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Interactive comment on "Significant Seasonal Change in Optical Properties by atmospheric humic-like substances (HULIS) in Water-Soluble Organic Carbon Aerosols" *by* Heejun Han and Guebuem Kim

Anonymous Referee #2

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The main assertion of this work is that the seasonal variation of HULIS in the urban environment of Seoul was driven by the photo-induced degradation, and therefore photochemical degradation is an important sink that was previously overlooked. The authors arrived at this conclusion based on (1) a statistically significant negative correlation (r2 = 0.5, p <0.001) was observed between fluorescence intensity of HULIS and UV radiation (Fig. 4 b); and (2) the fluorescence intensity of aerosol water extracts decreased by 52% for a winter sample (Fig. 5a) and no change for a summer sample (Fig. 5b) after 6-week UV irradiation in laboratory experiments.

Neither of the two observations could convincingly lead to the main assertion. As for the first observation, correlation does not equate cause-and-effect relationship. Incomplete combustion (e.g., biomass burning, coal combustion) and secondary formation are known to be significant sources of HULIS (e.g., Lin et al, 2010; Kuang et al., 2015). The seasonal variation in HULIS in Seoul (i.e. higher concentrations in the winter and lower in the summer) could well be a result of enhanced HULS sources in the winter as combustion-related sources were more prominent in the region while in the summer the clean marine air would dilute the overall PM levels and WSOC level as well. While the second observation indicates that the fluorescing component in WSOC in the winter sample photo-degrades, this is not evidence to indicate that the lower HULIS level in the summer is due to photo-degradation. In addition, the photo-degradation experiment was only conducted on two samples and this sample size is too small to draw a conclusion about the degradation rate of HULIS. Without quantitative data on typical photo-degradation kinetics, the claim of photochemical degradation as an important sink remains unsubstantiated.

References: Lin, P., Engling, G. and Yu, J.Z., 2010. Humic-like substances in fresh emissions of rice straw burning and in ambient aerosols in the Pearl River Delta Region, China. Atmospheric Chemistry and Physics, 10(14), pp.6487-6500.

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