The authors would like to thank Reviewer #1 for the detailed and helpful comments that will improve the quality and clarity of the paper. The author's responses are detailed below in italics.

Response to Anonymous Reviewer #1

"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."

Response: *Thanks. We are glad that the reviewer recognizes our effort to improve the standard QAA.*

"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 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."

Response: *We have added calibration coefficients for other ocean color (e.g., MERIS, MODIS-A, Sentinel3 OLCI, and SeaWiFS) and land observing (e.g., Landsat8 OLI and Sentinel2 MSI) sensors in the revised manuscript (Table S1). Additionally, we also showed the performance of the proposed calibration coefficients through performance comparisons between the sensors and field observations (Figure S1). We added Figure 10, Table 3, new sub-sections in the Results and Discussion sections. Also, based on the extension of the QAA-V to a larger number of ocean color sensors, we will modify the title to "An estuarine tuned Quasi-Analytical Algorithm (QAA-V): assessment and application to satellite estimates of SPM in Galveston Bay following Hurricane Harvey"*

Results Section
3.6 Extending the QAA-V tuning to additional satellite sensors
The estuarine-specific green to red band tuning was further applied to evaluate and to extend its applicability to past and present ocean color (e.g., Sentinel3 OLCI, MODIS-Aqua, MERIS, and SeaWiFS) and land observing sensors (Landsat8 OLI and Sentinel2 MSI) (Table 3). The validation analysis showed promising performance of QAA tuning in obtaining total non-water absorption coefficient ($a_{tnw}443$) and total-non water backscattering coefficient ($b_{btnw}470$) in optically complex and shallow waters of Galveston Bay (Fig. 10). Overall, different satellite sensors showed similar trends of $a_{tnw}443$ and $b_{btnw}470$ along the transect despite having different spectral and spatial sensor resolutions (Fig. 10a-j;10I-IV). The MRE were ~15 %, 9 %, and 12 % for $a_{tnw}443$ retrievals from VIIRS, MODIS-A, and Sentinel3 OLCI sensors respectively (Fig. 10a-c & 10I), whereas they were ~26 %, 7 %, 22 % for $b_{btnw}470$ retrievals on October 29, 2017 (Fig. 10f-h & 10III). For Landsat8 OLI, these MRE were ~20 % and ~10 % for $a_{tnw}443$ and $b_{btnw}470$, respectively on September 29, 2017 (Fig. 10e, 10j, 10II, & 10IV).

Discussion Section
4.4 Application of the QAA tuning to additional ocean color and land observing sensors
Sensor-specific QAA tuning showed overall valid retrieval of absorption and backscattering coefficients with various ocean color and land observation sensors (Fig. 10). Although satellite-derived values and trends of $a_{tnw}443$ and $b_{btnw}470$ are similar to the field observations, the observed discrepancies could be attributed to several sources of errors. For example, it is well-

known that satellite products suffers from large errors in the blue region especially due to the atmospheric correction (Supplementary S3). The large errors in IOPs at the blue wavelengths could have resulted due to the fact that the QAA processing chain uses these erroneous Rrs values to obtain a_{tnw} *and* b_{btnw} *at the blue wavelengths. Likewise, the errors were relatively smaller at the reference wavelength because the proposed QAA tuning avoided using blue wavelengths in the primary step of getting* a_{tnw} *and* b_{btnw} *at a reference wavelength (Level 1B in Table 2). Hence, the success of the atmospheric correction procedure is a vital component for using QAA in ocean color application in shallow estuarine and near-shore waters. Further, the uncertainties in field measurements can additionally contribute to this difference.*

"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."

