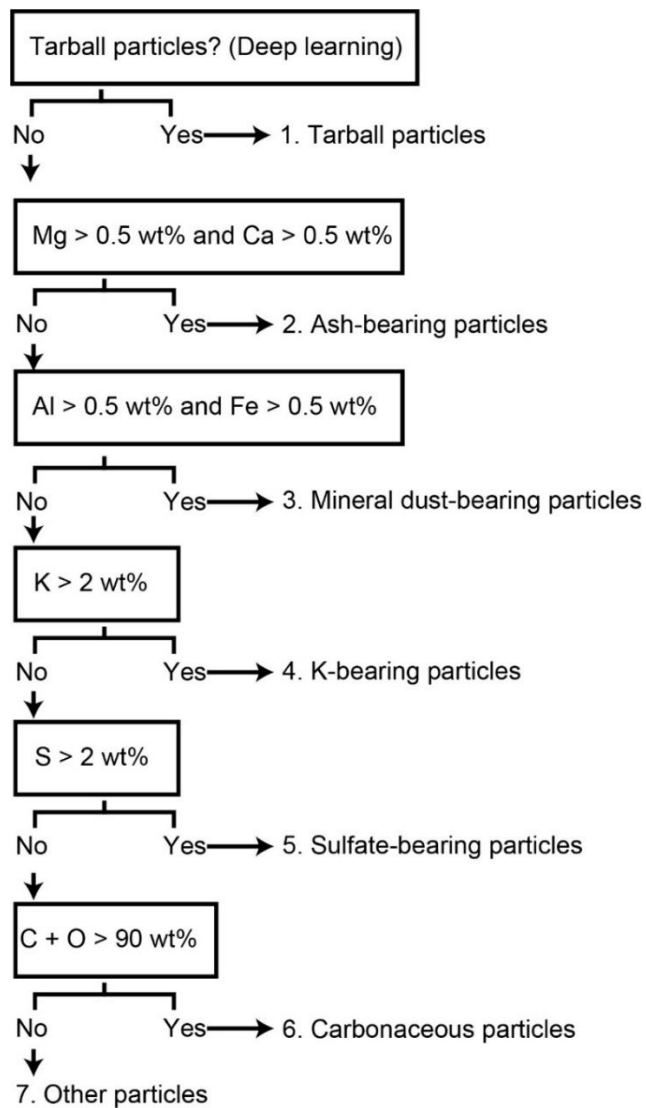Atmospheric
Chemistry
and Physics

Supplement of

Occurrence, abundance, and formation of atmospheric tarballs from a wide range of wildfires in the western US

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Figure S1. The flow chart for classifying individual particles into seven categories based on an image analysis technique (Deep learning) and STEM-EDS measurements.
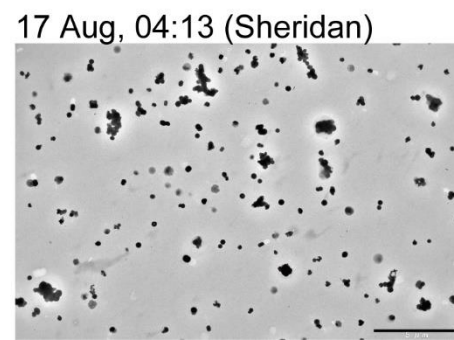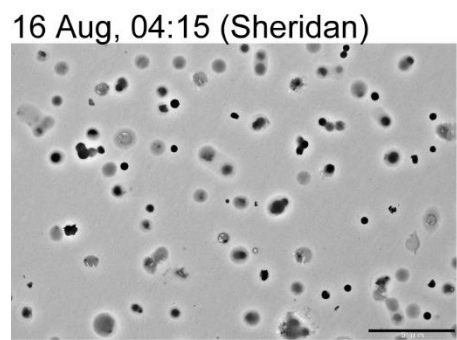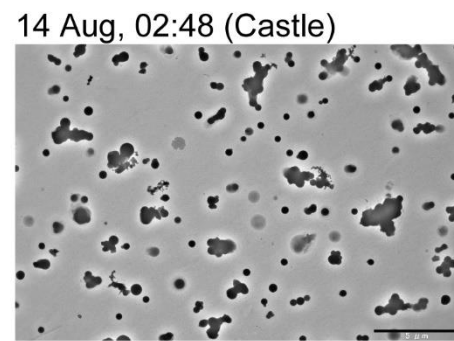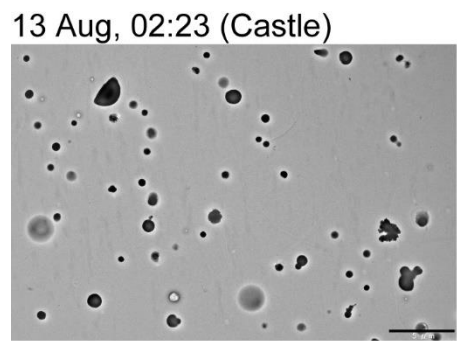
20

