

Supplement of

Detection of ice core particles via deep neural networks

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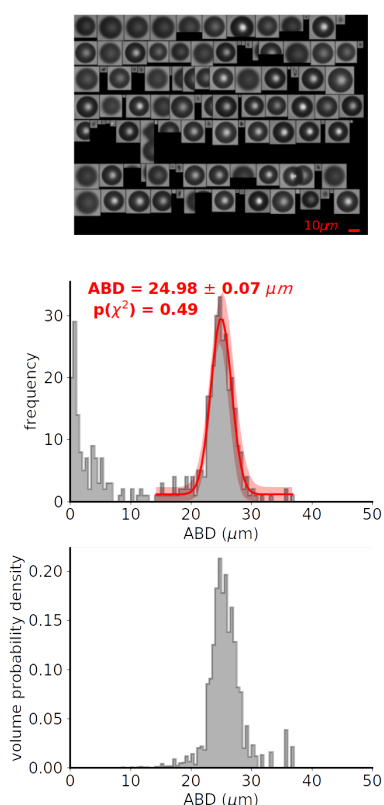


Figure S1. Optimization of focus and threshold value. Analysis of a 25 μm -diameter focus beads solution at 5700/mL beads concentration. Top panel: some representative images. Middle panel: ABD size distribution ($n=428$ particles) along with a least squares gaussian fit (χ^2 probability = 0.49, 3σ red shaded band). The estimated mean is consistent with the reference 25 μm value. The counts towards zero reflect small spurious particles present in the solution. Particles bigger than 25 μm are associated with clusters of more than one particle glued together (see second last row in top panel). Bottom panel: corresponding volume density distribution.

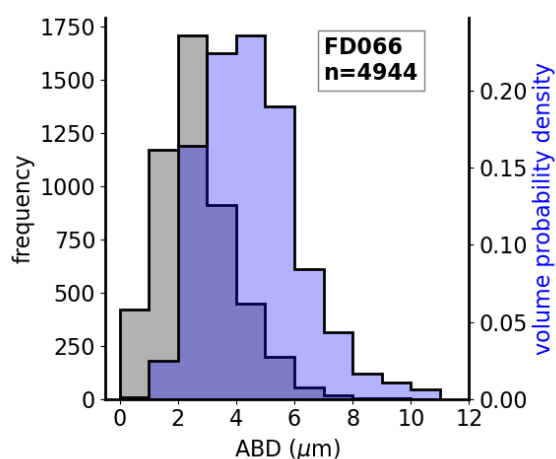


Figure S2. ABD size distribution (number and volume-weighted) of an FD066 sample comprising 4944 dust particles.

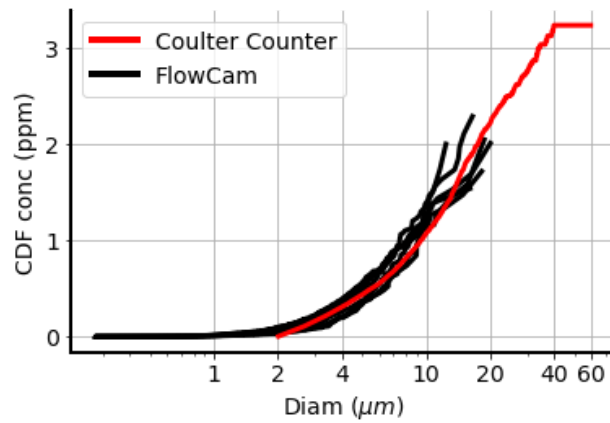


Figure S3. Comparison between CC (red) and FlowCam (black) mass concentration of a representative Quelccaya ice core sample. The FlowCam underestimates the concentration (2 ppm compared to the 3.2 ppm from the CC) because fewer large particles are detected.

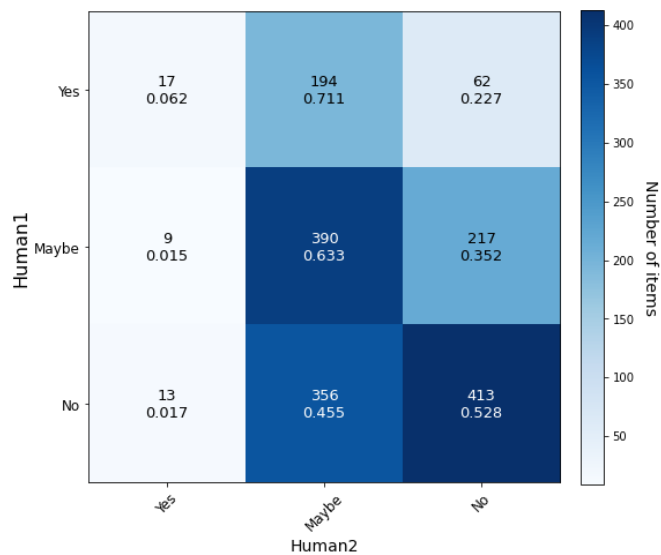


Figure S4. Confusion matrix between the human assessments of the n=1671 images predicted as tephra in the GRIP samples.

