Specific comments:

About the Introduction :

A paragraph should been added to describe the relevant plasma knowledge: why negative DC rather than positive DC corona discharge is selected ? the effects of the radius and material of wire? the definition of reduced electric field and source density? the species of negative ions (O_2?)? the mechanism of the decay of ions during transport?

Answer:

The content of answers to the question above is more than one paragraph. To put them in the section 2.1 and explain why we choose corona discharge source is more appropriate.

Both the positive and negative corona discharge can be used to increase the ion density in the open air. Under the similar conditions of the electric circuit the loss of the positive corona is greater than that of negative corona at the same applied voltage. Because the negative corona curve is flatter and since larger negative corona currents can be obtained, the negative corona is much better adapted for the application such as fog elimination and electrical precipitation than the positive corona.(Sawant et al., 2012; Strong, 1913)

The wire electrode is a low cost and high efficiency plasma source configuration, especially for the large scale corona discharge system. For the wire electrode radius within the range of 100 μm to 1000 μm, the plasma thickness increases with increasing wire radius. The larger wires can generate more electrons, however, the electron energy decreases due to the lower electric field near the larger wire(Chen and Davidson, 2003). Stainless steel stranded wire is suitable wire electrode material considering durability and stability.

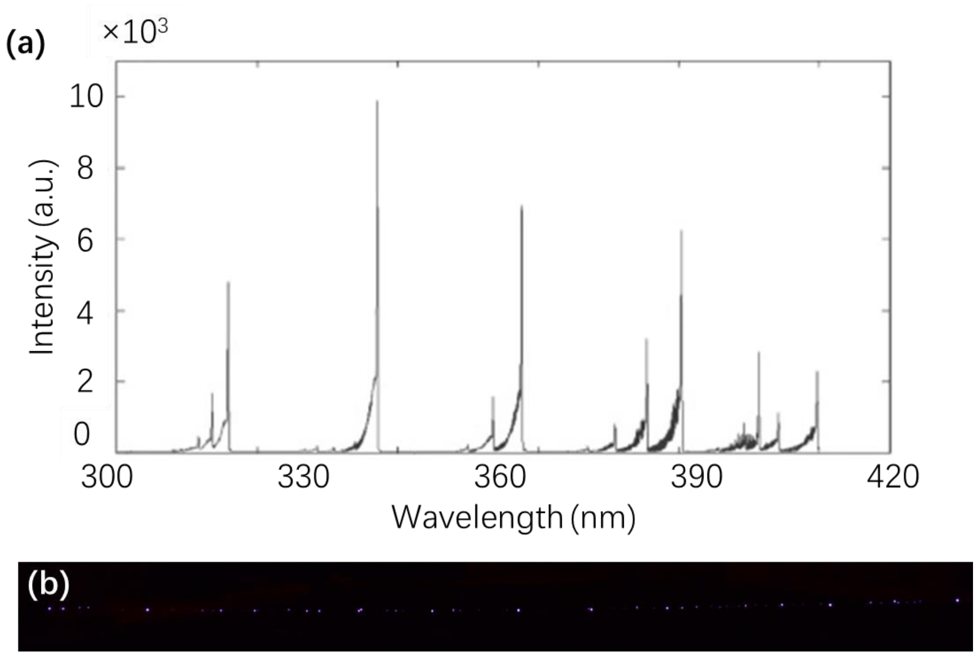
Electrons generated by negative corona discharge attach to electronegative gas molecules (such as, O_2) to generate negative ions (O_2^-). Recombination of electrons with positive ions is negligible. Therefore, ionization competes primarily with electron attachment. The ionization predominates over the electron attachment and new electrons are generated. The rate of ionization balances the rate of electron attachment at the reduced electric field of 120 Td (1 Td =10^{-21} Vm^2). Beyond this ionization boundary, the attachment dominates over the ionization, and the electron density decrease gradually as the electric field decreases.(Chen and Davidson, 2003; Kossyi et al., 1992; Lowke and Morrow, 1994) In the region away from the electrode, because the absence of the electric field, the charged particles, including electrons and ions, perform a faster decay through the electron-ion and ion-ion recombination with background charged particles.(Xiong et al., 2010)

About the Field experiment:

Fig. 1(e) may be move into Fig. 3.

