

Interactive comment on “Understanding Spatiotemporal Development of Human Settlement in Hurricane-prone Areas on U.S. Atlantic and Gulf Coasts using Nighttime Remote Sensing” by Xiao Huang et al.

Anonymous Referee #3

Received and published: 8 June 2019

The paper deals with an interesting analysis of a urbanization index change from 1992 to 2013 and storm proneness in the eastern coast of the United States, showing that the urbanization index is slightly decreased in area less prone to storms (north and far from the coast) and significantly increased in southern areas that are closer to the coast and far more prone to undergo severe storms. The topic is as interesting as important, and is dealt with by the Authors using modern data (remote sensing) and techniques. However, I have some major concerns that should be clarified and fixed before the paper can be accepted for publication.

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MAJOR POINTS

-The goals of the study are not always declared clearly, and sometimes they are overstated. For example, in the last paragraph of the introduction (p.3, l. 14) the Authors state that the goal of the paper is “to monitor urbanization process and hurricane impact”. First, NTL is only a proxy for (some features of) urbanization, and “monitoring urbanization process” goes far beyond what is presented in this paper. Second, “hurricane impact” can be ascribed to a variety of factors (storm duration, exposure, vulnerability, etc.) that are not accounted for either by NTL or the wind speed only. To sum up, the paper draws a comparison between i) an urbanization index based on NTL (and not directly between urbanization) and ii) the storm proneness, unless the link between VANUI and real urbanization (or, better, exposure to storms) is validated quantitatively.

-I have some doubts on the significance of the linkage between satellite-derived indexes such as VANUI and urbanization of an area. First, the use of NTL-derived indexes as a proxy of urbanization intensities and exposure to storms should be validated against urban maps and census data, at least for some significant regions/cities of the study area. Second, while it is evident that urbanization of rural areas produces an increased spatial extent of NTL, it is difficult for me to believe that a (moderate) decrease of population in an already urbanized area would reflect in a reduction of NTL. To put it simply, the streetlights are not kept off because some apartments become uninhabited, and the NTL differences linked to small population reductions are probably lower than uncertainties in the NTL data/calibration; buildings are rarely destroyed to restore cultivated fields. Rather, I see a very different resolution between 1992 and 2002 scenarios, which probably descends from the resolution of the NDVI. I think that substantial difference in the estimated extent of the urban area could descend from a sensibly different resolution of the processed data.

-Again about NTL. . . How can NTL be influenced by differences in how cities are illuminated? For example, have policies been put in place to combat light pollution in the study area? (e.g., by forbidding upward oriented spots) How can these policies affect

the NTL?

-Page 8, l. 18-20: what does “per unit” mean? What is the sense of summing slopes?

-Note that urbanization process and exposure to storms can be monitored using census data. Such a way is undoubtedly more burdensome than using NTL, but far more precise and accurate.

SPECIFIC POINTS

-The paper contains a huge number of abbreviations, which sensibly hinder the text readability particularly for not-familiar readers. I ask the Authors to limit the number of abbreviations to the minimum necessary (for example, NAB, CONUS, EPB, DN are of course not necessary. . .).

-The quality of the English should be significantly improved.

-p.3, l. 6-9: applications of DMSP/OLS NTL data also encompass exposure to floods (Ceola et al., 2014, 2015).

-p.3, l. 20: what is “disaster migration”? Furthermore, an analysis of storm proneness can undoubtedly provide valuable information to support urban planning. The spatiotemporal changes of human settlement is what we need to influence, not an input data to allow disaster mitigation.

-Section 2 should be merged with the following sections into a “Material and methods” section.

-p.5, l. 3: “were downloaded” . . . and also used? Or not??

-p.6, l. 13: “of radius R”

-p.6, l. 16: why using the wind speed and not the square of the speed? Consider that wind drag goes with the speed squared.

-p.19, l. 3: start a new paragraph after “the Atlantic Gulf coasts.”

-I note that, in a recent study by Viero et al. (2019), similar trends have been identified (and conclusions drawn) for a large coastal lowland in Italy, where population has been found to resettle in areas at high(er) risk of flooding. Interesting comparisons could be drawn.

-In the bibliography, cited references should be ordered alphabetically. Please check all the bibliographic references throughout the text. For example, line 6 at page 2 should read "(Goldenberg et al., 2001)".

ADDITIONAL REFERENCES

Ceola, S., Laio, F., Montanari, A., 2014. Satellite nighttime lights reveal increasing human exposure to floods worldwide. *Geophys. Res. Lett.* 41, 7184–7190. doi:10.1002/2014GL061859

Ceola, S., Laio, F., Montanari, A., 2015. Human-impacted waters: New perspectives from global high-resolution monitoring. *Water Resour. Res.* 51, 7064–7079. doi:10.1002/2015WR017482

Viero, D.P., Roder, G., Matticchio, B., Defina, A., Tarolli, P., 2019. Floods, landscape modifications and population dynamics in anthropogenic coastal lowlands: The Polesine (northern Italy) case study. *Sci. Total Environ.* 651, 1435–1450. doi:10.1016/j.scitotenv.2018.09.121

Interactive comment on *Nat. Hazards Earth Syst. Sci. Discuss.*, <https://doi.org/10.5194/nhess-2019-64>, 2019.

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