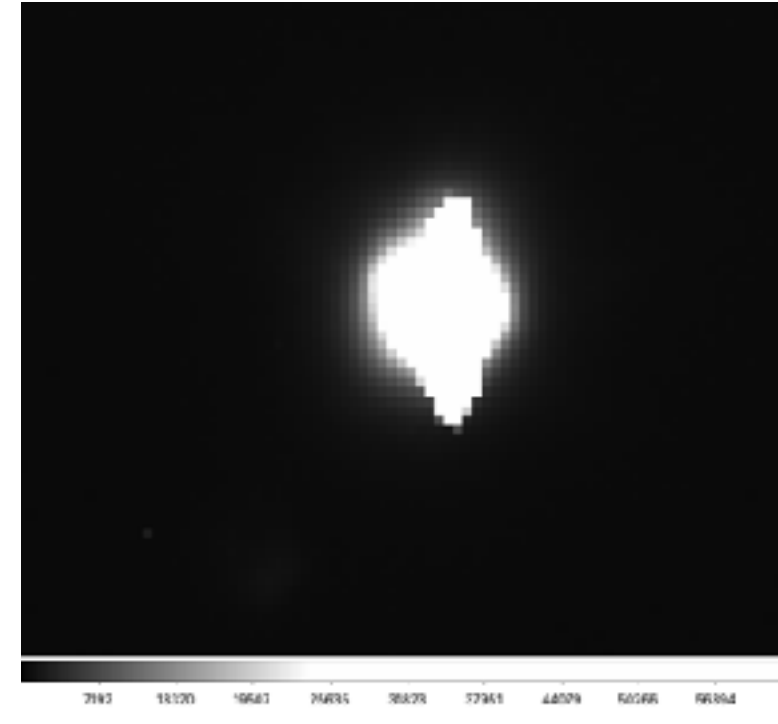