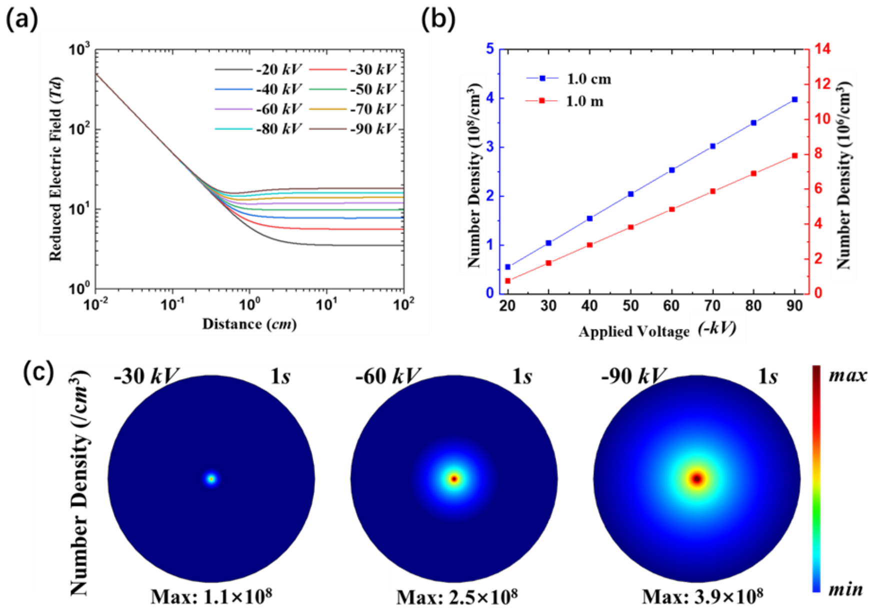
What is the relation between the number of corona discharge points and applied voltage? I think the relevant figure should also been shown in Fig. 3.

Answer: Figure 1 (e) is changed to Figure 3 (b) as the figure below



The increasing applied voltage increased the plasma power indeed. Our experiment results also indicated that as the applied voltage increased from -30kV to -40kV, besides the corona discharge points increased by ~10%, the OES intensity increased by ~20%.

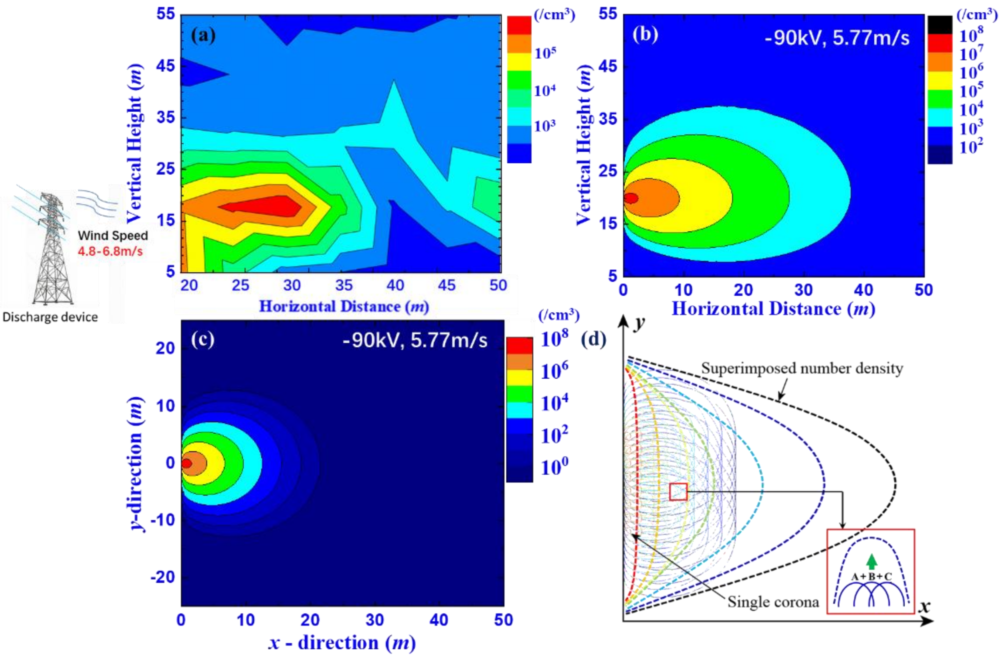
It seems that the figures in Fig. 4 should be plot in the rank of c-b-a rather than a-b-c.
Answer: Figure 4 is replotted by the order of “c-b-a” as the figure below.



Change the title of section 3.1 to “Corona discharges and ion generation”, and move the context in Line 2-13, Page 7 into section 3.1.
Answer: The title of section 3.1 is changed to “Corona discharges and ion generation”. The context

in Page 7 is moved into section 3.1.

