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Supplementary Materials for

Electrostatically driven fog collection using space charge injection

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The PDF file includes:

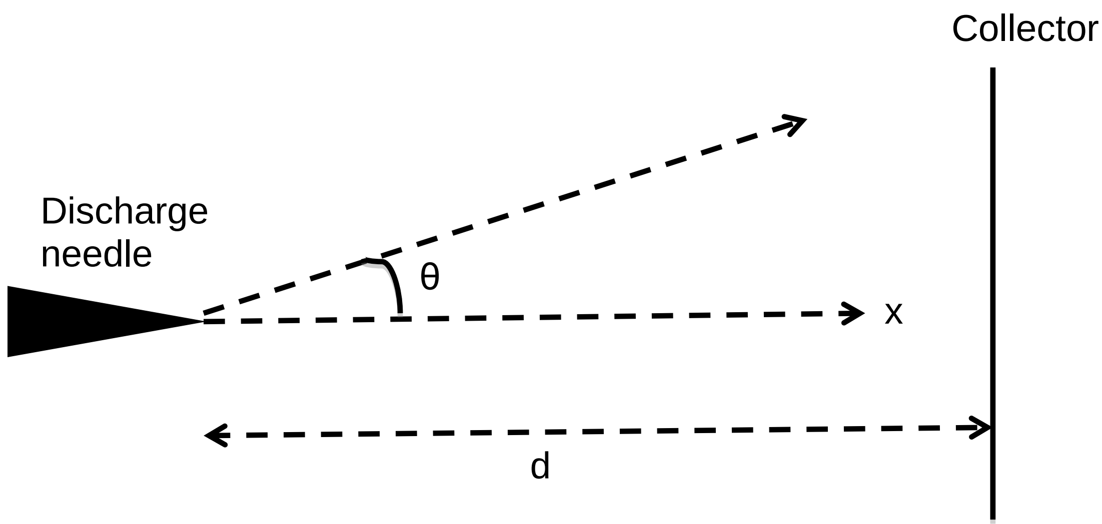
- Supplementary Text
- fig. S1. Nondimensional collection area as a function of the inverse of wind speed for five different voltages.
- fig. S2. Nondimensional collection area for two wires as a function of *Ke* for three different wire distances.
- fig. S3. Continuous 10-hour fog collection experiment.
- Legends for movies S1 to S4

Other Supplementary Material for this manuscript includes the following:
(available at advances.sciencemag.org/cgi/content/full/4/6/eaao5323/DC1)

- movie S1 (.mp4 format). Droplet trajectories in the absence of an electric field.
- movie S2 (.mp4 format). Droplet trajectories with corona discharge.
- movie S3 (.mp4 format). Ninety-second video of fog collection on meshes with and without corona discharge.
- movie S4 (.mp4 format). Thirty-minute video of fog collection on meshes with and without corona discharge.

Supplementary Text. Estimation of the charge on a water droplet.

Electric field:



Warburg's law gives the electric field in the vicinity of a corona discharge point:

$$E = E_0 \cos^5(\theta) = \frac{V}{x} \cos^5(\theta)$$

Charge on water droplets:

Continuity equation for electric field (water is a conductor compared to the surrounding medium that is air, a very good insulator) gives the surface charge of the droplet:

$$\sigma = \epsilon_0 E$$

Droplets can gain charge when the ions attach to them but they cannot lose charge to the air (insulator), so the final charge of a droplet will be determined by the maximum value of the electric field it encounters in its trajectory.

We suppose that droplets have horizontal trajectories until they approach the mesh/wire. By deriving the expression of E with respect to x, we find that E is maximum when $x = 2y \ or \ \theta = 27^{\circ}$.

The average surface charge can then be calculated

$$\sigma = \frac{\epsilon_0}{d}\int_{r}^{d} \frac{V}{x}\cos^5(\theta)\,dx \ \approx \ \frac{\epsilon_0}{d}\int_{\frac{d}{200}}^{d} \frac{V}{x}.\,0.6\,dx \ \approx \ 3\epsilon_0\frac{V}{d}$$

r is the radius of the tip of the discharge needle which in our case is approximately d/200. This value doesn't need to be very precise since it appears in a log function.

