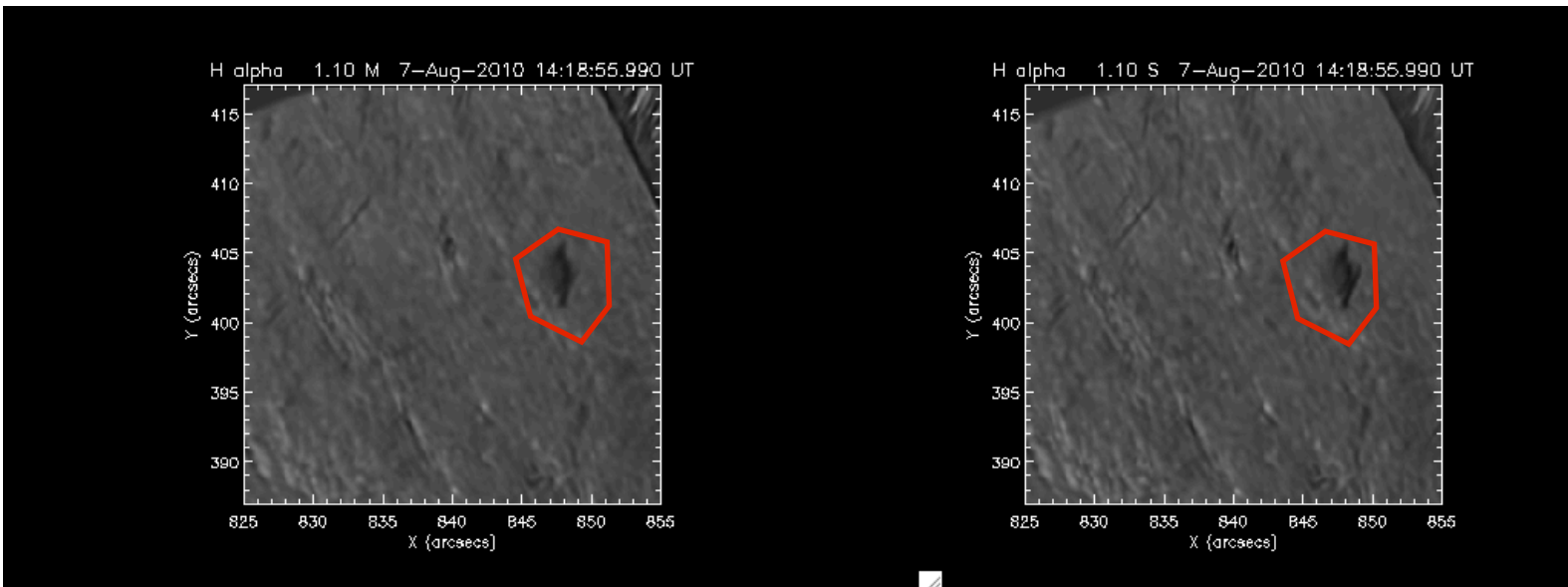


MFBD vs Speckle Images
Isabel Lipartito
Investigating High-Speed Phenomena in the Solar Atmosphere

We have hundreds of images of the same region of the Sun taken over a period of 20 minutes. Some of these images were reduced using the MFBD process and others were reduced using the Speckle process. We intend upon using both sorts of images in our data analysis, but we first needed to ascertain that there were no major differences between both sets of images that might affect our research (i.e. we mistake an artifact from the image reduction process for a new and significant observation).

