from very remarkable past articles, with a specialized focus on certain aspects of the presented problem, by world experts on the field. Yet, in its current form, it does not build robust new arguments on the investigated subject. I believe that if the Editors should consider its publication, at least a major revision should take place, rewriting most of its parts supported by novelty aspects and fresh findings. Some graphs should be omitted (as they are reported elsewhere or refer to previously published literature) and new methodologies of interconnecting the existing knowledge should be proposed and applied. Moreover, some clarifications on the followed approaches are also deserved.

In the following, I present my major comments and some specific remarks in tandem with editorial changes and spellcheck needed.

Major Comments:

1) The paper is actually a full **review** of all the met-ocean physical parameters and mechanisms contributing to high sea levels and eventually the generation of Venice floods. This should be **clearly stated in the Title**. This is not a Research Article.

2) Flooding phenomena are by default considered as **extreme events** in literature, yet the authors present proper **analysis** based on univariate **extreme value theory only for the storm surges** and not all the other components of sea level variations. This perspective undermines the notion of a compound event. Moreover, the **wave-induced** component, i.e., the **run-up**, adding to the total sea-surface height, especially near the coastal front, is left out. Of course, its influence is limited to areas near the waterfront, whereas all the other components (surges, RSLR, etc.) can cause spatially extended inundation, yet all the above need to be discussed and explained to the reader.

3) Figure 4: Please elaborate on the **storm track algorithm** and its previous validation. Does it treat **proper identification of secondary lows in the wake of e.g., "Medicanes"**, as NASA's storm track algorithm to **avoid double backing** of storm center on itself over the course of 24 hours. Please further discuss the use of storm tracking technique.

4) The **wind patterns** are in the Adriatic are defined as a crucial factor of surge-driven flood dynamics, but **no data is presented to back this up**. Thus, some kind of wind maps in extreme cases or anything else would help to relate wind set-up to certain flood events.

5) The **geological and geotechnical aspects** of Venice floods are totally overlooked, yet the **low elevation of terrestrial land** in the Venice area is the **main factor for inundation**, rather than changes in storminess patterns. It is reported in many papers that constant **geotectonic land subsidence** and potential overexploitation of coastal aquifers may drive sediment **settlement** and the urban environment's ever-evolving **land sinking below MSL**.

6) Lines 169-176: present a classic methodology for signal processing of timeseries to separate storm surges, PAWs, meteotsunamis and IDAS, but the **choice of cut-off frequency** seems arbitrary, as the eventual durations of the reported phenomena are not "physically" fixed. These are known to occur at similar frequency bands (**overlapping frequencies between several components**) and this makes it difficult to discriminate between different phenomena, especially between surges and meteotsunamis. This should be at least discussed in terms of results' robustness.

7) Lines 183-185: Are the authors sure that these are separate events? Which is the **methodology of discrimination** used? Defining the same event (with several peaks) as multiple cases may insert bias to the statistics of extremes.

8) In general, the submitted paper **feels more like a report** (Figures can be enhanced) or a **review** more than a new research paper. Therefore, all past data on the reported phenomena should be "sewed" together in a comprehensive narrative with new clear scientific insight on the specifics of coastal inundation in Venice city center.

Specific Comments:

1) Some literature of storm surges, waves, climatology, cyclogenesis, extremes etc. in the Mediterranean could be added to the state-of-the-art:

Bengtsson et al. (2006). Storm tracks and climate change. J Clim 9(15): 3518–3543.

Calafat et al. (2012). Comparison of Mediterranean sea level variability as given by three baroclinic models. J Geophys Res 117, C02009.

Campins et al. (2011). Climatology of Mediterranean cyclones using the ERA-40 dataset. Int J Climatol 31(11): 1596–1614.

Makris et al. (2016). Climate Change Effects on the Marine Characteristics of the Aegean and the Ionian Seas. Ocean Dyn, 66(12): 1603–1635.

Fernández-Montblanc et al. (2019). Towards robust pan-European storm surge forecasting. Ocean Mod, 133: 129-144.

Line 44: No keywords are provided.

Lines 23, 93, 98: The authors refer to planetary waves (e.g., Rossby and Kelvin waves) in the Mediterranean. Maybe this terminology could be avoided to prevent possible misinterpretations. The Kelvin waves' mechanics could be approximately used to interpret small sea-level oscillations induced by large-scale **tidal motions** in the **elongated Adriatic**, but **classic planetary wave** motions usually refer to **equatorial Rossby waves** in global scale basins, such as the Atlantic Ocean etc., rather than a closed, marginal, regional aquatic body, as the Mediterranean Sea. Planetary waves depend heavily on global thermoclines etc. and their periods of oscillation are of monthly or yearly scales. This is hardly the case in the Mediterranean. The PAWs referred to in Lines 130 and on, are well-established motions, but more likely treated as meteorologically driven long waves of fine temporal scales (hours to days) rather than actual planetary waves. The authors themselves do a good job clarifying that in Lines 133-135.