Response: *We focused on VIIRS primarily due to our earlier work based on this sensor (Joshi et al. 2017). We appreciate the reviewer's suggestion for using land observing sensors for coastal applications. We worked on several ocean color and land observing sensors and will provide their calibration coefficients and validation analysis in the revised manuscript (Table S1 and Fig. S1). We now strongly feel that our study is applicable to a large number of ocean color sensors, including VIIRS. We will include the following lines in section "2.3 QAA-V processing chain in Materials and methods" to initiate discussion on this additional work,*

To extend and to evaluate the applicability of estuarine-specific QAA tuning, it was further applied to various ocean color (Sentinel3 OLCI, MODIS-Aqua, MERIS, and SeaWiFS) and land observation sensors (Landsat8 OLI and Sentinel2 MSI). The calibration coefficients for obtaining total non-water absorption coefficient at a reference wavelength ($a_{tnw}(\lambda_0)$*; Level 1B in Table 2) are given in Table 3.*

"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."

Response: *Thank you for pointing this out. We appreciate the reviewer's detailed comment and suggestion for this error. We will replace "optically shallow waters" by "optically complex and shallow waters" or "shallow waters" at several locations in the revised manuscript.*

"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."

Response: *Thank you very much for this suggestion. Because we obtained reasonable estimates of backscattering coefficients from QAA-V processing chain, we decided to include in the latter section of the manuscript (a case study of post-hurricane SPM dynamics in Galveston Bay) as an application of QAA-V for obtaining Level-2 products such as SPM. We strongly agree that there are limitations in the bbp-based approach because of the uncertainty in satellite estimates of bbp (and thus SPM estimates) due to several factors. We listed these limitations in Section 4.2 according to the reviewer's suggestion.*

Several factors limit the efficacy of "bbp method" and cause large differences between field and satellite SPM matchups, These include: 1) propagation from various steps of the QAA-V processing chain to $b_{btnw}532$ (e.g., 20–30 %, Fig. 7c) and hence, further down to the SPM inversion, 2) the uncertainty in the atmospheric-corrected green and red Rrs (e.g., 5–20 %, Table 4), 3) the uncertainty in SPM–$b_{btnw}532$ relationship due to limited observations, 4) the assumption of linearity in SPM–$b_{btnw}532$ model beyond the instrument threshold may not hold well because $b_{btnw}532$ to SPM ratio depends on the particle characteristics; this may not always be constant especially in highly turbid waters, and 5) errors in SPM measurements.

Table S1: The calibration coefficients for sensor-specific QAA tuning. λ_0 is a sensor-specific reference wavelength.

Sensor	$\rho = \log_{10}\left(\frac{R_{rs}^{0-}(\lambda_0)}{R_{rs}^{0-}(\lambda_1)}\right)$	$a_{tnw}(\lambda_0) = 10^{(a+b\times\rho+c\times\rho^2)}$ **(Level 1B —Table 2)**					
		ρ < 0.25			**ρ ≥ 0.25 and ρ ≤ 0.65**		
		a	**b**	**c**	**a**	**b**	**c**
VIIRS	λ_0 = 551 nm & λ_1 = 671 nm	0.139	-1.788	0.490	0.406	-2.940	0.928
MODIS-Aqua	λ_0 = 555 nm & λ_1 = 667 nm	0.091	-1.800	0.560	0.275	-2.674	0.813
Sentinel3 OLCI	λ_0 = 560 nm & λ_1 = 674 nm	0.176	-1.830	0.528	0.397	2.940	0.800
MERIS	λ_0 = 560 nm & λ_1 = 665 nm	0.081	-1.868	0.688	0.314	-2.733	0.713
SeaWiFS	λ_0 = 555 nm & λ_1 = 670 nm	0.128	-1.792	0.505	0.276	-2.742	0.842
Sentinel2 MSI	λ_0 = 560 nm (Band 3) & λ_1 = 665 nm (Band 4)	0.0814	-1.868	0.688	0.223	-2.732	0.740
Landsat8 OLI	λ_0 = 560 nm (Band 3) & λ_1 = 655 nm (Band 4)	-0.087	-1.900	0.952	0.057	-2.667	0.753

