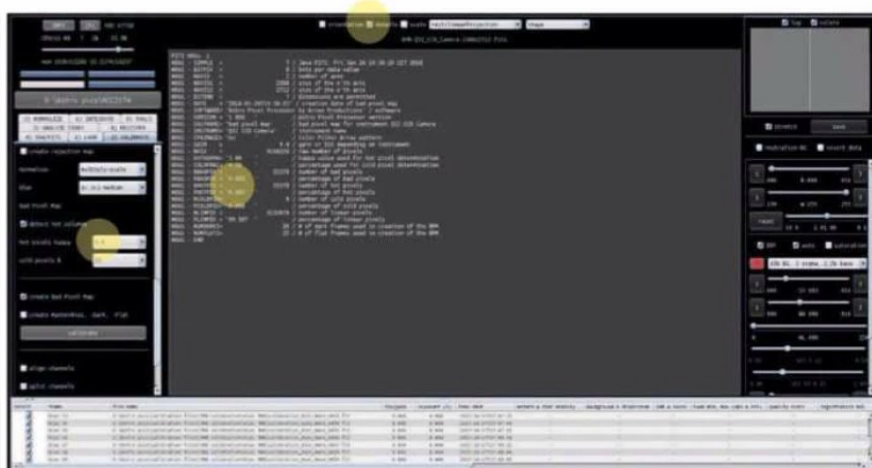▲ Check all of your calibration frames have loaded by scrolling down through the lower console

▲ Click 'details' at the top of the screen to see your bad pixel map information

Double click the 'bad pixel map 1' file at the bottom of the lower console to see the BPM, then click the 'details' tick box at the top of the window to see the readings. What you want to see is about three per cent hot and cold pixels. Adjust the 'hot pixels kappa' rating using the drop-down menu on the calibration panel (lower the value to increase the percentage) and click 'Calibrate' again, then re-check your bad pixel map. Repeat this process until you reach about three per cent. We find that a Kappa figure of 1.9 works well.

Make your master frames

To create reuseable master calibration frames there are a couple of steps that need to be followed at the start of your first integration process. Once the master frames have been created, you can load them up instead of all the individual frames on each subsequent integration.

Ensure that the 'Create MasterBias, -dark -flat' tick box is ticked and the 'create bad pixel map' and 'detect hot columns' are not, then click 'Save calibrated frames'. APP will create master calibration frames in the lower console. These will be saved automatically in your original working directory along with your calibrated lights. We like to save these calibrated lights so that they can be used and added to subsequent imaging runs.

Add the bad pixel map you created earlier by going to 'Load>flats' and select your bad pixel map. This will load into the lower console along with your light, flat, dark and bias frame as well as your masters.

It's always worthwhile checking how well your calibration frames have worked. You can do this by opening a light frame in the lower console by double clicking it. The image will open in the middle screen. Along the top of this you'll find a drop-down 'image' menu. Click on this and select 'l-calibrated' and the image will change to the calibrated image. This is a useful visual check. You can zoom in by clicking the left button on your mouse to see if most of the hot pixels have gone.

From this point, everything can be left at default except 'Outlier rejection' in the 'Integration' tab. Select 'winsor sigma clip' and 'kappa 2.5'. This will ensure that any final hot pixels are eliminated. Click 'integrate' and APP will create a calibrated, integrated stack of your lights data, which can be viewed in the lower console.

Now when you next integrate any data you just need to load in the master dark, bias and flat frames, and the BPM, then integrate them as above. Ⓢ

SARA WAGER is an amateur astronomer who loves imaging nebulae in narrowband

Pre-calibration image

Post-calibration image
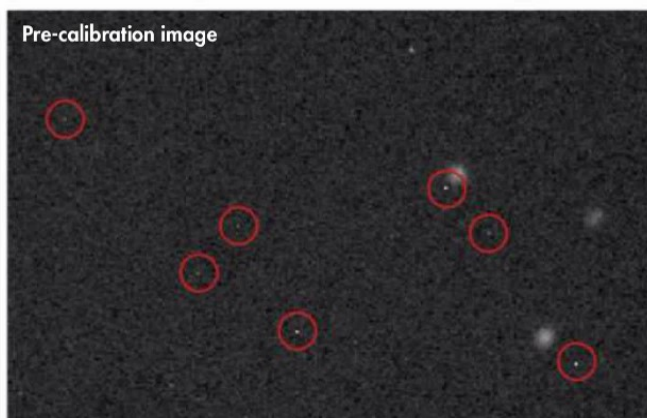
▲ Hot pixels visible in the pre-calibration image (circled red) have been virtually eliminated in the post-calibration image