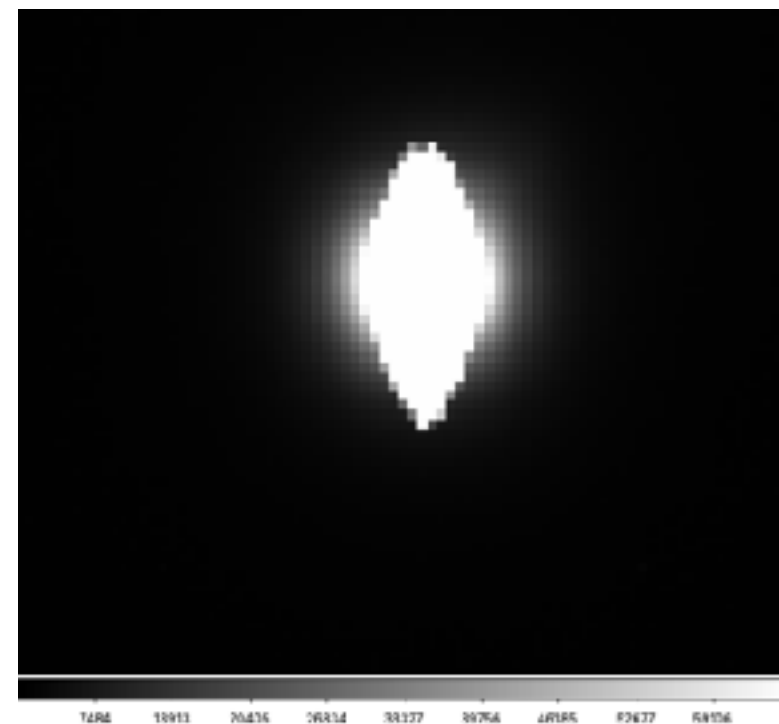
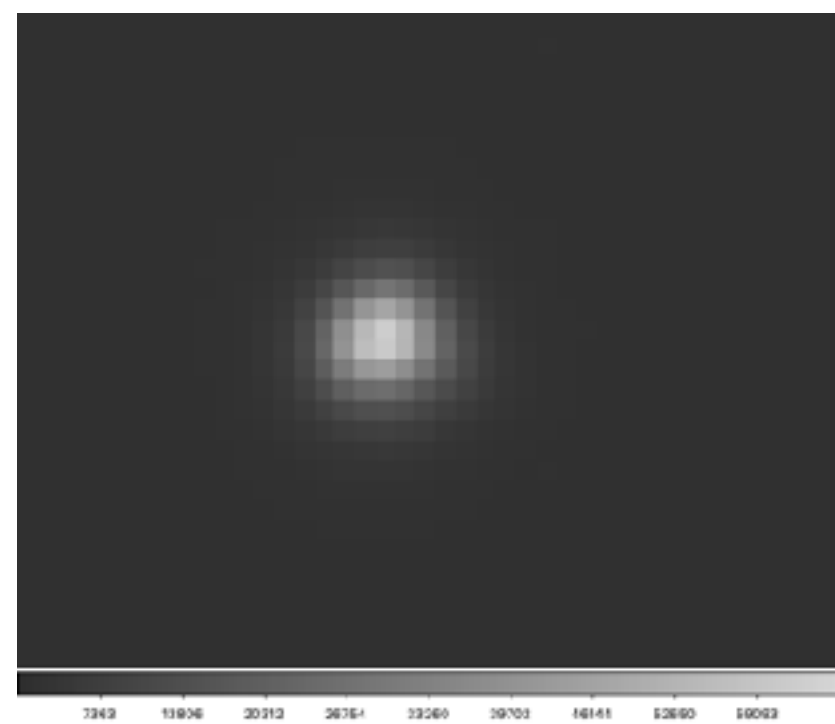