Line 24 and *elsewhere in the text*: The authors use the term Sea Level Anomaly (SLA) for any sea level variation investigated in the paper. However, in literature, the SLA term usually refers to large-scale long-term (even to climatological scales of analysis) deviations of the Mean Sea Level (MSL) from earth's geoid, not the episodic, short-term, meteorologically induced, coastal sea level elevations that the paper mainly discusses. According to NOAA, "*A sea level anomaly reveals the regional extent of anomalous water levels in the ocean that occurs when the 5-month running average of the interannual variation is at least 0.1 meters (4 inches) greater than or less than the long-term trend. The interannual variation is the monthly MSL after the trend and the average seasonal cycle are removed. The anomalies are usually mapped by month, using the mid-point of the 5-month running average. When the 5-month average is more than 0.1 meters above the trend, it is indicated as a positive anomaly...*". Thus, I would recommend using the term sea surface height or anything similar.

Line 51 and 149: please provide the reference period of determining the RSLR in Venice. It is essential information for determining the robustness of the values presented, depending on the timeframe of continuous observations.

Lines 276-282: Please elaborate on the methodology used here (RMSD of which parameter, explain k-means analysis, etc.). Are the authors sure that these are extreme events? Is the analysis based on some robust EVA method? Moreover, please explain how this correlates with the Venice flood events? It seems more of a cyclogenesis-surge association.

Line 334-337: these statements seem like speculations, not numerical facts. Please elaborate or rephrase.

Line 354-358: This is an issue of time-framing, i.e., the choice of the right temporal window to trace statistically significant trends. Moreover, the approach based on stationarity or non-stationarity is also a big issue. Please elaborate and discuss further.

Line 407: All the presented material is in the form of an inventory of past hard work reported in older papers, but it does not integrate all the datasets together in a composite, coherent way to produce new knowledge on Venice flooding.

Lines 418-422: This analysis seems irrelevant to Venice city center floods and inundation of the surrounding areas. The wave set-up is a surf zone sea-level parameter in nearshore areas, but what would be important for flooding is the wave run-up on the coast. This is a different task to perform as it would require a huge amount of beachfront and coast cross-sections treated with several different empirical relations depending on run-up calculation over engineered or natural beach types. Furthermore, as high waves are dissipated by depth-limited breaking and the specifics of the Venice lagoon topography do not allow very high waves to attack the waterfront, wave-induced would not be a crucial factor.

Figure 7: The Figure’s results are most likely reported as is in Barriopedro et al. 2010.

Figure 8: This kind of information is already reported in Vousdoukas et al. (2017).

Figure 9: **Plagiarism detected**. This is the exact same Figure as Vousdoukas et al. (2018)’s Fig. 5. Moreover, it is not clear how this Figure’s results correlate with local or even regional projections of mean Sea Level Rise focused on the northern Adriatic.

Figure A.1: **Plagiarism detected**. This is the same Figure as Barriopedro et al. (2010)' Fig. 2. It is also not clear how these results relate to Venice city center floods.

Table 1: This is an interesting feature. Percentages of contribution by each component to the total RSL would be beneficial to the reader for supervisory purposes. Is that new knowledge or reported elsewhere? It should be clarified.

Editorial Comments:

Lines 25-26: correct "by storm surges produced by the inverse barometer effect and enhanced locally by the Sirocco winds".

Lines 50-55: Repetition of "*damages and losses of a unique monumental and cultural heritage*" expression.

Line 72: Correct "*relevant **to** extreme sea levels*".

Line 74: "*factors(see*" typo.

Line 111: "***is** ceases*" typo.

Lines 117-126: better use *atmospheric pressure* than *air pressure*.

Line 162: fix RSL term repetition (use only abbreviation), "*...when it exceeds 80 cm*"

Line 200: change expression to something like "*with a rather moderate storm surge value*"

Lines 232-233: please rephrase (*region is one of the areas…. in the region..* repetition)

Line 266: correct *in **the** Atlantic*

Correct the way of citations' writing in the main text and specifically the use of parentheses e.g., in Lines 78, 251, 258, 268, 304, 340, 352, etc.

Lines 272-275: This sentence is rather vague, please elaborate further on the reported findings of previous studies and how they specifically correlate with Venice city center floods.

Lines 295-296: Please rephrase or clarify. Do the authors refer to the synoptic-scale wave train of very low pressures in central Europe and how they drive frequent high autumn surges?

Lines 308-309: Define *rho* (the Spearman's correlation?) in the main text. In terms of which parameters?

Line 320: correct "how such **a** small"

Line 344-345: How is the frequency determined? As event/year?

Line 375: maybe use "optimistic" than "low" for RCP2.6

Line 378: correct "depend **on"**

Line 390: correct "spatially **averaged"**

Line 387-392: More information about the employed EVA method is needed.

Line 863: Explain OND as October-November-December seasonal period.

Figure 5: Write No. of cases on the graphs before the actual numbers.

Figure 7: Clette et al. 2014 is missing from the Reference list.

Line 897: rephrase "Heavy".

Line 918: correct "As Figure **A.1**".