Image PROCESSING

With **Sara Wager**

Calibration frames

Reduce the thermal noise in your astrophotos with the help of calibration frames

▲ The flat frame (left) shows dust; the master bias frame (centre) removes any light readings in the sensor; master dark frames (right) show hot pixels

Calibration frames should play a key role in your data processing. With Astro Pixel Processor software (APP) using calibration frames is easy and they make such a difference to the images you produce that you'd be mad not to use them.

The calibration frames we'll be using are flats, darks and biases. Bias frames remove the electronic signal inherent in the sensor and should be taken with the dust cap on and at the fastest exposure possible. Darks are taken with the dust cap on and at the same exposure length as the light frames (the shots of the object you're imaging); they're used to remove hot pixels and amp glow within the sensor. Flats are taken to counter inherent vignetting and any dust on the filters or optics. These aren't taken at a specific exposure length as the aim with flats is to capture data around a third to halfway across the histogram. As such, flats need to be taken against a light source, for example a light box.

It's worth noting that calibration frames benefit massively from being taken at the same temperature as the light frames. This can be almost impossible for DSLR users, but easy if you camera is astro-cooled.

Calibration begins by creating a Bad Pixel Map (BPM) so you can deal with any hot and cold pixels. After that you're going to use the integration process to create master calibration frames. If nothing in the imaging train changes then your flat frames can be reused for subsequent imaging sessions; bias and dark calibration frames can be reused for many months. We used our calibration library for more than eight months.

Get started

Start by opening APP and loading your light frames by selecting the 'Load' option from the menu on the left and 'light' from the frame options below the menu.

Add your flat, dark and bias frames by following the same process ('Load>flat'; 'Load>darks'; and 'Load>bias'). There are no limits for how many of these frames you can load – we like to add as many as possible, perhaps 30 flats, 30 darks and 100 bias frames. You can check that all your calibration frames have loaded by using the right scroll bar on the lower console.

Producing a BPM can take a bit of trial and error. Select the 'Calibration' option on the menu. Keep everything at its default setting but ensure that the 'create bad pixel map' and 'detect hot columns' tick boxes are ticked, and that the 'Create MasterBias, -dark -flat' tick box is not. Then click 'Calibrate' to create your BPM.
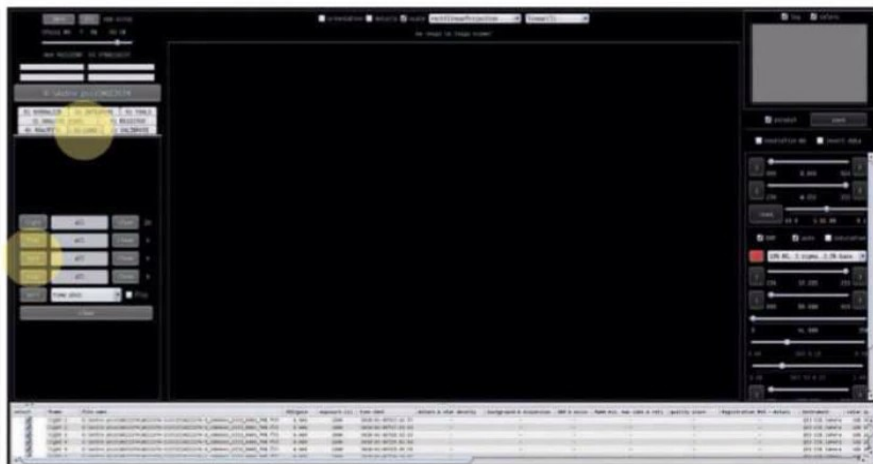
▲ Choose 'load' and then select whether you want to add your flat, dark and bias frames

ALL PICTURES: SARA WAGER