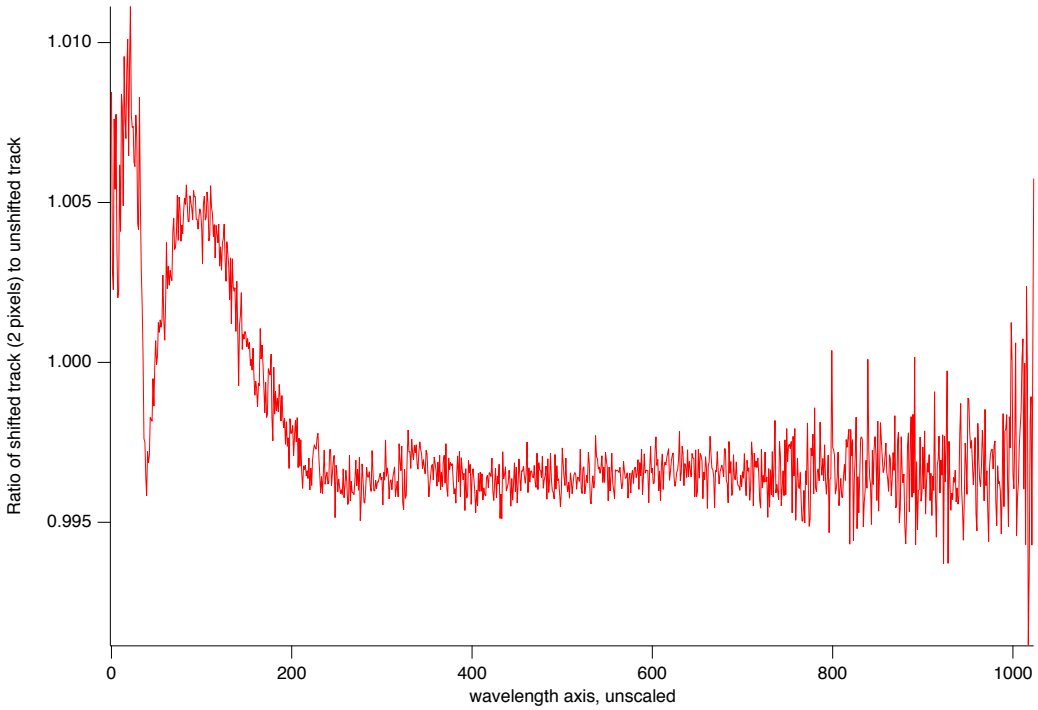
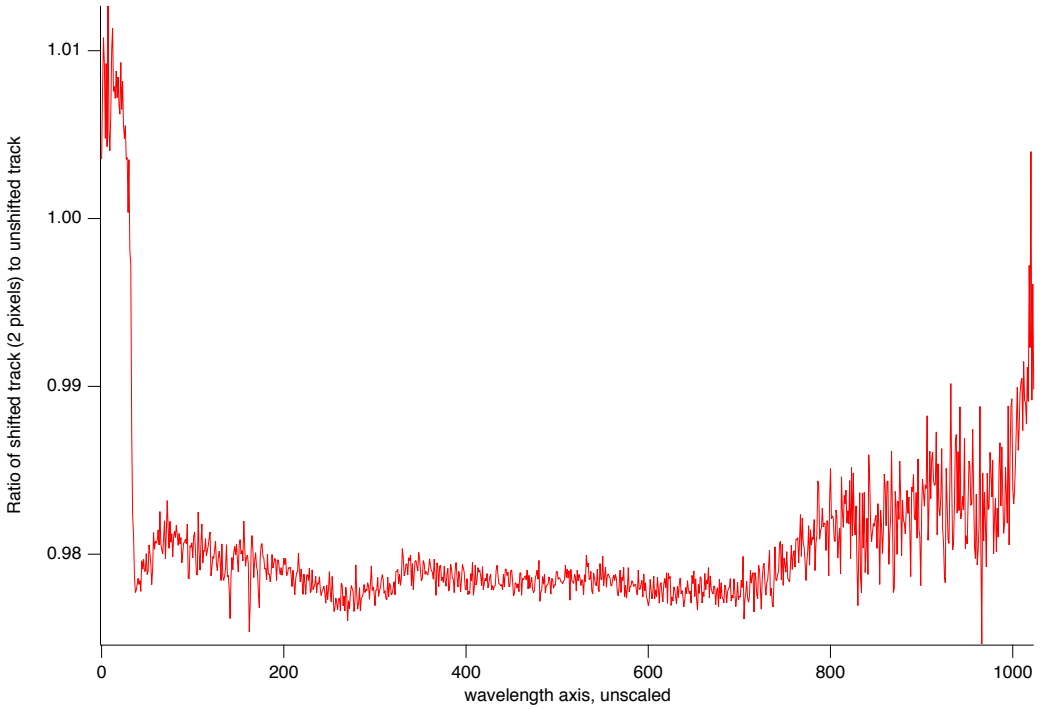
Differences because of track movement.

