

**Response to second referee's comments on "Understanding Spatiotemporal Development of Human Settlement in Hurricane-prone Areas on U.S. Atlantic and Gulf Coasts using Nighttime Remote Sensing" (round 2)**

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*"I would like to thank the authors for their reply. However, I still have some doubts concerning the use of "percentage of pixels with VANUI>0" instead of "sum of VANUI". The authors, in their reply, state that "we believe that this yearly statistic [percentage of pixels] illustrates the expansion of newly built area in different zones"."*

**Our response:** Thank you for your comment. We well understand your concern. Please allow us to correct our claim *"we believe that this yearly statistic [percentage of pixels] illustrates the expansion of newly built area in different zones"*. We meant to say that the **evolvment** of percentage of pixels (VANUI > 0) **during the 22-year investigated period** illustrates the trend of the expansion in each zone. If in Zone 1, there are 30% of pixels (VANUI > 0) in 1992 and 10 year later, there are 40% of pixels (VANUI > 0) in 2002, we believe the difference in the percentage illustrates the expansion of human settlement. In our previous manuscript, we aimed to build the percentage of pixels with VANUI > 0 at a yearly basis (Figure 6), and we did find remarkable trend in both Zone 1 and Zone 2, following a log distribution.

*"I respectfully disagree. This yearly statistic considers all impervious surfaces, and does not take into account if it's a newly built area. Also, how can you identify a newly expanded human settlement only looking at percentage?"*

**Our response:** Thanks for providing your insight on this issue. We respectfully disagree with the claim that VANUI considers all impervious surfaces. Actually, based on the calculation of VANUI:

$$\text{VANUI} = \text{light} * (1 - \text{vegetation})$$

we could claim that VANUI > 0 represents **"lights AND impervious surface"**, meaning that it has to satisfy two requirements: 1) lights casted to a certain area and 2) that area has to have impervious surface. Traditional remote sensing (multispectral) that gauges urban expansion mainly consider the expansion of impervious surface. VANUI transcends those approaches by introducing another aspect of "lights". By building a time series (yearly) of percentage of pixels (VANUI > 0), we believe we can gauge the urban expansion trend in each zone. We'd like to apologize for our claim "identify newly expanded human settlement" in our response letter. We believe Figure 6 only presents the evolvment of percentage during the 22-year period. The

identification of newly expanded human settlement is completed by using our trend analysis approach (Mann-Kendall + Theil-Sen slope).

*“To do this, you should consider the sum of VANUI. Therefore, I kindly ask the authors to check, for the entire study area, if the sum of VANUI confirms previous findings (namely, repeat exactly what you did with percentages).”*

**Our response:** Thank you for your suggestion. We confirmed that the trend of VANUI summation in different zones agrees well with what we have found using percentage of  $VANUI > 0$ . We performed the statistics for Zone 1 and Zone 2 using sum of VANUI and found the same log trend while Zone 3 and Zone 4 exhibit no significant trend. We presented the yearly sum of VANUI in Zone 1 and Zone 2 in the previous response.

*“I am totally fine with the trend analysis and the remaining replies.”*

**Our response:** We are glad that you are satisfied with our response. We appreciate your valuable comments. Thanks for your time.