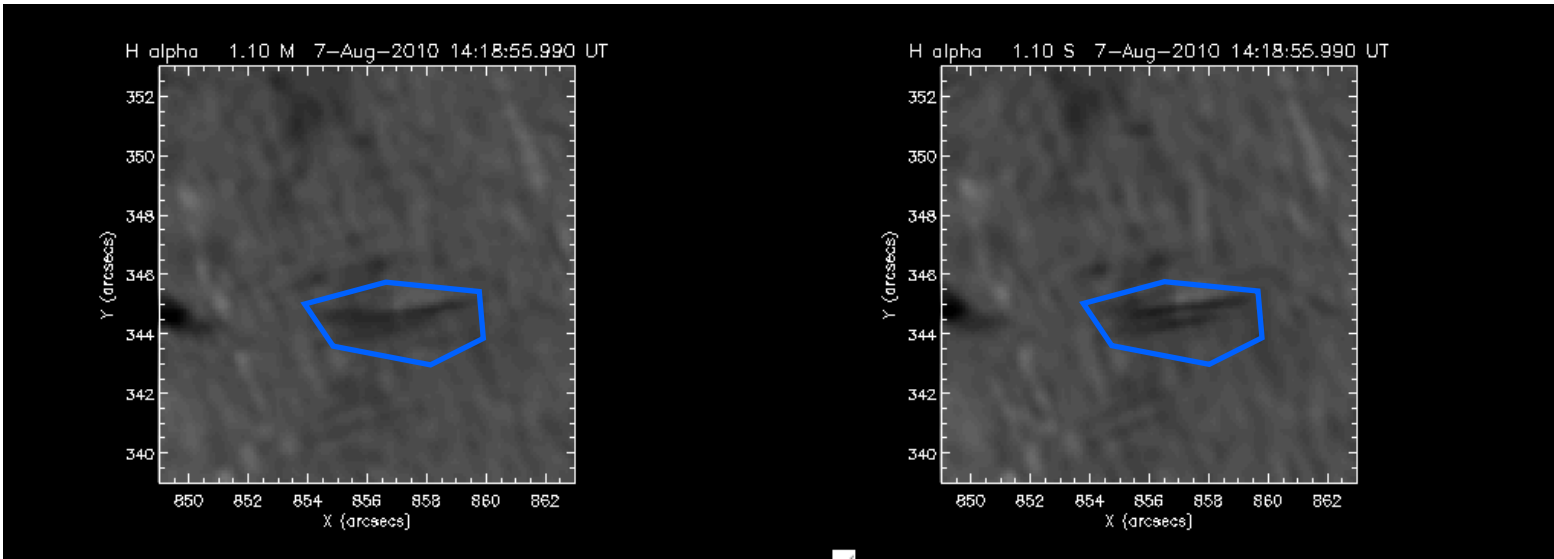
I wrote a program to juxtapose two sets of Speckle and MFBD images taken in H-alpha at a blue wavelength (below the H-alpha line) and at red wavelength (above the H-alpha line). Care was taken to ensure that compared images were taken at exactly the same time exactly the same wavelength.

Below are the results of the comparison of the MFBD and Speckle images taken in red