$$q = 12\pi {R_p}^2\epsilon_0\frac{V}{d}$$

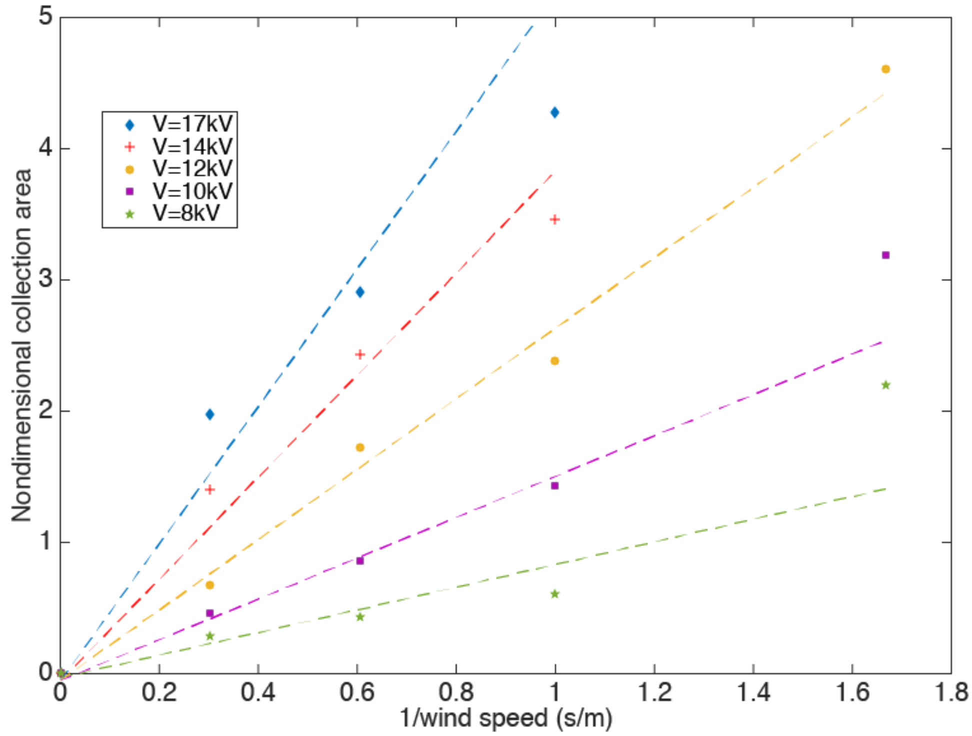


fig. S1. Nondimensional collection area as a function of the inverse of wind speed for five different voltages. The dashed lines are linear correlations.

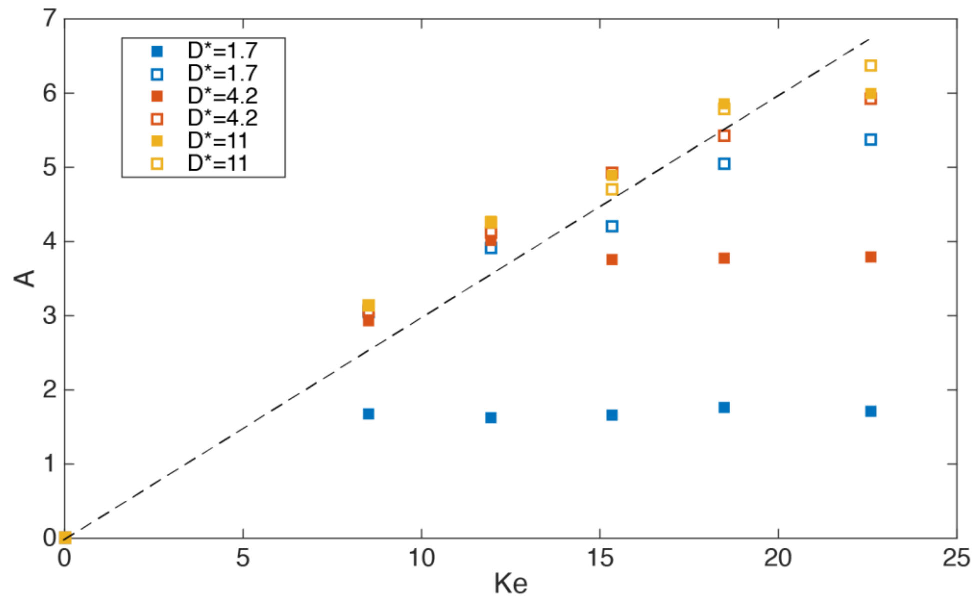


fig. S2. Nondimensional collection area for two wires as a function of *Ke* for three different wire distances. Closed symbols represent A_{in} and open symbols represent A_{out}. A_{out} has a linear behavior with a slope close to that of a single wire. Collection is not limited on the outer side.