The different Lu measurements in M263 have very different track profiles. Lutop is fairly flat, while Lumid and Lubot are very asymmetric. I thought it would be worthwhile to see how these different shapes might cause differences in the derived KL's. At the same time I thought it would be worthwhile and look at how we are defining the tracks to see what method might be more insensitive to track movements.

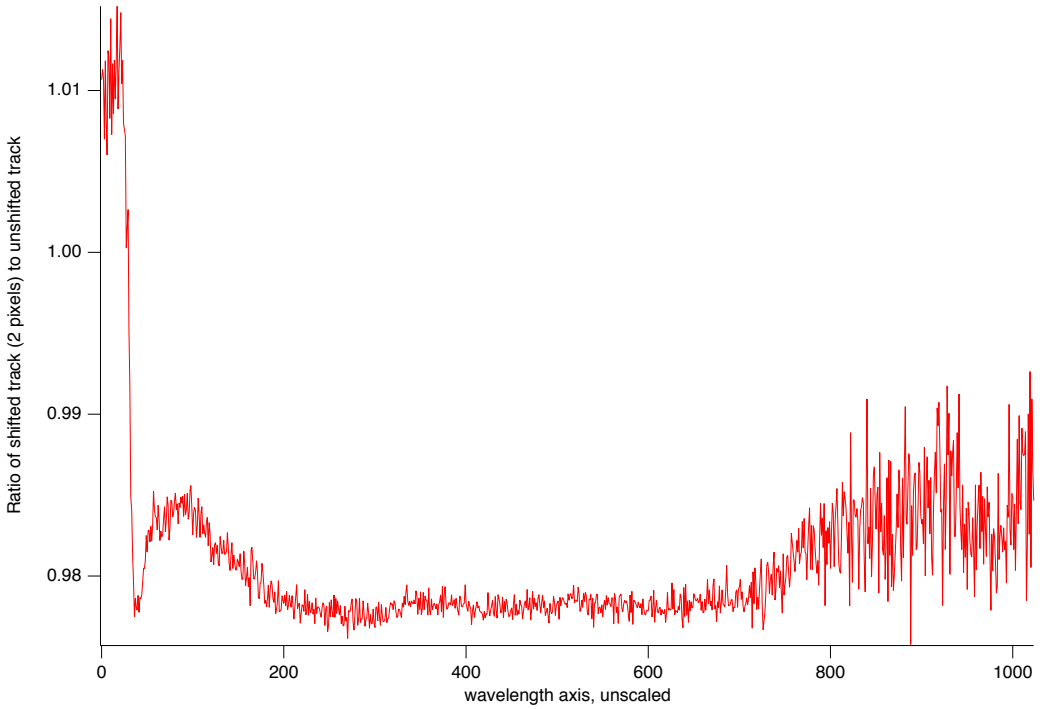
The first question is how do Lutop, Lumid, and Lubot respond to different track movements. In all of this I am going to avoid talking about or dealing with movement in the spectral direction. The first thing I did was to get a data set sample from Steph that used a data set from M263 and found the net signal after averaging the appropriate images and subtracting the background. I then used Steph's track definitions for each sensor and took the ratio of the track, when calculated with the track definitions, then the track shifted by 2 or 4 pixels.