26 July, 01:04 (Shady)　　　　　　　07 Aug, 00:20 (Horsefly)

5µm

08 Aug, 00:43 (Williams Flats)　　　09 Aug, 00:13 (Williams Flats)

13 Aug, 02:23 (Castle)　　　　　　14 Aug, 02:48 (Castle)

16 Aug, 04:15 (Sheridan)　　　　　17 Aug, 04:13 (Sheridan)

25
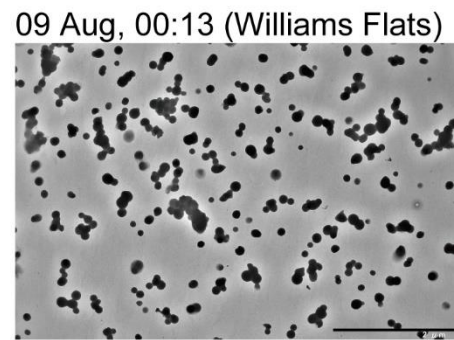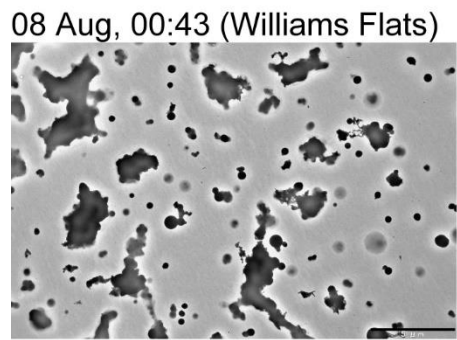
Figure S2. Representative TEM images of samples containing TBs from each wildfire. Scale bars indicate 5 µm. The header of each TEM image shows the sampling date and time (UTC) and the name of the wildfire.
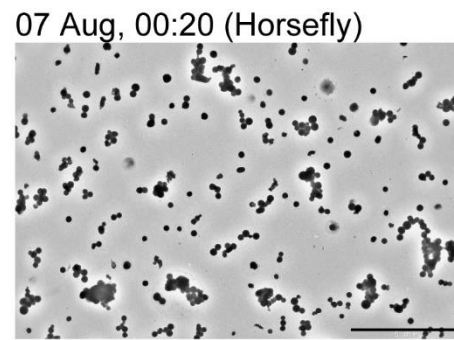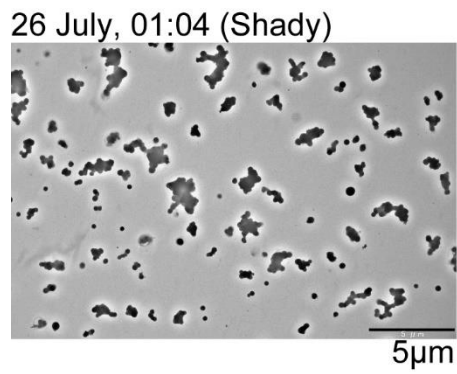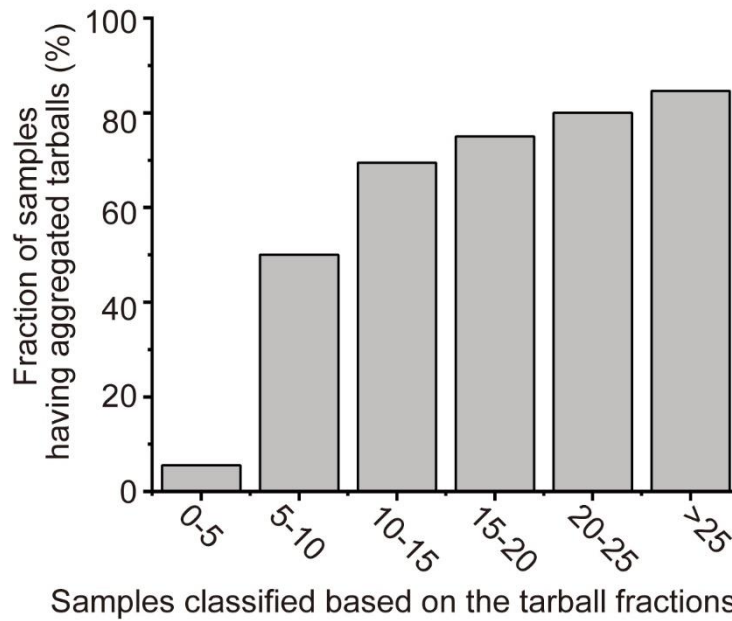
Figure S3. Fractions of samples having aggregated TBs for samples with various TB number fractions. Samples were classified into each bin based on their TB number fraction (X-axis). The samples with any aggregated TBs in the representative TEM images were defined