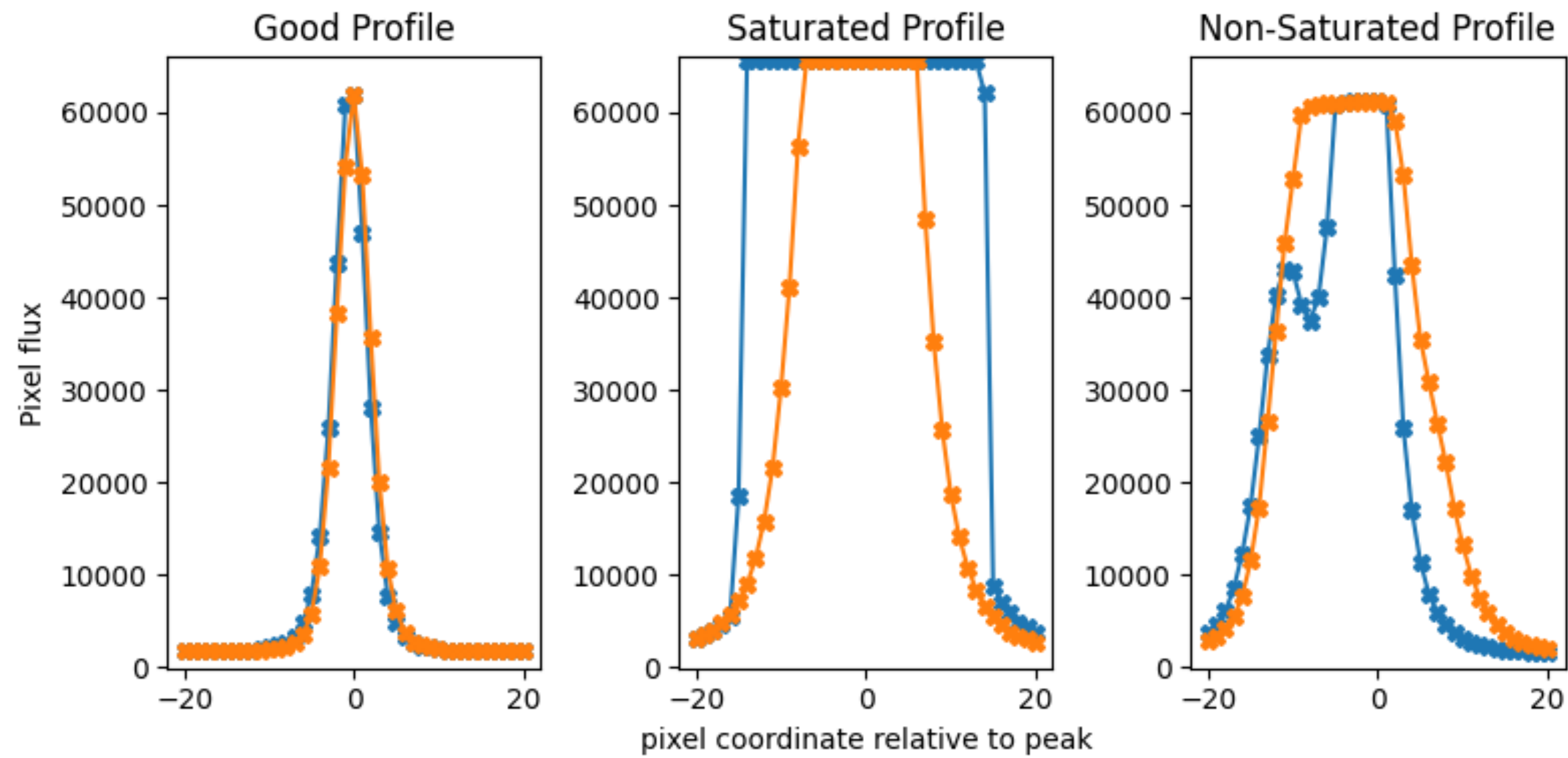