For Lutop, shown above, because the track profile is pretty symmetric, the errors are generally quite small.



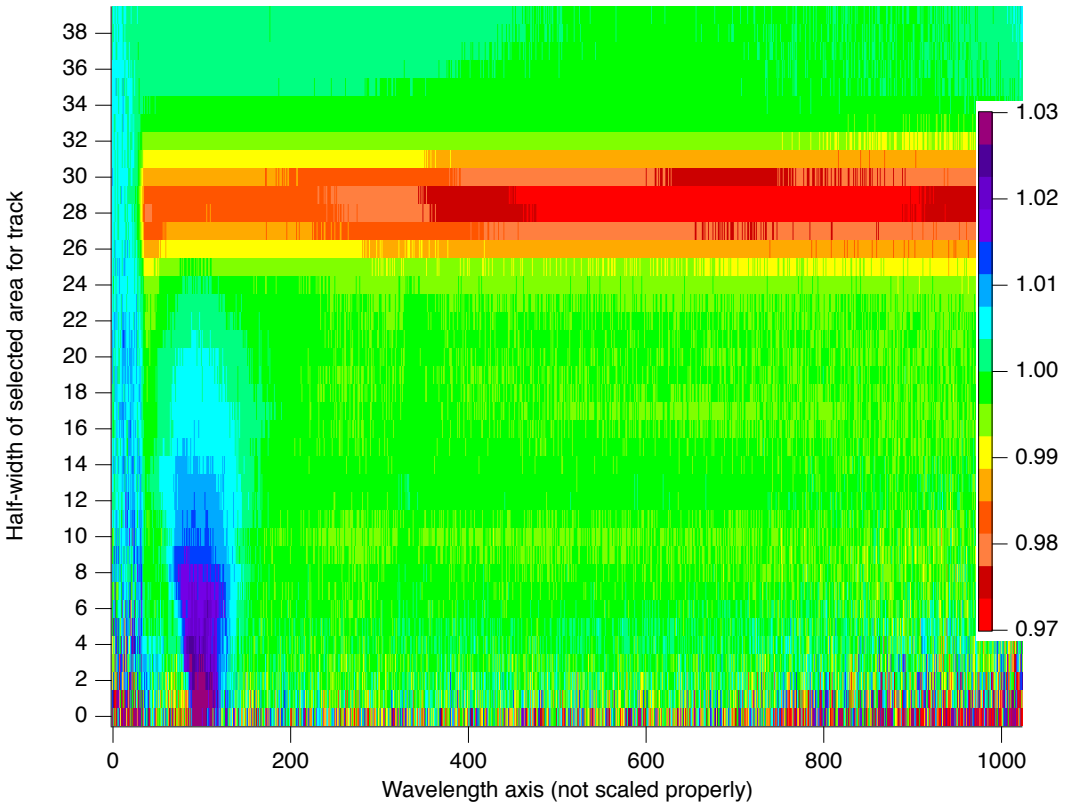
For Lumid, shown above, the error is quite large with only a 2 pixel shift. For a 4 pixel shift the ratio is about 0.96, so twice as large.