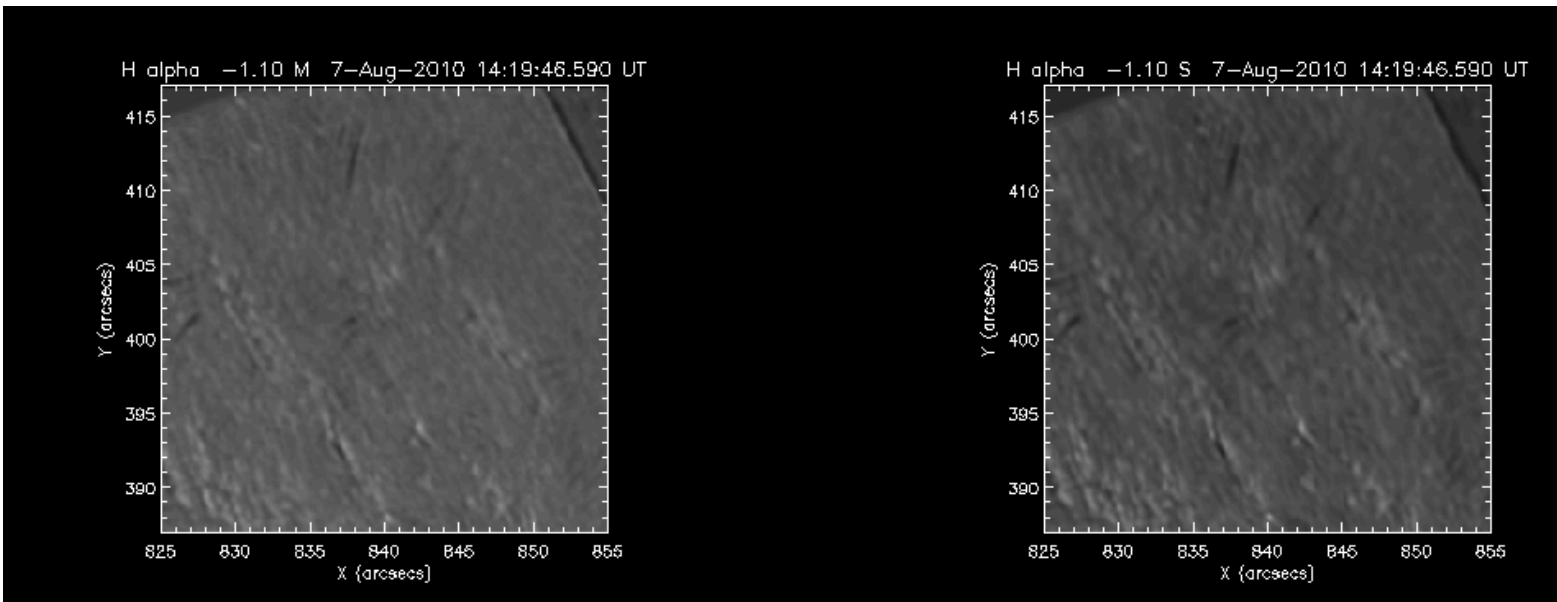


We have here a small region on the disk of the sun. The left image is MFBD and the right image is Speckle. Aside from a few differences in clarity and darkness of sunspots (circled in red), these images are extremely similar despite their different processing mechanisms. The Speckle image appears to have a slightly more defined sunspot.

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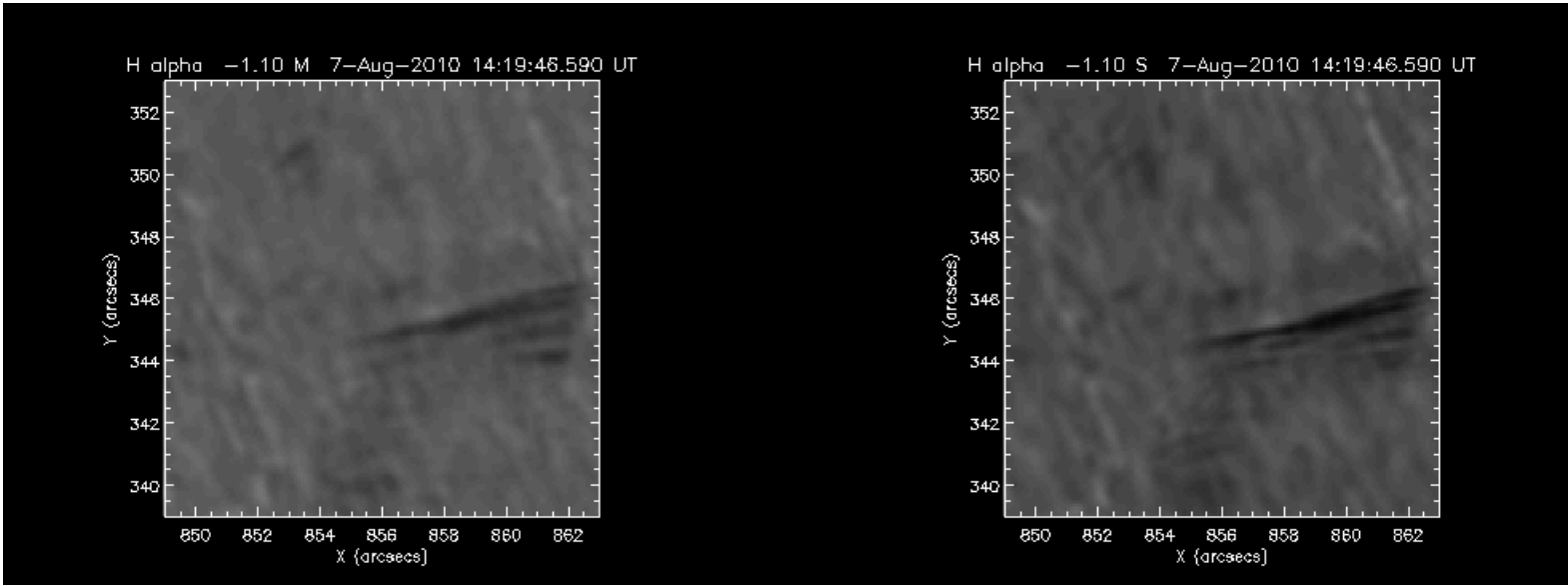