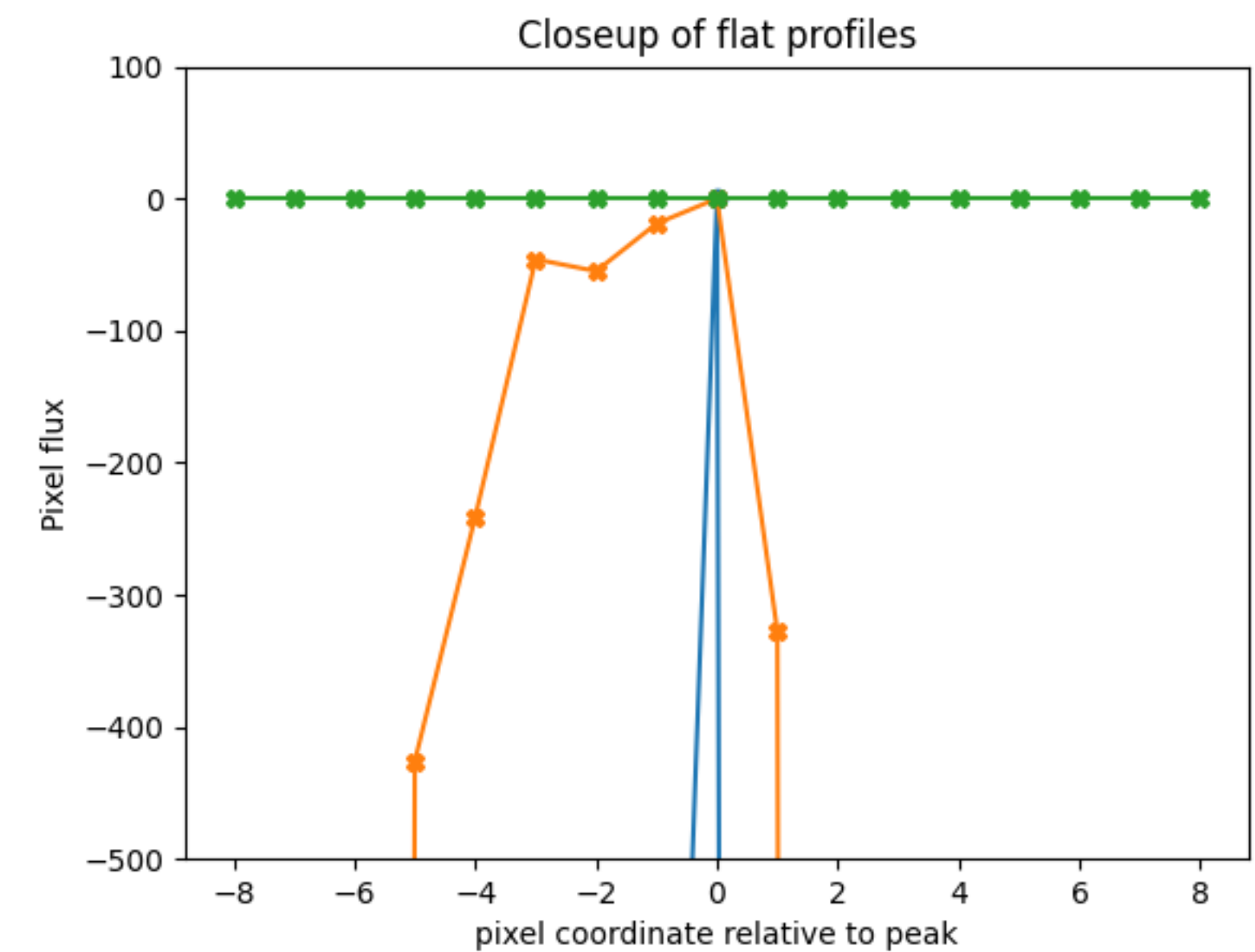


