Many thanks for the valuable comments. We have revised our manuscript significantly. Below are the summary of the reply.

Comments: This paper introduces a new nine year AOD dataset over China retrieved with a novel SRAP method. However, because the way of presenting the results, and lack of discussion I can not yet recommend this article for publication. The main point of this paper remained rather unclear. If it is to introduce the new AOD dataset, it should have been be compared not only with AERONET, but also to other available satellite retrieved AOD datasets, which are many. Also, the authors do not clearly state what is the benefit for using specifically this approach over China, e.g. instead of the standard MODIS AOD product.

Answer: The ratio of the research is to produce an AOD dataset over China. We have found that the most areas in China are high reflectance surface. There are so many areas in China without any MODIS AOD values. Our SRAP method is specially developed for solving AOD retrieval over land surface, which can retrieve AODs over more areas. We have added one Figure to show the coverage differences of with valid AOD values.

The SRAP-method itself was poorly described. For example, it remained very unclear, what happens to the retrieval if you are not having Terra and Aqua observation for a certain location for the same day, e.g. because of changing cloudiness? Could you see e.g. from the AERONET observations, that your assumption about constant aerosol types and properties in between Terra and Aqua overpasses is valid? Also the different sources of uncertainties in the retrieval were not discussed at all. What do you mean by "mutually cloudfree"? How do you make the comparison with the AERONET measurements, which temporal and spatial averages are used?

Answer: The SRAP method is invalidated if only one satellite measurement is available for a pixel. We use MOD35/MYD35 for cloud mark. We only process the pixels without cloud contamination in both Terra and Aqua data. The assumption about constant aerosol types and properties in between Terra and Aqua overpasses is reasonable valid from AERONET site observations. We use the standard averaged method and collocated AERONET datasets.

Following are detailed description of the SRAP method which will be added to the revised version.

The transmission process of electromagnetic radiation on atmosphere is described by radiative transfer equation. Chandrasekhar (1960) and Kondratyev (1969) gave the expression of the radiative-transfer equation as follows:

$$\frac{Cos\theta'}{\rho}\frac{\partial I^{\lambda}(z,r)}{\partial z} = \frac{\sigma}{4\pi}\int I^{\lambda}(z,r')\gamma^{\lambda}(z,r',r)d\omega' - (\kappa+\sigma)I^{\lambda}(z,r) \qquad (1)$$

Where θ' is the zenith angle between the transmission and the vertical direction; ρ is the mass density; $I^{\lambda}(z, r)$ is the intensity of the radiation at height z and direction r; σ and κ is the coefficient of scattering and the mass scattering cross section, respectively; $\gamma^{\lambda}(z, r', r)$ is the scattering function that characterizes the scattered light intensity distribution in the direction (z, r', r).

Eq. (1) cannot be solved analytically for $I^{\lambda}(z, r)$. Xue and Cracknell (1995) introduced an optical depth $\tau = \int_0^z \sigma\rho dz$ with taking the case of shortwave radiation transfer in a non-absorbing atmosphere and eliminated the integral in Eq. (1) using a two-stream approximation based on the assumption that radiation attenuation is determined by the primary scattering influence only. For a depth *dz*, the variation in the upgoing flux and is caused by two factors. One of these factors is the extinction by backscattering of the original upgoing flux, and the other is the increment by backscattering of the downcoming flux:

$$\begin{cases} \frac{1}{\rho}\frac{dF_1^{\lambda}(z)}{dz} = -\sigma m_1^{\lambda}(z)\Gamma_1^{\lambda}(z)F_1^{\lambda}(z) + \sigma m_2^{\lambda}(z)\Gamma_2^{\lambda}(z)F_2^{\lambda}(z) \\ -\frac{1}{\rho}\frac{dF_2^{\lambda}(z)}{dz} = -\sigma m_2^{\lambda}(z)\Gamma_2^{\lambda}(z)F_2^{\lambda}(z) + \sigma m_1^{\lambda}(z)\Gamma_1^{\lambda}(z)F_1^{\lambda}(z) \end{cases} \quad (2)$$

Where F_1 and F_2 are upgoing and downcoming fluxes, respectively, at height z and

$$m_1^{\lambda}(z) = \frac{\int_{2\pi^+} I_1^{\lambda}(z, r')d\omega'}{\int_{2\pi^+} I_1^{\lambda}(z, r')\cos\theta' d\omega'}$$

$$m_2^{\lambda}(z) = \frac{\int_{2\pi^-} I_2^{\lambda}(z, r')d\omega'}{\int_{2\pi^-} I_2^{\lambda}(z, r')\cos\theta' d\omega'}$$

$$\Gamma_1^{\lambda}(z) = \frac{\int_{2\pi^-} I_1^{\lambda}(z, r')\beta_1^{\lambda}(r')d\omega'}{\int_{2\pi^+} I_1^{\lambda}(z, r')d\omega'}$$

$$\Gamma_2^{\lambda}(z) = \frac{\int_{2\pi^+} I_2^{\lambda}(z, r')\beta_2^{\lambda}(r')d\omega'}{\int_{2\pi^-} I_2^{\lambda}(z, r')d\omega'}$$

In our model, the upgoing radiation is assumed isotropic. As a consequent, $m_1^{\lambda} = 2$. The angular distribution of the downcoming radiation has a very marked maximum at direction θ and $m_2^{\lambda} = \sec\theta$. The backscattering coefficients of the upgoing and downcoming fluxes are $\Gamma_1^{\lambda}(z)$ and $\Gamma_2^{\lambda}(z)$. Typically, they have a value of 0.1.

