**Response to Reviewer #1**

This work developed an algorithm for the simultaneous retrieval of aerosol optical thickness (AOT) and normalized water leaving radiance (nLw) by using multispectral satellite measurements. Authors used a coupled atmosphere-ocean radiative transfer (RT) model combined with a oceanic bio-optical module as the forward RT simulation. Then they used an optimization approach by adjusting retrievals to fit with multispectral observation in an iterative manner. The accuracy of the algorithm is evaluated by comparing retrievals with products collected from 8 AERONET-OC sites and products from MODIS standard atmospheric correction (AC) scheme. This work presents great improvement in the accuracy of AOT and nLw. However, authors did not mention the computational efficiency of their iterative algorithm compared to MODIS AC scheme. Overall, this manuscript is well written and straightforward to follow. This manuscript is recommended for publication in the Atmospheric Chemistry and Physics after minor revision.

Response: Thanks for the reviewer's insightful comments very much, which helped improve the manuscript greatly. We have revised our paper based on your comments carefully. We also have reworded/rephrased some sentences and added some references that may improve the paper.

Generally, current algorithm makes full use of spectral information as well as shorter bands measurements in the simultaneous retrieval of AOT and $nL_w$ based on an optimization approach, so that the aerosol spectral properties can be better estimated and cases of negative values of derived $nL_w$ can be avoided. Since the algorithm adopts the coupled radiative transfer (RT) model as forward radiation calculation and AOT and $nL_w$ are derived in an iteration manner, the computational efficiency of current scheme is lower a lot than that of standard atmospheric correction schemes. In an effort to solve this problem, a neutral network (NN) solver is being used to replace the RT model as the forward RT simulation, where the calculation efficiency will improve over thousand times faster. Such a NN solver has already been successfully implemented in the estimation of solar radiation (Takenaka et al., 2011) and related acceleration results for current algorithm will be explicated in another paper. More description of computational efficiency of current scheme are added in the last section of manuscript as "Since current algorithm adopts the coupled RT model and optimization approach to derive AOT and

$nL_w$ in an iteration manner, the computation efficiency will be lower a lot than that of standard AC schemes. In order to overcome this problem, a Neutral Network solver, which has been successfully implemented in the estimation of solar radiation (Takenaka et al., 2011) from geostationary satellite measurement and joint retrieval of AOT and ground surface albedo over land (Hashimoto et al., 2017), is being constructed to accelerate the algorithm by a factor of several thousand and related study will be explicated in another work".

Reference:

Hashimoto, M., Takenaka, H., Higurashi, A., and Nakajima, T.: Adaptation of an aerosol retrieval algorithm using multi-wavelength and multi-pixel information of satellites (MWPM) to GOSAT/TANSO-CAI, In Proceedings of the AGU Fall Meeting, A21A-2152, 2017.

Takenaka, H., Nakajima, T. Y., Higurashi, A., Higuchi, A., Takamura, T., Pinker, R. T., and Nakajima, T.: Estimation of solar radiation using a neural network based on radiative transfer, J. Geophys. Res.: Atmospheres (1984–2012), 116, 2011.