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Interactive comment on "An estuarine tuned Quasi-Analytical Algorithm for VIIRS (QAA-V): assessment and application to satellite estimates of SPM in Galveston Bay following Hurricane Harvey" *by* Ishan D. Joshi and Eurico J. D'Sa

Anonymous Referee #1

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The main objective of the paper is to propose an improved version of the Quasi-Analytical Algorithm for the VIIRS ocean color sensor (QAA-V) and for estuarine and near-shore water applications. Calibration and validation of the QAA-V are based on a large synthetic and in situ dataset. Results are convincing. I particularly appreciate the effort intended to present and motivate the modifications/improvements of the standard QAA. Otherwise, I think the paper is well written, clear and very readable. However, I note three major deficiencies before publication. By consequence, I recommend this manuscript for publication in Biogeosciences but only after minor revisions are made in

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Discussion paper

order to address the following comments : 1- The QAA-V was developed for the VIIRS ocean color sensor. I find that the VIIRS-specific development of the QAA-V limits the scope of the study. Moreover, authors do not motivate the choice of this sensor. For example, why choose VIIRS while Landsat-8/OLI or Sentinel-2/MSI provide data with a better spatial resolution (which is crucial for coastal applications)? I recommend to the authors to make explicit the choice of VIIRS. I also recommend that authors provide in a table the calibration coefficients for other ocean color sensors. 2- Authors mention that the QAA-V can be applied in optically shallow waters. For instance, p.1, lines 8-11 : “The standard quasi-analytical algorithm (Lee et al., 2002) was tuned as QAA-V using a suite of synthetic data and in-situ measurements to improve its performance in OPTICALLY complex and shallow estuarine waters”. p.4, lines 5-7 : “In this study, we present a tuned multiband Quasi-Analytical Algorithm (QAA-V) optimized to estimate IOPs in OPTICALLY shallow and near-shore waters for the Visible and Infrared Imaging Radiometric Suite (VIIRS) ocean color sensor”. or, p.19, lines 12-14 : “The QAA-V may not perform satisfactorily in optically deep waters as the empirical relationships were designed specifically for the optically shallow environments”. I think this error comes from a lack of knowledge of the authors of the definition of “optically shallow waters”. “Optically shallow waters” doesn’t mean “shallow waters”. A definition can be found in the IOCCG Report Number 3 (2000). “Optically shallow implies that the product of the diffuse attenuation coefficient Kd and the geometric depth z is small” (p.33). “Coastal waters can also be optically shallow, so that water-leaving radiance is affected by bottom reflectance” (p.94). “Where coastal waters are optically shallow, algorithms for water-column constituents need to remove contributions from bottom reflectance” (p.99). For highly absorbing and turbid waters (which is the case of this study), we can expect a high value of Kd and consequently a high value of the product of Kd and z (even in the case where z is small). It is difficult to believe that the water-leaving radiance is significantly affected by bottom reflectance. More important, the QAA is not designed to take into account the contribution from bottom reflectance. No study has ever shown that QAA works in optically shallow waters. By consequence,

I recommend to the authors to replace “optically shallow waters” by “shallow waters”. Moreover, for clarity, the author should also specify that the QAA-V was developed for optically deep waters. 3- The results do not really demonstrate the interest of using QAA rather than existing algorithms (for instance, Nechad et al. (2010) or Han et al. (2016)) to estimate SPM. P.16, lines 15-22, authors mention the limits of the use of Rrs to estimate SPM before to underline the interest of the use of bbp. They forget to mention the strong limits of this alternative method. bbp is not directly measured. The inversion model used to derivate bbp generates an inherent error that propagates for the SPM inversion. Another source of error is due to the fact that the bbp to SPM ratio is not constant and its value depends of the particle nature. I recommend to authors to discuss precisely the limits of the “bbp method” for the SPM estimation.

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