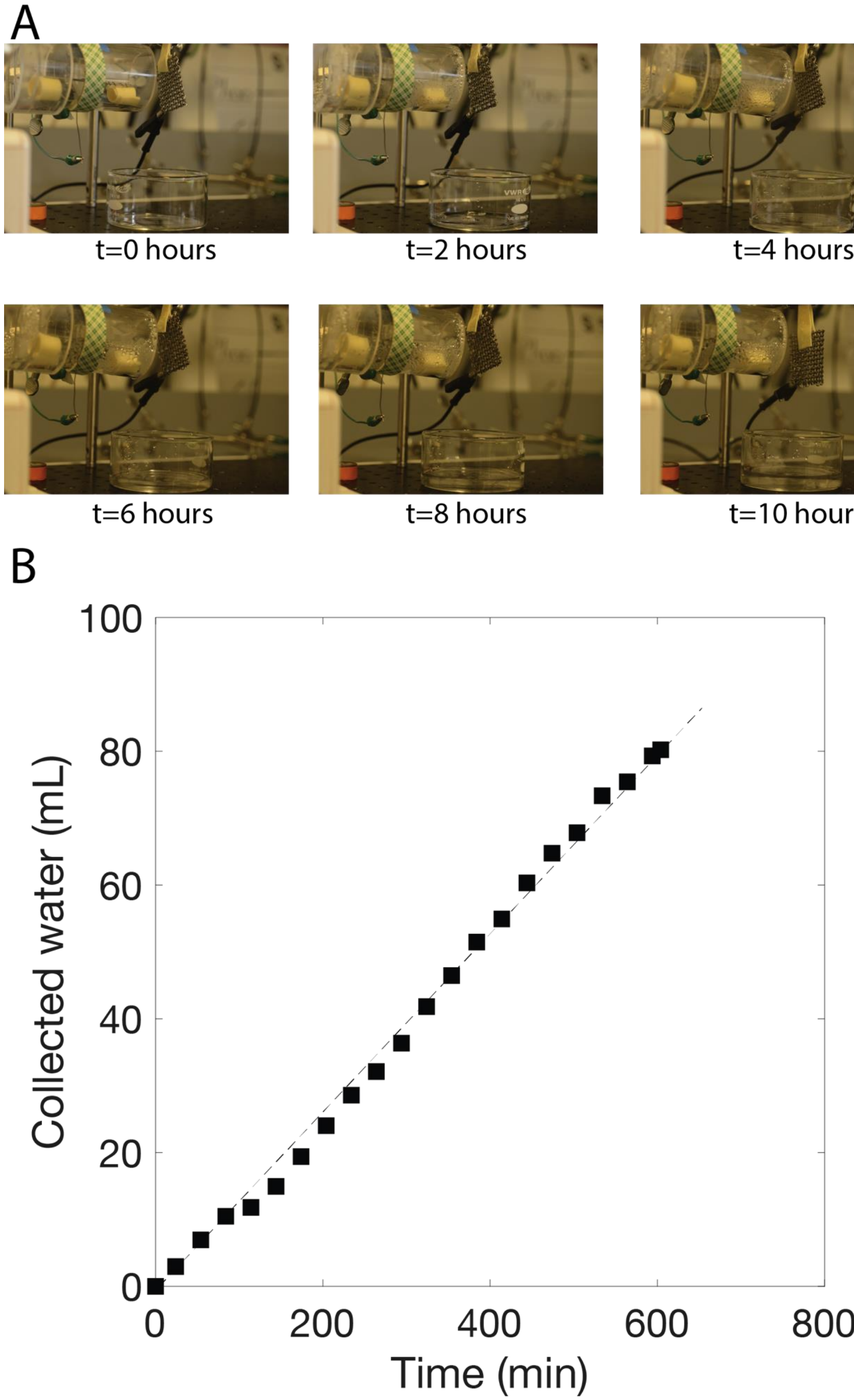


fig. S3. Continuous 10-hour fog collection experiment. Collection was steady and no abnormal activity was observed. **(A)** Snapshots of collector mesh and collection beaker underneath at 2-hour intervals. **(B)** Collection volume as a function of time.

Movie legends

movie S1. Droplet trajectories in the absence of an electric field.

movie S2. Droplet trajectories with corona discharge.

movie S3. Ninety-second video of fog collection on meshes with and without corona discharge.

movie S4. Thirty-minute video of fog collection on meshes with and without corona discharge.