Fig. 6: The inset of “Discharge device” seems to be not necessary, I suggest deleting it.
Clearly plot the applied voltage and wind speed inside the Fig. 6(a)(b)(c) as Fig. 7.
The hydrogen balloon drifts between 20 m and 50 m away from the wire electrode for safety (Page 5, Line 6), how was the ion concentration within 20 m in Fig. 6(a) measured?
The source density in the model locates at the plasma boundary, just 1 cm from the wire, thus the peak in Fig. 6(b)(c) is very close to the wire. However, the peak of ion concentration in Fig. 6(a) is about 10 m ~ 20 m away from the wire, please explain why that happens.
Answer: Because the hydrogen balloon drifts between 20 m and 50 m and we did not measure the ion density within 20m, the x-axis of Figure 6 (a) should be 20m ~ 50m. The previous x-axis label of 0-50m is a mistake. The applied voltage and wind speed are also added on the Figure 6 (b) and (c).
The peak concentration at the position between 25m and 30m in Figure 6 (a) is $5.6*10^6/cm^3$, and the concentration in the close region is about $3*10^6/cm^3$. The color scale of Origin (software to plot the figure) make the peak concentration is more visible. The reason of this peak is the randomness of wind. The overall trend of Figure 6 (a) is the decreasing ion density as the distance increases, which is consistent with the simulation results of Fig. 6(b)(c). Figure 6 is replotted as the figure below.



About the 2-D model:
The x(downwind direction), y(wire direction), z(vertical direction) should be clearly defined in the context, which will be frequently used in Fig. 4, 5, 6 ,7.
The expression of coefficients K and $\lambda\lambda$ should be given explicitly, and explain the physical processes, especially for the decay constant.
Answer: The explain of x (horizontal downwind direction), y(horizontal radial direction), z(vertical direction) is added.

The eddy diffusion K represents the diffusion of ions under the influence of the turbulent state of atmosphere. During stable conditions, the maximum value of eddy diffusivity decreases with increasing stability. In stable conditions, a height at which turbulence maintained is limited by the destruction of turbulent kinetic energy by negative buoyancy(Ulke, 2000), while in unstable conditions, the maximum value of eddy diffusivity increases with growing instability characterized by increasing values of H_A/L (H_A is the ABL-height, L is the Monin-Obukhov length).

The decay constant λ, it represents the decay of ions due to the recombination reactions between charged particles, such as $e+N_2^+ \rightarrow N_2$, $e+O_2^+ \rightarrow 2O$, $O_2^-+N_2^++N_2 \rightarrow 2O+2N_2$, etc. According to our simulation results, the combination of numerous corona discharge points actually decreases the decay of ions generated by a single corona discharge point in the open air.

Line 23 Page 8, the decay constant $\lambda\lambda$ was reduced by 4.533 times from one single discharge point, what is the physical basis?

Answer: The prototype of our model is designed to simulate the transportation and decay of ions generated by one source point, but the large scale corona discharge system consists of many corona discharge source points, in order to simulate the enhanced transportation effect of multi corona discharge points, decreasing the decay constant of the model by 4.533 can get the similar result as the experiment measurement.

If the values of $\lambda\lambda$ in Fig. 7 for voltage of -60, -90, -180 kV were all reduced by 4.533 times, in consideration of the number of discharge points will change with increasing voltage?

Answer: To be honest, because our large scale corona discharge experiment was only carried out with the applied voltage of -90 kV, the λ decreased by 4.533 was used for all simulation cases after the checking between the simulation and experiment measurement case at -90 kV. The further experiment will be carried out to get more accurate λ for the cases of -60, -90, -180 kV.

When multiple discharge points are involved, strictly speaking, the model is no longer two-dimensional, thus more details should be given for the model in this scenario. I doubts if it is valid to build the multiple points discharge model by simply reducing the decay constant in the 2-D single point discharge model. Will the simulated results in Fig. 7 also work at 4000 m level, considering the low pressure/density there?

Answer: We absolutely agreed with editor's suggestions. To setup the accurate the transportation model for multi corona discharge points need consider the interactions between corona discharge points, wind direction and speed, temperature, pressure, background ion density, and decay reactions of ions in the air. The model at the moment is only a prediction model. Once the construction of large scale corona discharge system on the high mountain is finished, the accurate measurement can provide the essential data for the model.

About Cloud chamber experiments:

Line 14-15, Page 9, the ion density of $1.2*10_5$~$2*10_4$/cm_3 was provided, however, according to Fig. 4(b) and Fig. 5, the ion density at 1 m away for -23 kV should be about $1*10_6$/cm_3 for a single point, why the ion concentration in the chamber is so low?

Answer: Fig. 4(b) and Fig. 5 show the ion density of the corona discharge on 1m long wire electrode.

The chamber experiment want to prove the ion density of the measurement region can enhance the precipitation of droplet, therefore, a single needle electrode is used to generate a single corona discharge point and provide the ion density at the position of 30m-35m from the large scale corona discharge system in the chamber. The higher ion density can be obtained by increasing the applied voltage or using the wire electrode.