We have boundary conditions at the top of atmosphere (TOA) and the bottom of atmosphere (BOA):

$$F_2^{\lambda}(\infty) = E_0^{\lambda}\cos\theta \qquad \text{at } \tau^{\lambda} = \tau_0^{\lambda}\sec\theta' \qquad (3)$$

$$F_1^{\lambda}(0) = RF_2^{\lambda}(0) \qquad \text{at } \tau^{\lambda} = 0 \qquad (4)$$

where E_0^{λ} is the extraterrestrial solar irradiance, $\tau_0^{\lambda} = \int_0^{\infty} K_{\lambda} dz$, θ' is the zenith angle of the sensor, R' is the reflectance at the top-of-atmosphere and R is the Earth's surface reflectance.

$$\begin{cases} R' = \frac{F_1^{\lambda}(\infty)}{F_2^{\lambda}(\infty)} \\ \frac{dF_1^{\lambda}(z)}{d\tau^{\lambda}} = \frac{dF_2^{\lambda}(z)}{d\tau^{\lambda}} = -\varepsilon \sec\theta F_2^{\lambda}(z) - 2\varepsilon F_1^{\lambda}(z) \end{cases} \quad (5)$$

Solving the system of ordinary differential equations, Eq. (5), with the boundary conditions of Eqs. (3) and (4), it returns the results for the case of a clear sky and sec(q):

$$R = \frac{(R'b-a)+a(1-R')\exp[(a-b)\varepsilon\tau_0^{\lambda}\sec\theta']}{(R'b-a)+b(1-R')\exp[(a-b)\varepsilon\tau_0^{\lambda}\sec\theta']} \quad (6)$$

Where $a=\sec\theta$ and $b=2$; ε is the backscattering coefficient, typically 0.1. The solar zenith angle is calculated from latitude, longitude and time. The atmospheric optical depth τ_0^{λ} is determined by the turbidity state of the atmosphere.

Eq. (6) describes an approximate relationship between R, R' and τ_0^{λ}.

For our model SRAP (Synergic Retrieval of Aerosol Properties), which only takes into account the scattering of atmospheric molecular and aerosol particles, we assume that the atmospheric optical depth τ_0^{λ} consists of two parts: the molecular Rayleigh scattering $\tau_M^{\lambda}(\infty)$ and the scattering of aerosol particles $\tau_A^{\lambda}(\infty)$. Linke (1956) provided an approximate expression that is sufficiently accurate for most applications in remote sensing:

$$\tau_M^{\lambda}(\infty) = 0.00879\lambda^{-4.09} \quad (8)$$

and Ångström (1929) suggested a single formula for aerosol scattering optical depth that is generally known as Ångström turbidity formula and is given by the following:

$$\tau_A = \beta\lambda^{-\propto} \quad (9)$$

Tang et al. (2005) assumed that, for two MODIS observations within short time intervals between the overpasses of Terra and Aqua, the ground surface bidirectional reflectance properties and aerosol types and properties (α) did not change.

Flowerdew and Haigh (1995) proposed that the surface reflectance be approximated by the variation in the wavelength and the variation in the geometry. Under this assumption, the ratio of the surface reflectance from both Terra MODIS and Aqua MODIS in morning and early afternoon can be expressed as follows:

$$K_{\lambda_i} = \frac{A_{1,\lambda_i}}{A_{2,\lambda_i}} \quad (10)$$

where i =1, 2 indicates the observation of Terra MODIS and Aqua MODIS, respectively. Three visible bands (0.47, 0.55, and 0.66 m) of MODIS were used to retrieve the AOD data.

The results were introduced very extensively, but the discussion and conclusions after remained rather weak. Defining trends from the satellite data is always very challenging task. I would suggest to study the extensive ground based data that you have used in you study and look if they show similar AOD variation over the years and seasons. What about other satellite instruments? Do you think that the observed instrument degradation in MODIS Terra can affect your results? When making conclusions about the decreasing AOD trend over Beijing, did you take into account the number of available observations/year and month? The haze is certainly an issue over China, but the case study is a bit away from the main focus of the results. Also for the dust case, more testing than the one case should be included. In fact, how exactly are the dust-type AODs obtained from the SRAP-data?

Answer: We agree with the suggestion that it is better to focus on AOD retrieval. We will remove the Section 5 and prepare another paper for the usages/applications of China Collection 1.0 AOD dataset. We will include the comparisons with other AOD datasets such as MODIS AOD datasets etc. The new figures have also been prepared following the comments from another reviewer.

I would also suggest to pay attention to the language and overall presenting things in a more concise way when resubmitting this manuscript. In the equations some of the parameters were not explained, e.g. what is "theta" in Eq. 1, solar zenith angle? Why the backscattering coefficient is typically 0.1 (do you use this value in all of your retrievals)? In addition the number of figures is too high, and the information content in some figures, e.g. Fig.3, is rather low and hence it could be easily left out. Also the clarity of the figures, labels, and the information in the captions should be improved. E.g. in Fig. 9 it is very hard to distinguish the dust AOD and the API (which is not explained in the caption) over e.g. the East coast. In the scatter/bar plots error bars could be shown.

Answer: We have used ELSEVIER language service to polish the revised manuscript. The new figures have also been prepared following the comments.