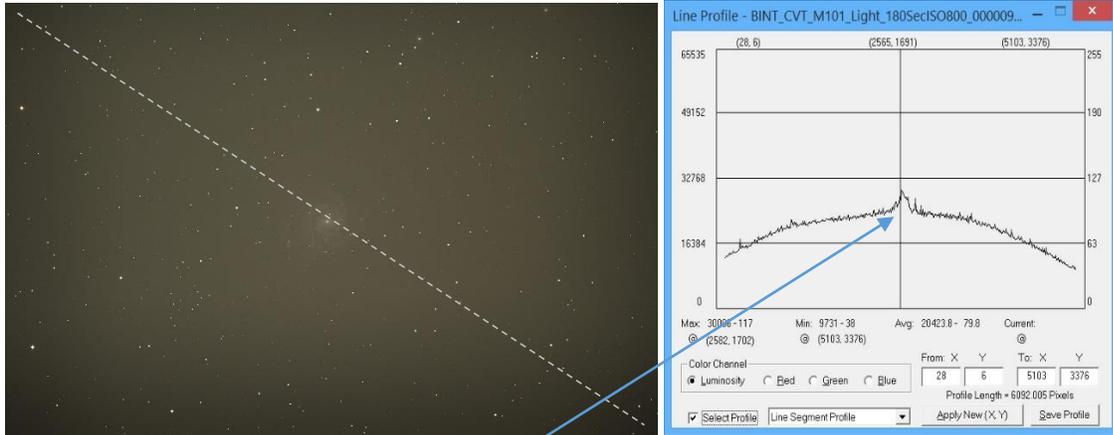


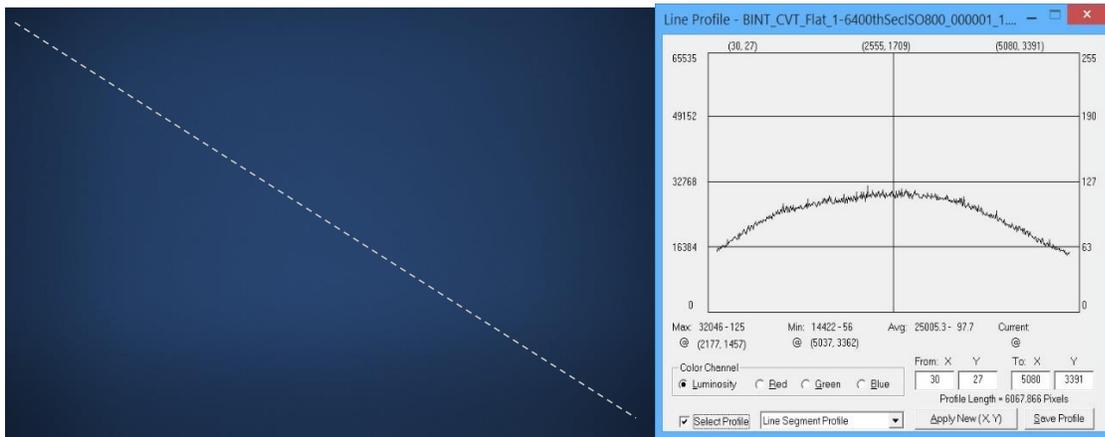
## Necessary Relation Between Flat and Light Frames for Good Flat Calibration

Flat frame calibration is a simple operation where each pixel of the light frame is divided by the corresponding pixel of the flat frame. So the curvature of the light and flat frames needs to be similar at each pixel otherwise over or under correction will occur during flat calibration. The example below shows very mild over correction at the top left of the image. Good flat correction in the center of the image and mild under correction at the lower right of the image.

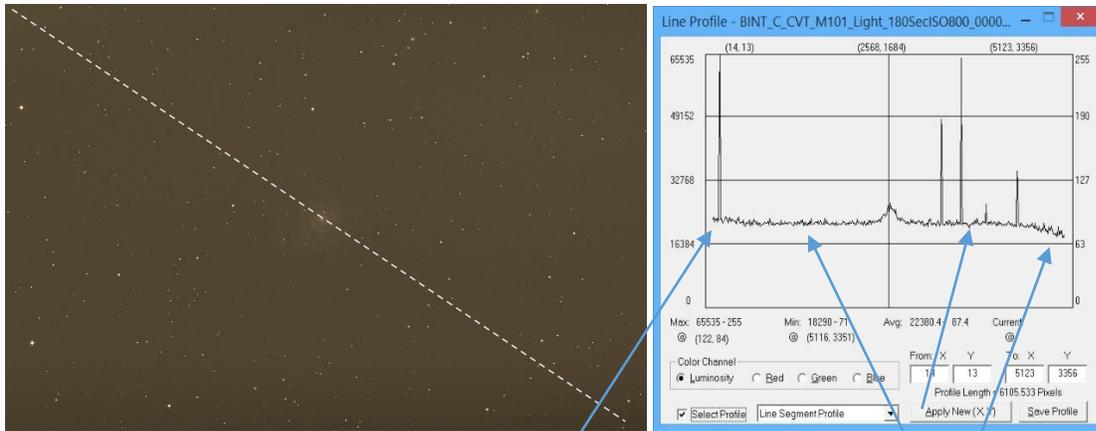
The test light and flat frames were taken under suburban light pollution using a Canon 60Da with C14 F2 Hyperstar.



Single 3 minute light frame is shown on the left with line profile on the right. Note that the right side of the profile is lower than the left side. Pretty sure this is due to light pollution being brighter on the left side. M101 is the cause of the spike at the center of the profile.



Sky flat with same ISO as light frame is shown on the left with line profile shown on the right. Note the very similar shape of the flat profile to the light frame profile except but both ends of the flat profile are at the same level.



Flat calibrated image on left with its profile on the right. Flat calibration is good where the light and flat profiles are similar. Calibration is a little over corrected at the left end and under corrected at the right end where the light and flat profiles are a little off. Visually flat correction look good across the entire image but the over and under correction will start to appear the more the image is stretched and this is why tools like masks and multi-point flatten are used to perform local correction.

With good calibration frames and processing a fast system like a C14 F2 can yield very nice results even under suburban light pollution. As show by the final processed image below.



Final image from a set of 50 3 minute exposures calibrated with flat, dark, and bias frames.

The [flat CR2](#) and [light CR2](#) files are available for download so you can try this example.