What is the distribution of charges on varying size of aerosols? Is it possible to provide the average charges on aerosols through dividing the amount of charges by the amount of aerosols?
Answer: We have measured the charge amount of charged aerosols. The idea is to let aerosols pass through the plasma generated by plasma jet, and then use the static electric field to decelerate the moving charged aerosols, which is just like "brake experiment". Because the mass, velocity and the travelling distance of charged aerosols, and electric field intensity are known, we can calculate the charge amount of charged aerosols. This paper is going to be published in "Plasma Science and Technology". This method is suitable for highly charged aerosols generated by plasma jet, although it's more accurate, we are still working to improve it to be suitable for low charged aerosols generated by the corona discharges.

Fig. 8(d) seems not necessary.
The results will be more interesting if figures like Fig. 8(c) are also obtained at times such as 1 min, 2 min, 10 min, as they will be helpful to illustrate the mechanism through which the charged aerosols enhance the growth of droplets. If possible, show them in Fig. 8, and move Fig. 8(a)(b) to Fig. 2.
The temperature in the chamber should be provided in section 3.3.
Answer: According to our previous experiment experience, the difference between charged and uncharged aerosols are negligible at 1 min, and there are much less charged aerosols than the uncharged aerosols at 10 min. Because of COVID-19, our university (Huazhong University of Science and Technology, Wuhan) is closed and every lab is shut down at the moment. We will probably start new experiment in September. So, we can not plot the condition at 1 min, 2min and 10 min now. The temperature inside the chamber is 2±1°C, which is provided in the section 3.3.

According to Fig. 6&7, the ion concentration reduced to ~10_{3}/cm$_{3}$ at 50 m away, will the effect of charges on precipitation still be significant at that low concentration? If possible, provide the minimum and maximum ion concentration that could affect precipitation.
Answer: The minimum ion concentration can induce precipitation of droplet is about 10^5/cm^3 with the humidity supersaturation at 130±10%. We tried the ion concentration less than 5×10^4/cm^3, but there was no significant effect. The higher ion concentration, such as 10^6/cm^{3}and even higher, obviously can accelerate the precipitation. The precipitation of droplets by ions actually depends on the relations between temperature, humidity supersaturation and ion concentration. To analyze these principles is our next work.

Technical corrections：
Answer: All these mistakes have been corrected.

Page 5, Line 6: in the downwind -> in the downwind, as shown in Fig. 1(d)

Page 5, Line 2: ∇is -> ∇ is
Page 6, Line 3: during the experiment -> during the experiment (Testo 605-H1)
Page 7, Line 5: the reduced electric field -> the reduced electric field (electric field divided by neutral density, E/N)
Page 7, Line 5: 80 Td -> 80 Td (1 Td = … V m^2)
Page 8, Line 10: -40 kV -> -90 kV
Page 8, Line 13-14: "The mutual … the wires" has already appeared in section 2.1. Delete it.
Page 9, Line 14-15: the ion density of $1.2*10^5$~$2*10^4$/cm^3 -> ???
Page 9, Line 15: 1-20 m -> ??? (20-30m?)
Page 9, Line 17: diameter > 0.7 -> diameter > 0.7 μm? Give a reference for this value.
Page 9, Line 18: contribute -> contributes
Page 9, Line 19: charging.(Jidenko…) -> charging (Jidenko…).
Page 9, Line 26: the charged aerosols -> the small charged aerosols
Page 10, Line 1: on uncharged aerosols -> on large uncharged droplets
Page 10, Line 1: "the consequent electric forces are short range attractive forces" -> the consequent image electric force is short-range attractive force.
Page 10, Line 3: magnitude.(Tan…) -> magnitude (Tan…).
Page 17, 6.75m^3 -> 6.75 m^3
Page 18, Line 6: 1 cm -> 1 cm (blue line) and 1 m (red line).
Page 19, Line 5: error bar -> error bars
Page 20, Line 8: color clines -> color lines.
Page 21, Line 5: the effect of wind on -> the effect of voltage on.
Fig. 1(a)(b)(c): plot "(a), (b), wind, 50 M" in white color; Fig. 1(c): explain the two red lines, and plot the direction chart at the lower left corner and "50 M" at the lower right corner.
Fig. 4(a), explain the meaning of '1s' in the caption.
Fig. 5: plot "-40 kV" inside the figure.
Fig. 6(a): plot "(a)" in white; Fig. 6(a)(b)(c): the legends should be better plot; Fig. 6(d): exchange the position of "y" and "(d)", move "x" below the arrow.
Fig. 8: move "(a)(b)" to the top left corner.
