Supporting Information:

Airborne sub-pollen particles from rupturing giant ragweed pollen

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Supplemental Text:

Equations for calculating n_f from continuous size distributions

The number of pollen fragments generated per pollen grain (n_f) may readily be estimated from continuous SPP number distributions, mass of a pollen grain, and the principle of mass conservation. The measured SPP number distribution as a function of particle diameter ($n_N(D_p)$; μm^{-1} cm^{-3}) should be background subtracted and integrated over SPP diameters to determine the total pollen fragment number concentration (N; cm^{-3}):

$$N = \int n_N(D_p) dD_p$$

The particle mass distribution as a function of particle diameter ($n_M(D_p)$; μg μg^{-1} cm^{-3}) and density (ρ; g cm^{-3}) is integrated over the range of measured particle diameters with a unit conversion introducing the factor of 10^6 to give the total mass of pollen fragments (M; μg cm^{-3}):

$$M = \int \left(\frac{\pi}{6}\right)\left(\frac{\rho}{10^6}\right) {D_p}^3 \, n_N(D_p) \, dD_p$$

Determination of the mass per intact pollen grain (M_{grain}; μg) requires knowledge of the intact grain diameter (D_{grain}) and shape. Geometric volume calculations here are shown for a sphere.

$$M_{grain} = \frac{\pi}{6}\left(\frac{\rho}{10^6}\right) {D_{grain}}^3$$

The principle of mass conservation is applied, whereby the mass of the intact pollen is assumed to be conserved as it fragments. Then, the number of pollen fragments generated per pollen grain (n_f) is calculated as:

$$n_f = N\left(\frac{M_{grain}}{M}\right)$$

Supplemental Figures and Tables:

Figure S1: Schematic of chamber used for pollen rupturing.

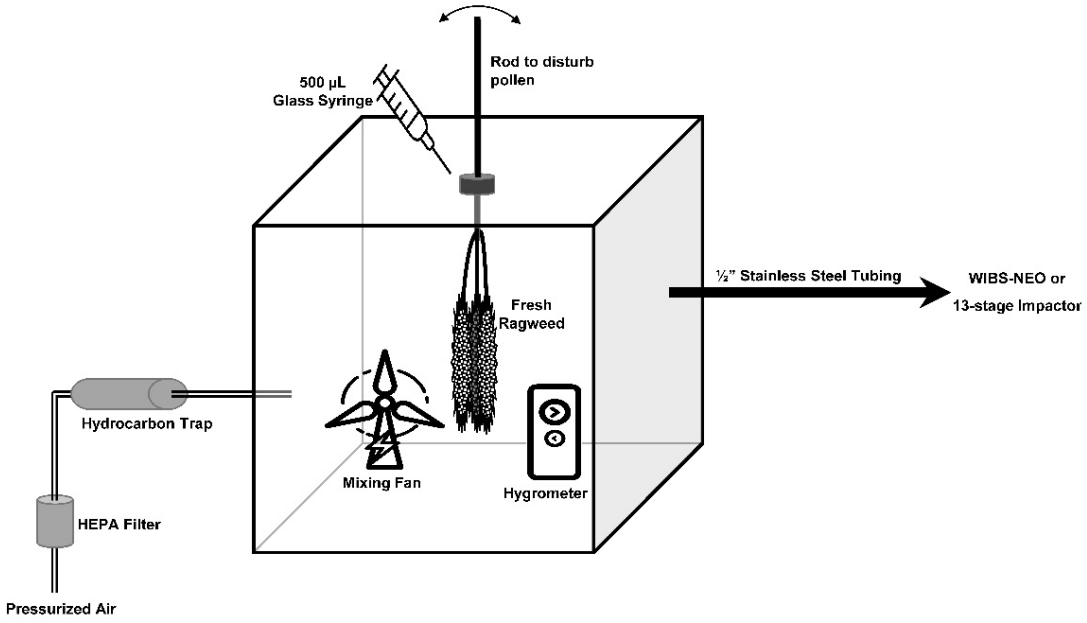

Figure S2: SPP circularity (a) and aspect ratio (b) relative to their area equivalent diameter, as determined by scanning electron microscopy (n = 147).

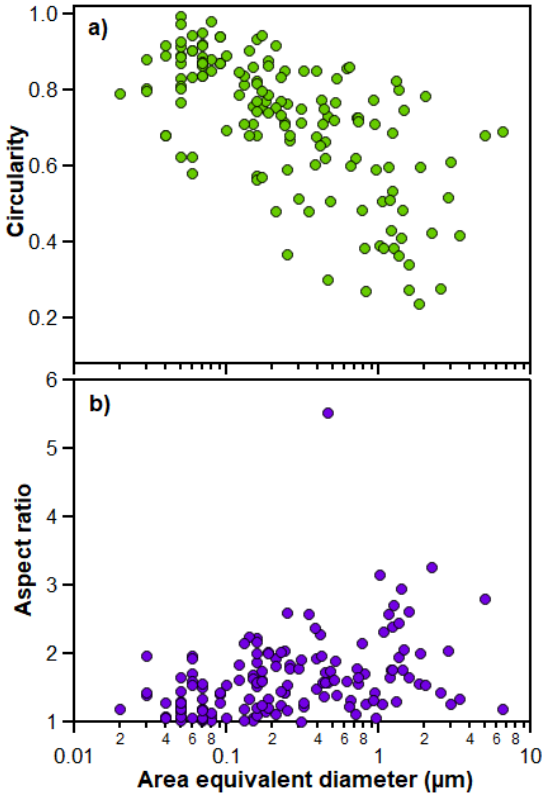

Figure S3: Frequency distribution of intact giant ragweed pollen grain diameters (n = 21).

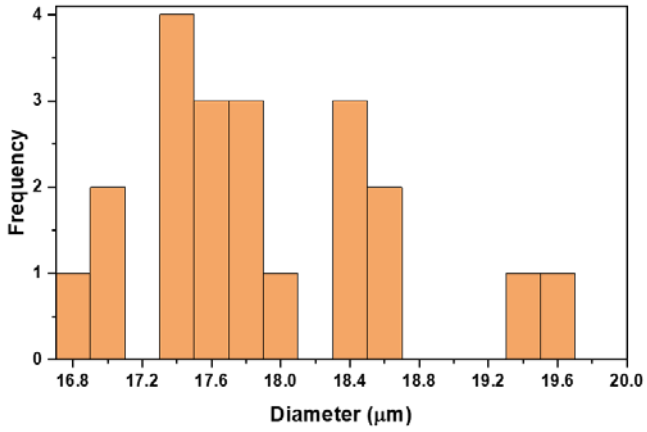

Table S1: Summary of WIBS measurements for giant ragweed SPP and pollen grains in wet and dry experiments, respectively, observed by WIBS.

Experimental conditions	Wet SPP diameter (μm)	Dry Intact pollen diameter (μm)
Range	0.5 - 8.3	0.5 – 25.2
Median	0.8	3.5
Mean	1.4	4.0
Standard deviation	1.4	2.5
n	636	3172

Table S2: Summary statistics for giant ragweed SPP particles observed by SEM (n = 147).

	Diameter (μm)	Circularity	Aspect ratio
Range	0.02-6.5	0.05-0.99	1.01-5.52
Standard deviation	0.89	0.19	0.57
Mean	0.56	0.71	1.62
Median	0.21	0.75	1.53

Table S3: Summary statistics for intact giant ragweed pollen grain diameters determined by light microscopy (n = 21).

	Diameter (μm)
Range	14.62-19.41
Mean	17.70
Standard deviation	0.99
Median	17.75