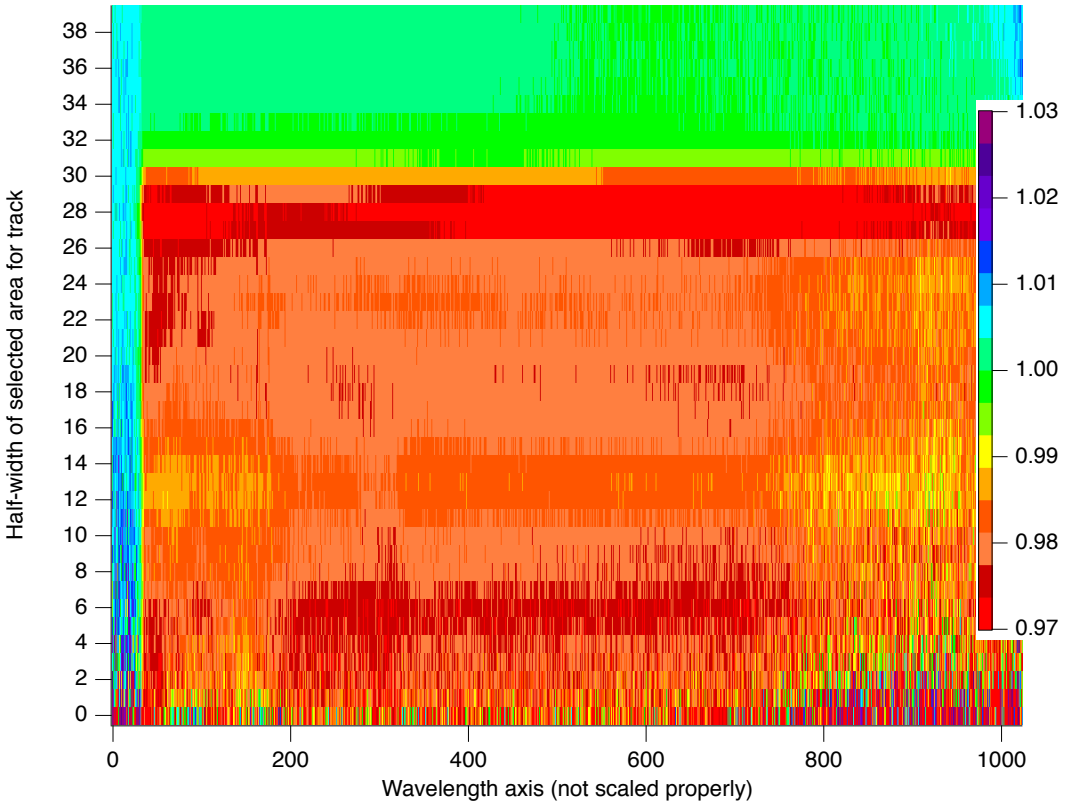
For Lubot, shown above, the situation is very similar to Lumid. Not surprising as they have the same rough shape in the track. This shows that both Lumid and Lubot have shifts that cause an error of about 1%/pixel shift. Also that,

because of the shape differences in the track profiles, this can cause relative differences between the different Lu's when the tracks shift (even if they shift uniformly) and hence this will be exhibited in the KLu's.

The next thing I wanted to check out was whether there was a better definition for tracks that we should be using, in particular while we are keeping empty tracks between measurements. For this I picked where the middle of the track definitions that Steph had, and increased the track half width from 0 to 40 pixels. For each track half width, I calculated the ratio of the shifted track to an unshifted track.



The image shown above, shows this ratio for Lutop. For the most part the ratio is very close to 1. It only gets significantly large, for a reasonable width (<8 pixels total) when you get out to 26 pixels or so. Here it is because you are right on the steep side of the track, and if one gets larger than 32 pixels (64 pixels full width) the ratio goes back to being 1. The values close to 1 for the small widths are due to the uniformity of the track profile for Lutop. There is also that problem in the UV.



For Lumid, until you get to track widths of 32 or more, there is no region which is insensitive to the two pixel shift. The same occurs for Lubot. Looking at the Es channels, they are slightly wider on the array (in particular Es), so the width needs to be >35 (70 pixel full width) to reach the region where the ratio is safely 1.

I think we should try using the full (plus a few) track widths to see how that works. It should remove some instability in the data, in particular when the tracks are shifting considerably.

Note none of this is big enough to cause the whole problem with KL differences that we are seeing….