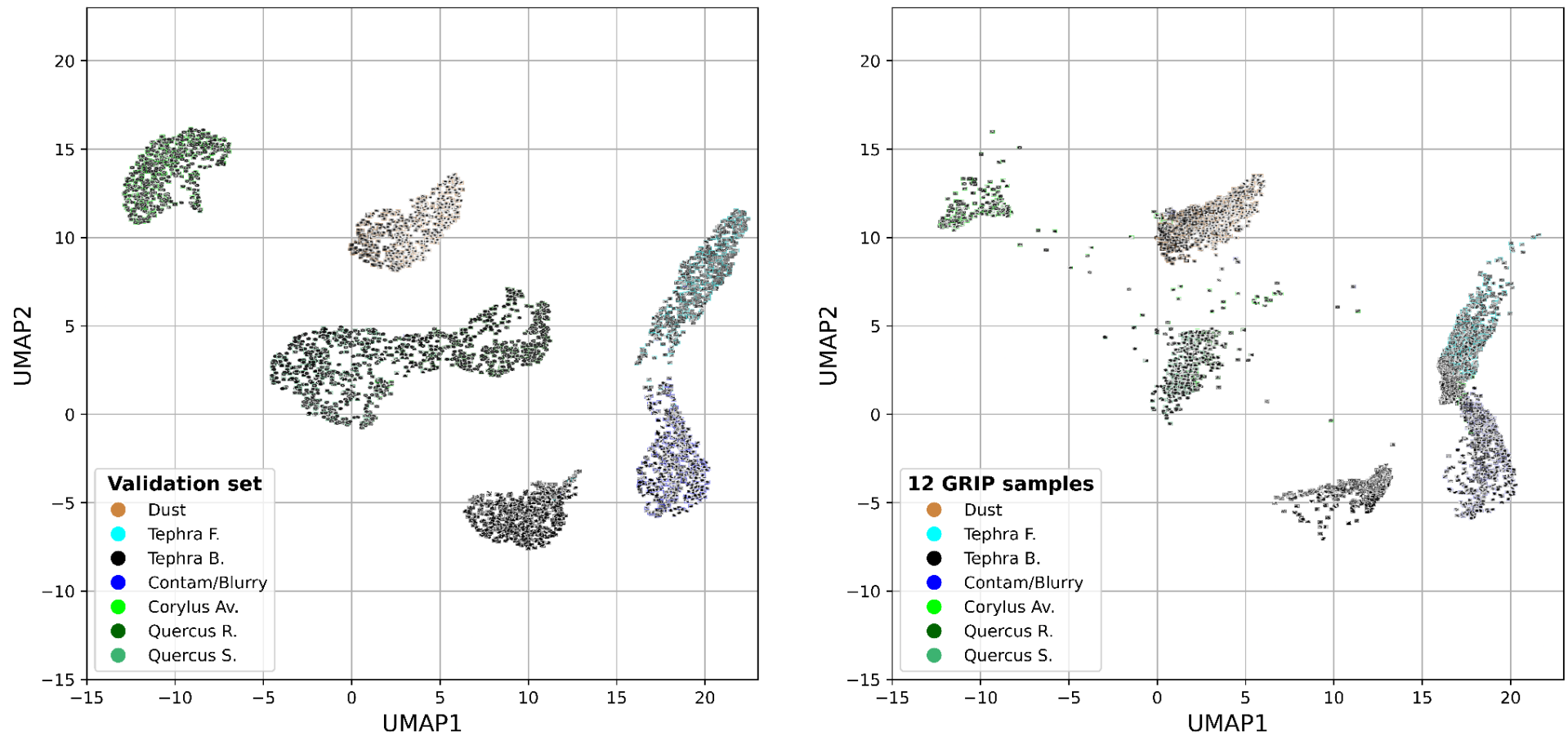


Figure S5. UMAP embeddings. Same as Figure 11 but with the particle images located at the (x,y) coordinates that correspond to the UMAP embeddings. The images are bordered according to the model classification. For clarity all images are resized to 16x16. Given the high number of dust and Contamination particles in the GRIP samples, only n=2000 random images are displayed for these two classes. Zoom in to see every single particle image.