Above is another comparison of the red Speckle (right) and MFBD (left) image, here just in a different region. The Speckle image has a more resolved fibril set (circled in blue: one can make out two separate fibrils) while the same fibril in the MFBD image is more blurred and hard to break into two. It is important to keep in mind that the Speckle images have been averaged together over a period of time about 5 times longer than have the MFBD images. This difference

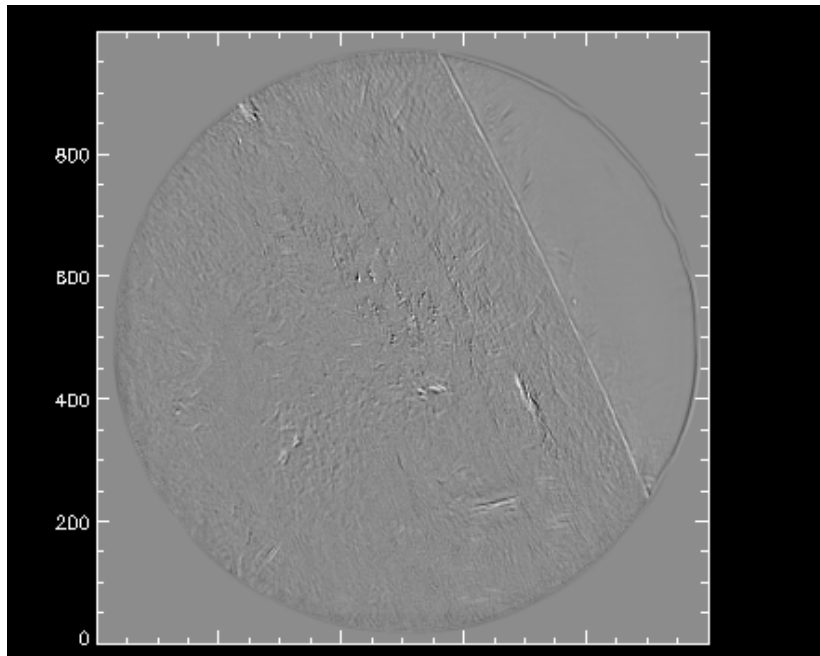


in resolution this has an explanation. Above is a comparison of a close-up region of a blue Speckle (left) and MFBD (right) image. We can see that the Speckle fibrils are more deep and defined than the MFBD fibrils, once again.

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We can draw a rather similar conclusion with this other region from the same blue images (MFBD is left, Speckle is right). The Speckle image has a deeper fibril with better resolution.



And here is an image of a blue MFBD image subtracted from a Speckle image. One can see the differences in intensity and definition between the two images highlighted in the image with the dark and light patches.

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CONCLUSIONS

There is an observable difference between MFBD and Speckle images in terms of definition of structures and brightness/depth levels. Generally, Speckle images have deeper resolution as they were averaged over a longer period of time than the MFBD images. However, the differences between each type of image (in red or blue) does not appear to be so great that they might interfere with actual identification of solar phenomena or structures. Each type of image contains the same structures and fibrils and the only real variance is the resolution of each structure. At the present, I have decided that the different processing mechanisms will not present an issue regarding data analysis and have decided to go ahead and treat them equally as their fundamental differences do not seem significant enough to distract our data analysis.