Flat Topped Sources



X and Y profiles of three bright sources, plotted on the same scale. The left panel is a bright source with a normal profile, the centre a saturated source, and the right a non-saturated but flat topped source. The lower panels show images of the same sources. The close-up panel shows the difference between saturated (green) and flat but unsaturated (orange), set to the same peak value; saturated sources are completely flat, the others are not.



Diagnostic

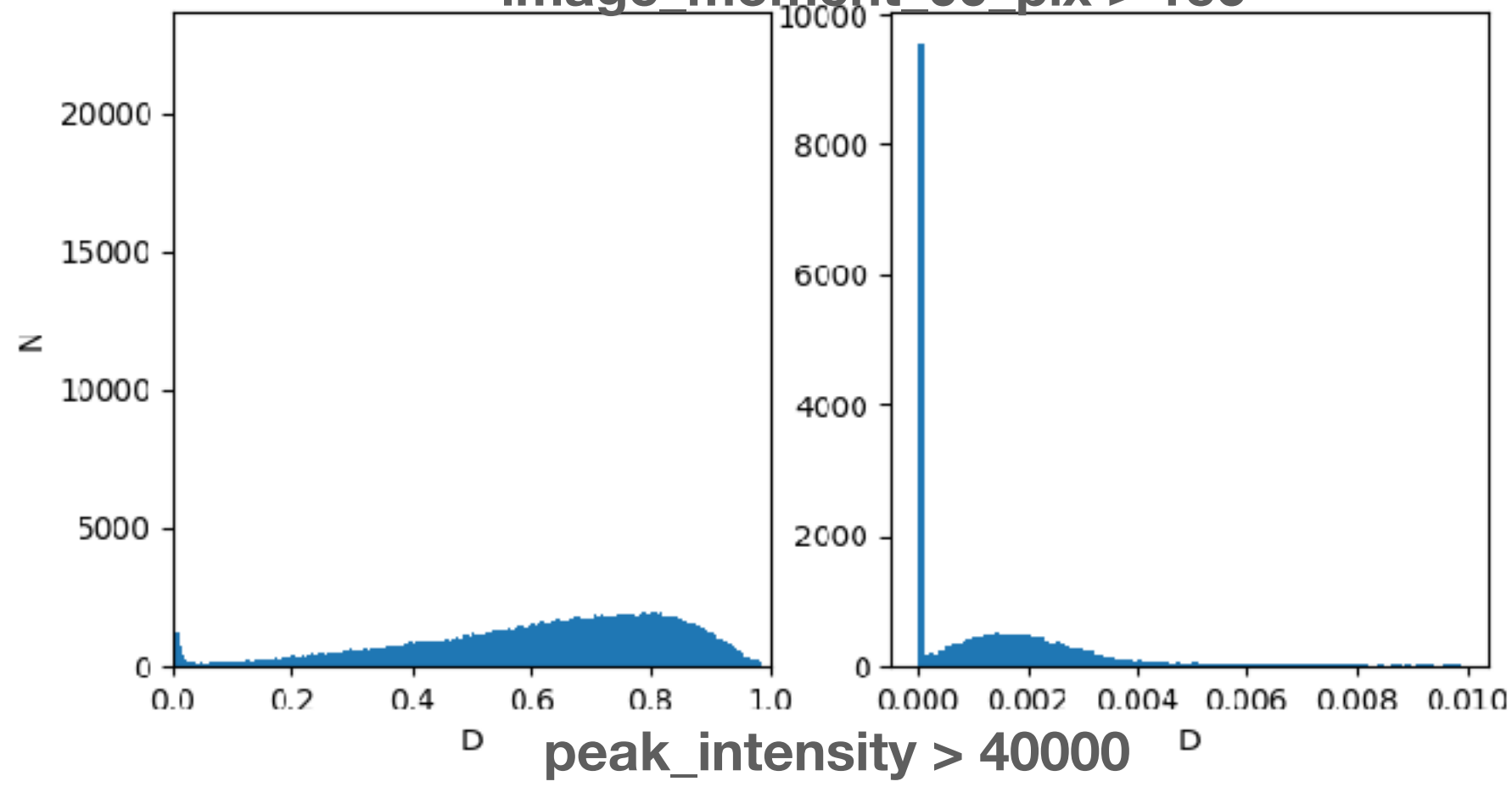
$$D = \min(P(x_c, y_c) - P(x_c, y_c \pm 5)) / (P(x_c, y_c))$$

Value of the pixel at the peak, minus the value offset by five pixels in the y direction, scaled to the peak pixel. We take the minimum of the absolute value of the offset in the positive and negative directions, to account for any uncertainties in the sextractor determination of the peak value of a flat source.

A value of 0 indicates a completely flat top, a value of 1 would be a hot pixel. The expected value of a normal PSF depends on the seeing and focus, however a focussed images drops off sharply from the peak, as can be seen in the first slide.

