GMOS-S imaging and longslit  with bad amp#5

GMOS CCDs have been in a bad state (abnormally high counts on amp #5, plus noise structures on the rest of CCD2) after the uncontrolled warmup caused by the general power failure at CPO on January 28th.  Since then a series of controlled thermal cycles (plus dewar vacuum pumping) have been attempted, with no success, unfortunately. This procedure had worked in the past most of the time; which had enabled us to resume normal operation within a couple of days at most. But now has been failing consistently over the last two weeks, which might indicate something more severe affecting this time. An intervention is being planned, in order to to permanently solve the issue. In the meantime, we looked into the possibility of resuming observations in a "limited" mode - for some use cases, data taken in this status would still be usable for science.

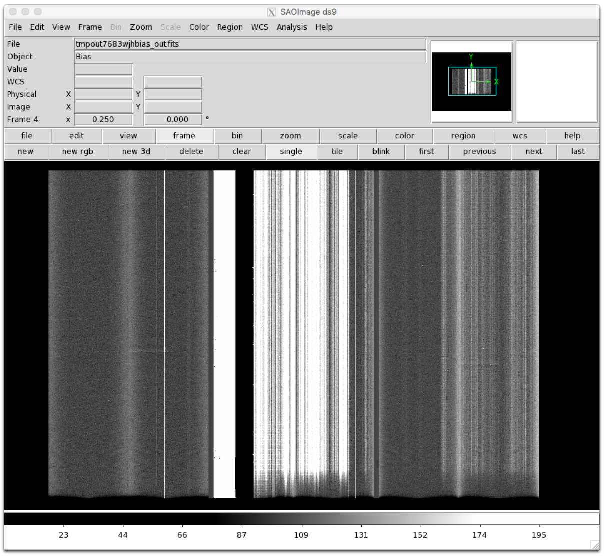
## Imaging mode

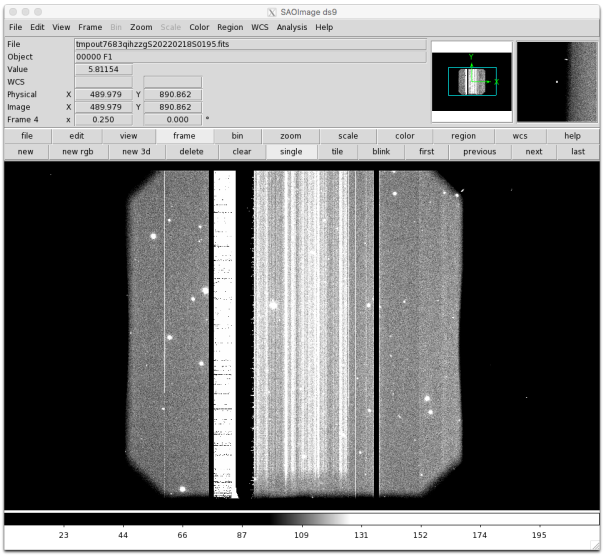
The options are:

1. do without the information on amp#5, if this is acceptable for the science case, or:

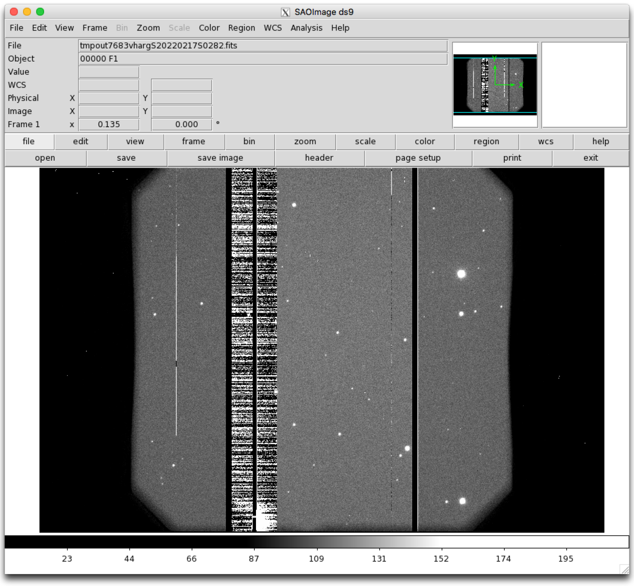
2. modify the observing strategy: dither in P in order not to lose information and mask amp#5 as if it was a broad ‘gap’.

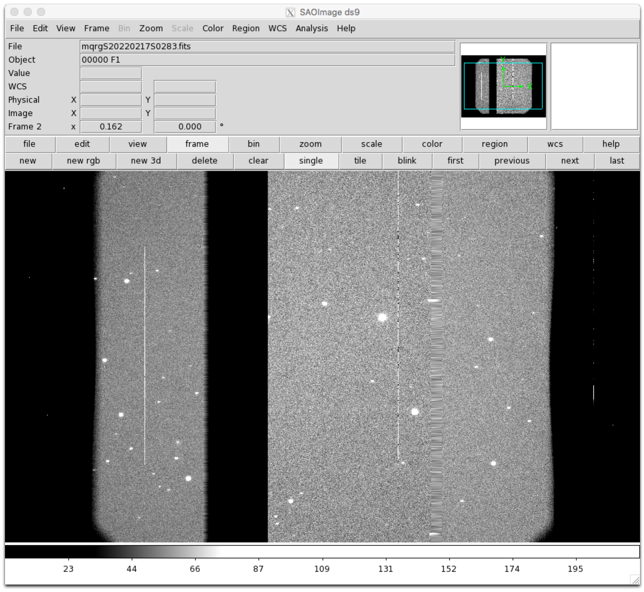
Biases taken *after* Feb18 are needed for reduction. Examples of  a bias and an on-sky image are shown below:



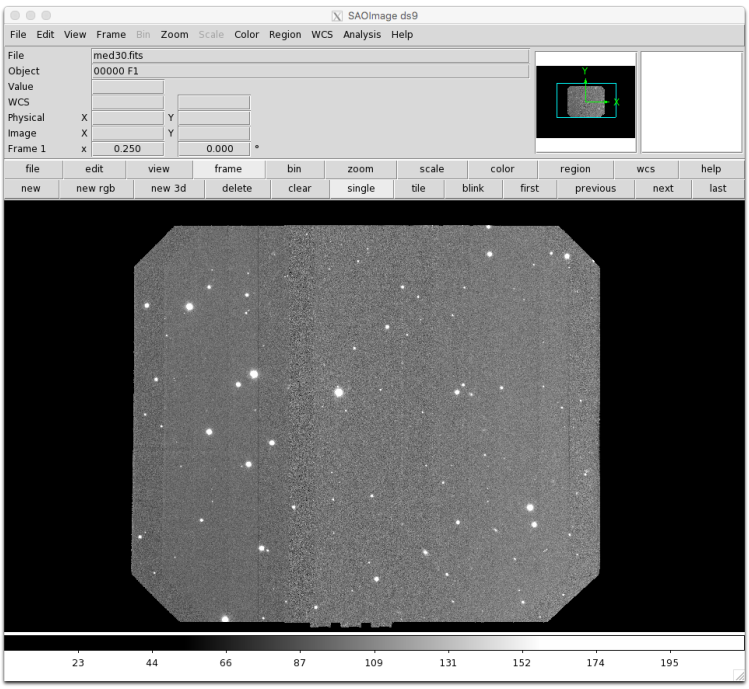



The noise structures are present in both CCD2 and CCD3, and counts on amp#5 (on the left left of CCD2) are close to saturation. By subtraction the bias fro the image, the noise structures subtract very well, but amp#5 is completely unusable (figure below, left). One can simply mask amp#5 (in iraf: imreplace image.fits[5] 0.). This can work for e.g. imaging of a single point source (image below, right), and corresponds to option 1 above.



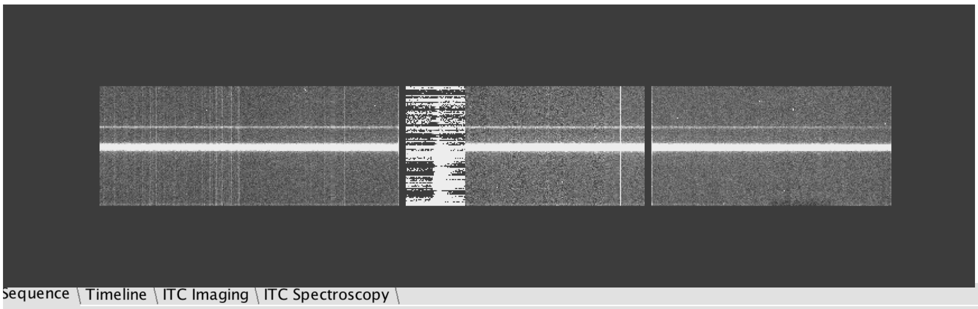




Option 2 is to use use an observing sequence consisting of a dithered imaging sequence with offsets P = 0, +30 , - 30 arcseconds. (Note: this will -in general- restrict the availability of guide stars to some extent). Therefore we end up with three images; when combined, we make up for the missing amp5 data of the original P=0 image, and all the FOV is recovered:



## Longslit mode

The idea is the same, only that instead of offsets in P, we need offset in wavelength in order to compensate for amp#5 gap. The minimum amount of offset will depend on the grating used and the central wavelength. The image below shows an example of a spectrum of a standard star, observed with B600, at (600nm +/- 30nm) central wavelengths. This was enough for this particular setting. The figure below shows the single 600nm spectrum, the snapshot of the OT sequence and the final reduced, combine spectrum.



Sequence | Timeline | ITC Imaging | ITC Spectroscopy

| Data Label | Class | Exposure Time | Disperser Lambda | Observing Wavelength | Object | Observe Type |
|---|---|---|---|---|---|---|
| GS-ENG20220219-16-001 | Nighttime Partner Calibration | 3.0 | 570.0 | 0.570 | GCALflat | FLAT |
| GS-ENG20220219-16-002 | Science | 60.0 | 570.0 | 0.570 | LTT3864 | OBJECT |
| GS-ENG20220219-16-003 | Science | 60.0 | 600.0 | 0.600 | LTT3864 | OBJECT |
| GS-ENG20220219-16-004 | Nighttime Partner Calibration | 3.0 | 600.0 | 0.600 | GCALflat | FLAT |
| GS-ENG20220219-16-005 | Science | 60.0 | 630.0 | 0.630 | LTT3864 | OBJECT |
| GS-ENG20220219-16-006 | Nighttime Partner Calibration | 3.0 | 630.0 | 0.630 | GCALflat | FLAT |