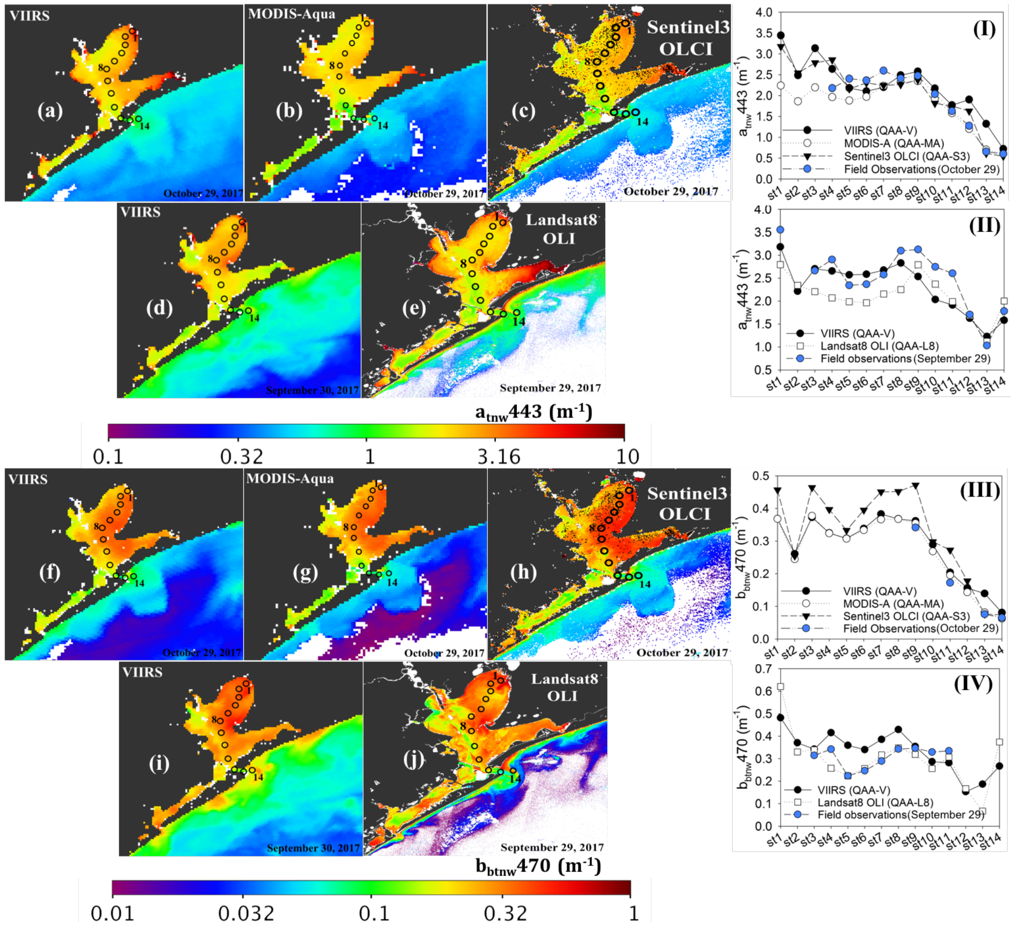

Figure S1: Application of sensor-specific QAA tuning to obtain the maps of $a_{tnw}443$ using a) VIIRS, b) MODIS-Aqua and c) Sentinel3 OLCI on October 29, 2017, and d) VIIRS and e) Landsat8 OLI on September 30, 2017 and September 29, 2017, respectively. The validation of these maps with field observation along the transect (St. 1 to St. 14) is shown in (I) for figs. 8a-8c and in (II) for figs. 8d & 8e. The maps of $b_{btnw}470$ were obtain similarly for f) VIIRS (October 29, 2017), g) MODIS-Aqua, h) Sentinel3 MSI, i) VIIRS (September 30, 2017), and j) Landsat8 OLI (September 29, 2017) with their validation results in (III) and (IV), respectively. Parameter values beyond the upper limit of tuned QAA ($\rho > 0.65$) is masked in white.

Reference:

Joshi, I. D., D'Sa, E. J., Osburn, C. L., Bianchi, T. S., Ko, D. S., Oviedo-Vargas, D., Arellano, A. R., and Ward, N. D: Assessing chromophoric dissolved organic matter (CDOM) distribution, stocks, and fluxes in Apalachicola Bay using combined field, VIIRS ocean color, and model observations, Remote Sensing of Environment, 191, 359-372, 2017.