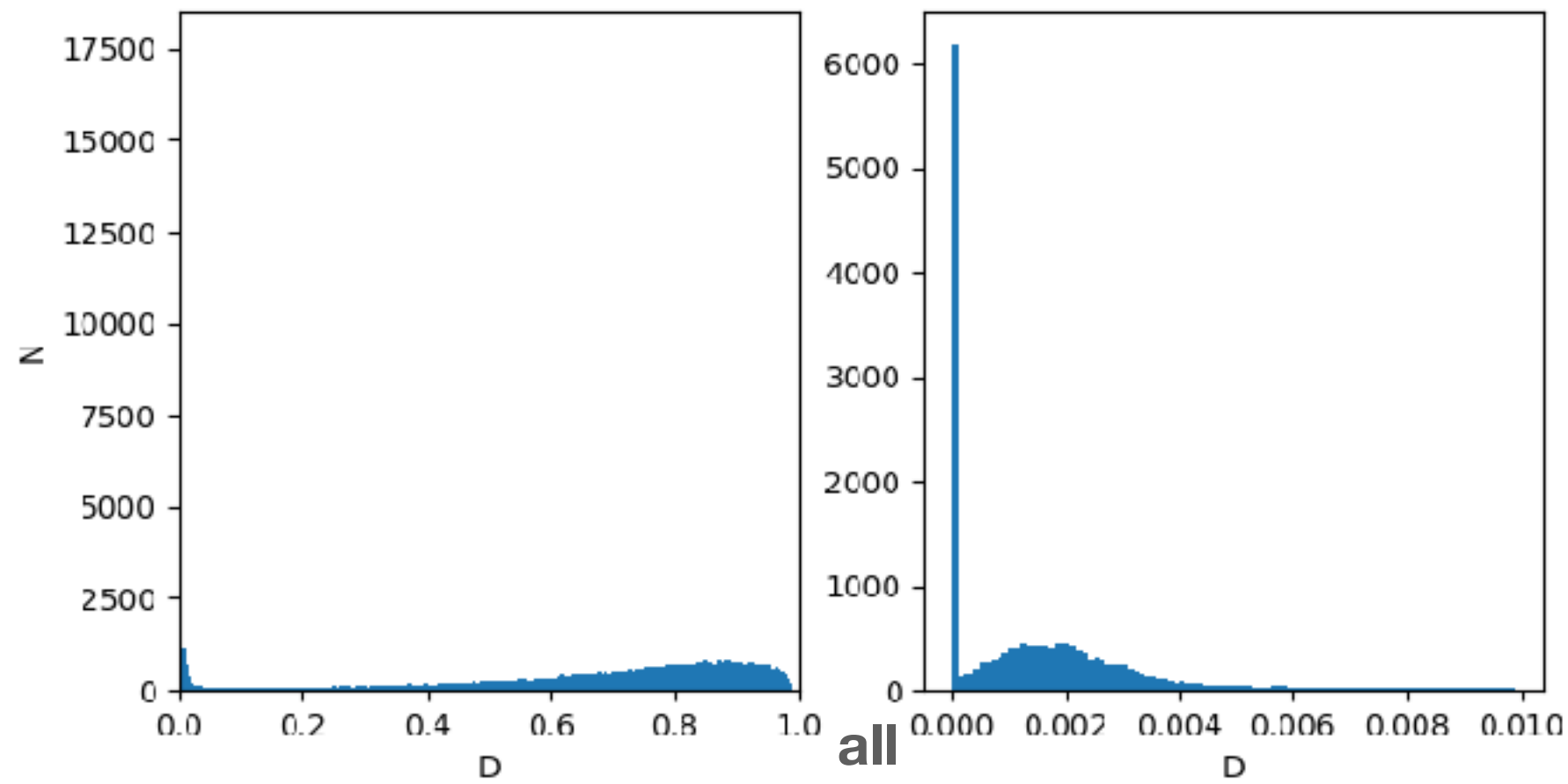
We calculated values of D for sources from all AG images taken from 2023-07-20 onwards. We filtered out all sources with quality flags, and used a bright subsample, for computational speed, filtering either by a peak value > 40000 or a moment zero flux > 1e6, as well as comparing it to a sample with no flux filtering, but only every tenth frame reduced (again, for speed purposes).

image moment 00 pix > 1e6



Histogram of D for various samples; bright (filtered by moment 0 flux), peak value above the background, and all. Left panels show the range from 0 to 1, right a closeup on the values of a nearly flat source.

Values of zero indicate a completely flat top, which happens close to saturation. The broad peak at around 0.0015 contains nearly flat sources. A value of 1 would indicate a hot pixel, while values > 1 can be produced by blended or extended sources which do not have the shape of the PSF.



From these diagnostics, we pick 0.01 as a threshold for filtering out flat topped sources.

Repeating the analysis including flagged sources does not significantly change the results.