as the samples having aggregated TBs (Sample$_{aggregatedTBs}$). The number fraction of Sample$_{aggregatedTBs}$ over all sample numbers in each bin is shown on the Y-axis. The number of samples containing TBs was 179, while that of Sample$_{aggregatedTBs}$ was 84. n = 54, 50, 36, 16, 10, and 13 for the bins of samples with TB fractions of 0%–5%, 5%–10%, 10%–15%, 15%–20%, 20%–25%, and >25%, respectively.
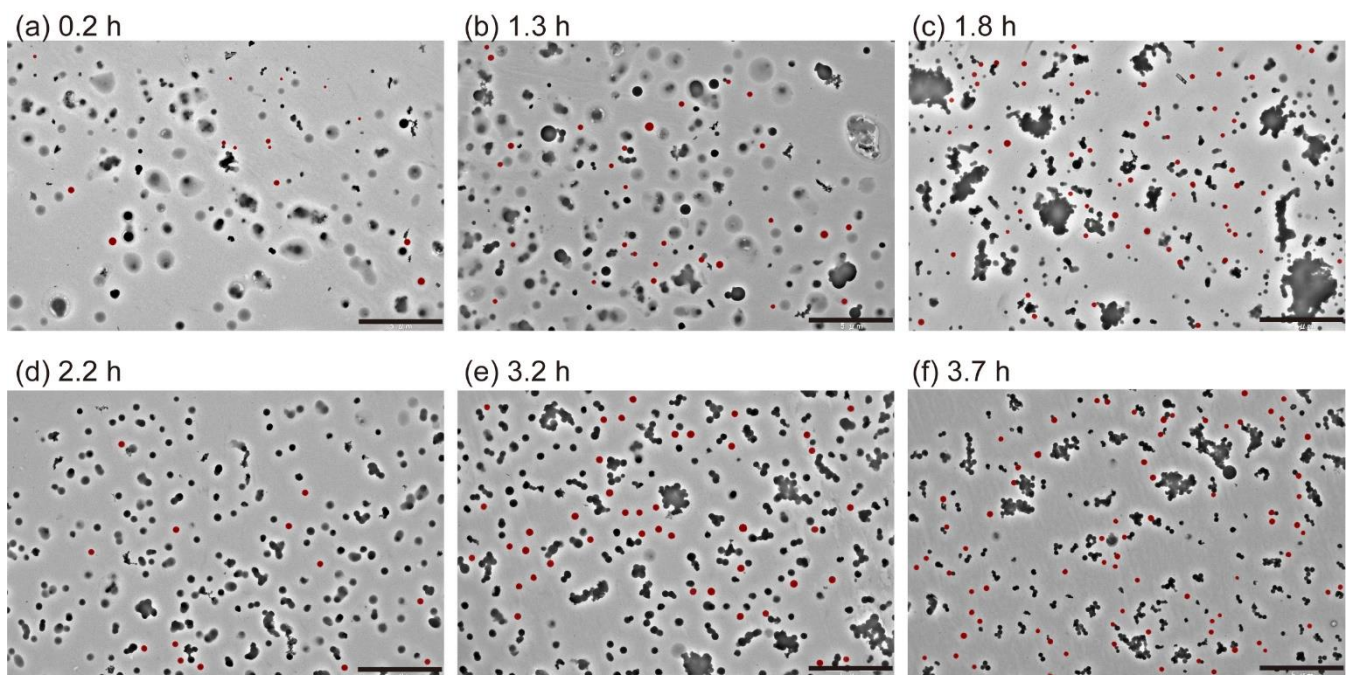
Figure S4. TEM images with different aging and TB fractions in the Horsefly wildfire. Samples were collected on (a) 6 Aug (20:58), (b) 6 Aug (21:19), (c) 6 Aug (23:27), (d) 6 Aug (23:37), (e) 7 Aug (00:11), and (f) 7 Aug (00:22) in UTC. The estimated aging hours (h) from the emissions are shown in each TEM image. These TEM images are the same as Fig. 7, except that the tarballs identified by deep learning are shown in red. Scale bars indicate 5 μm.