# Co-alignment MUSE-GBO : He II 304Å vs H-alpha

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#### Rob Rutten's report on Solar Orbiter campfires in SDO images

Lingezicht Astrophysics Reports 1, Dec 2020, <u>https://arxiv.org/abs/2009.00376</u>



Fig. 4. AIA 304 Å image at best-match time. The dense coverage by grey patches is addressed in appendix B. They show the chromosphere with traditional "transition region" temperatures but also visible in H $\alpha$ . Notice small brighter patches called "brushfires" below, as coyly as "campfires" but with language correction from Ron Moore (footnote 6).

# H I 6563Å vs He II 304Å



•He I ionisation threshold 24.6 eV (H I 13.6 eV)

•Simple assumption: structure visible in one line is invisible in other line

# H I 6563Å vs He II 304Å



•He I ionisation threshold 24.6 eV (H I 13.6 eV)

#### •Simple assumption: structure visible in one line is invisible in other line





Fig. 11. The same GONG H $\alpha$  image as in preceding figure 10, but with the greyscale reversed. This image is inserted here to facilitate blinking to the next (AIA 304 Å). How to blink pdf pages in a pdf reader is treated on page 9. When you blink them the scenes appear to jump due to your eye detecting patch size differences but they are actually well aligned. This comparison is striking and discussed in appendix B.

### Blink AIA 304Å and reversed H-alpha

#### Cross-correlation : $dx, dy = 2^{\circ}, -7^{\circ}$

25 I co-aligned these two images with **findalignimages.pro** which is my engine for SDO–STX co-alignments. It uses iterative best-fit determination of relative scales, shifts and rotation with Tom Metcalf's auto\_align\_images.pro in SSW. I applied the results per reformimage.pro. In this case the trick was to blur both images considerably. When blinking this pair the scenes appear to jump, but detailed **showex** inspection shows close alignment.



#### SST/CRISP WB 6563Å diameter = 87"



#### SDO - SST alignment using HMI continuum vs CRISP wideband

#### SDO/HMI continuum



#### SST/CRISP H-alpha diameter = 87"



#### SDO - SST alignment using HMI continuum vs CRISP wideband

#### SDO/AIA 304Å



#### Active Region

### SST/H-alpha

15-May-2024 Reetika Joshi & Ignasi Soler Poquet observing







#### Cross-correlation : $dx, dy = -0.02^{\circ}, 0.02^{\circ}$

http://tsih3.uio.no/lapalma/temp/muse/halpha+aia304 15May2024 ar blink.mp4



#### SST/H-alpha



#### Quiet Sun







#### Cross-correlation : $dx, dy = 0.08^{\circ}, -0.57^{\circ}$

http://tsih3.uio.no/lapalma/temp/muse/halpha+aia304 06May2024 qs blink.mp4

#### Active Region near limb

#### SST/H-alpha

24-May-2024 Reetika Joshi & Ignasi Soler Poquet observing







#### Cross-correlation : dx,dy = -0.3", 0.4"

http://tsih3.uio.no/lapalma/temp/muse/halpha+aia304 24May2024 ar blink.mp4



- Specially for active region targets
- Large FOV helps CRISP2 will have 120"
- •Will it also work on Ca 8542? Ca II H/K?



Cross-correlation :  $dx, dy = -0.3^{\circ}, 0.4^{\circ}$ 

Alignment He II 304Å vs H-alpha seems promising