



GOES-16 ABI Bands 5, 6, and 7 Useful in Analyzing Prescribed Burns

“CIMSS Blog, April 2nd, 2021, Prescribed Burning in the Central US”

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ABSTRACT

The purpose of the current study was to investigate how bands 1, 2, 3, 5, 6, and 7 helped analyze the prescribed burns that took place on April 2nd, 2021. The information on the CIMSS Satellite Blog helped see how Geostationary Operational Environmental Satellite (GOES) 16 imagery using the Bands of the Advanced Baseline Imager (ABI) helps to analyze the phenomenon of prescribed burning. This research involved looking at CIMSS Satellite Blog for information and satellite images. The blog showed the different wavelengths in these images and what ABI bands were being used to capture the image. The bands being used, which were bands 1, 2, and 3 for the True Color RGB images; 5, 6, and 7 for the Fire Temperature RGB images, helped show the intensity of the prescribed burns, their behavior, and their size. Researching and learning more about the phenomenon helped with learning more about the GOES-16 imagery and how different wavelengths affected the images when viewing the fires. Bands 7, 6, and 5, which was used for the Fire Temperature RGB image, worked best for fire detection. While the True Color RGB images, using bands 1, 2, and 3, detect smoke from the fires. But, the Fire Temperature image does not show smoke emitting from the burns.

RESEARCH QUESTION

How does GOES-16 imagery created using ABI Bands 1, 2, and 3; 7, 6, and 5 help to analyze the phenomenon, prescribed burning in the central US, on April 2nd, 2021?

RESEARCH METHODS

To analyze prescribed burning, there were steps that had to be taken.

- The CIMSS Satellite Blog provided information about the phenomenon, when and where the phenomenon happened, satellite images of the fire, and information about the image
- Learning more about the phenomenon being studied was useful as it helped understand the wavelengths being emitted by the fire and the ABI Bands being used
- Researching the ABI Bands helped understand what ABI Bands and images would be best used to study the controlled burns
- Researching the ABI Bands was possible with the ABI Bands quick guides
- Lastly, with the information gathered, I answered the research question

RESULTS

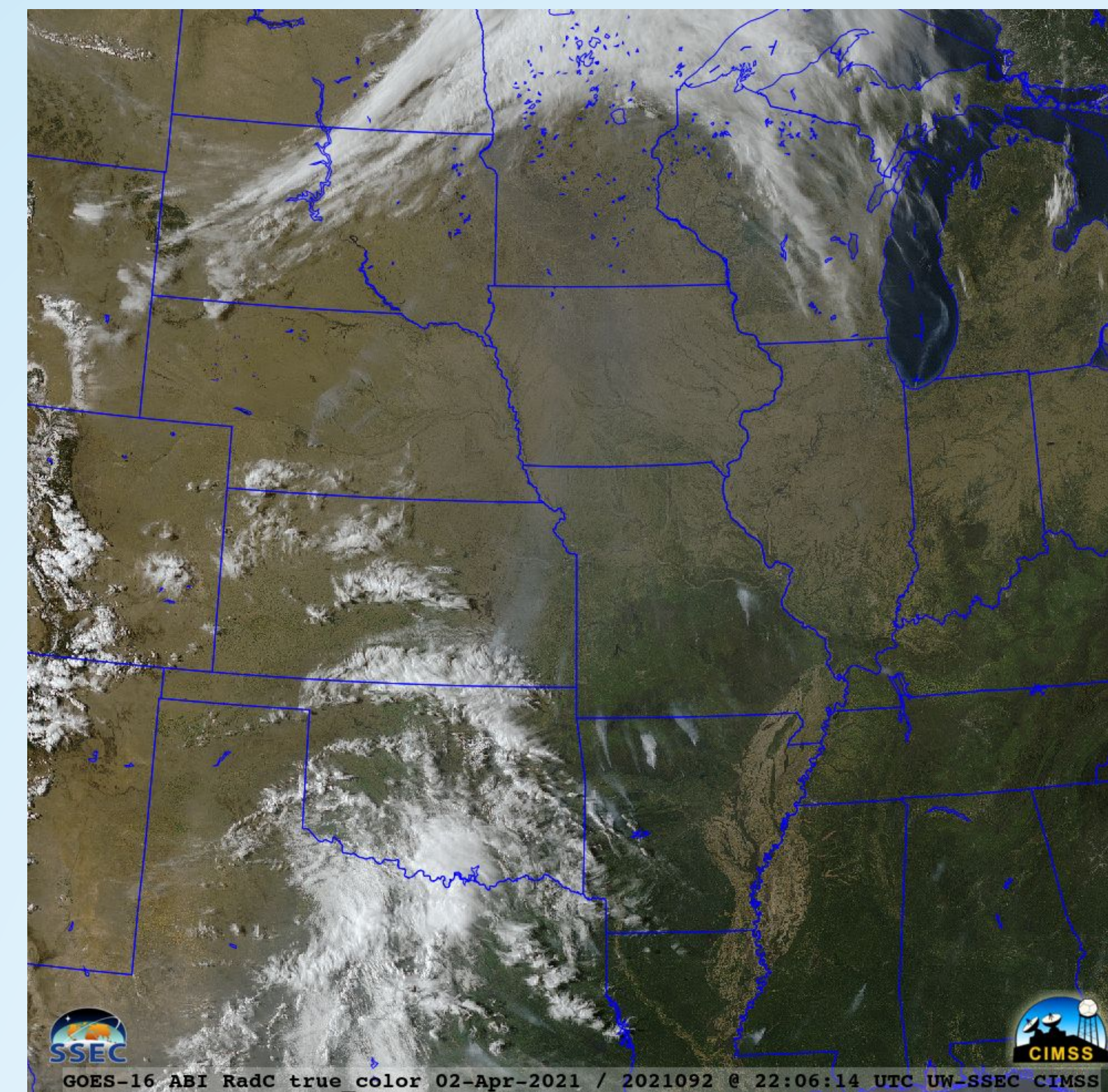


Image 2: GOES-16 True Color RGB images are showing a large amount of smoke plumes emitted from the prescribed burning traveling across part of the central US. ABI Bands 1, 2, and 3 are being used. This image has a simulated green component.

<https://cimss.ssec.wisc.edu/satellite-blog/?s=prescribed+burns>

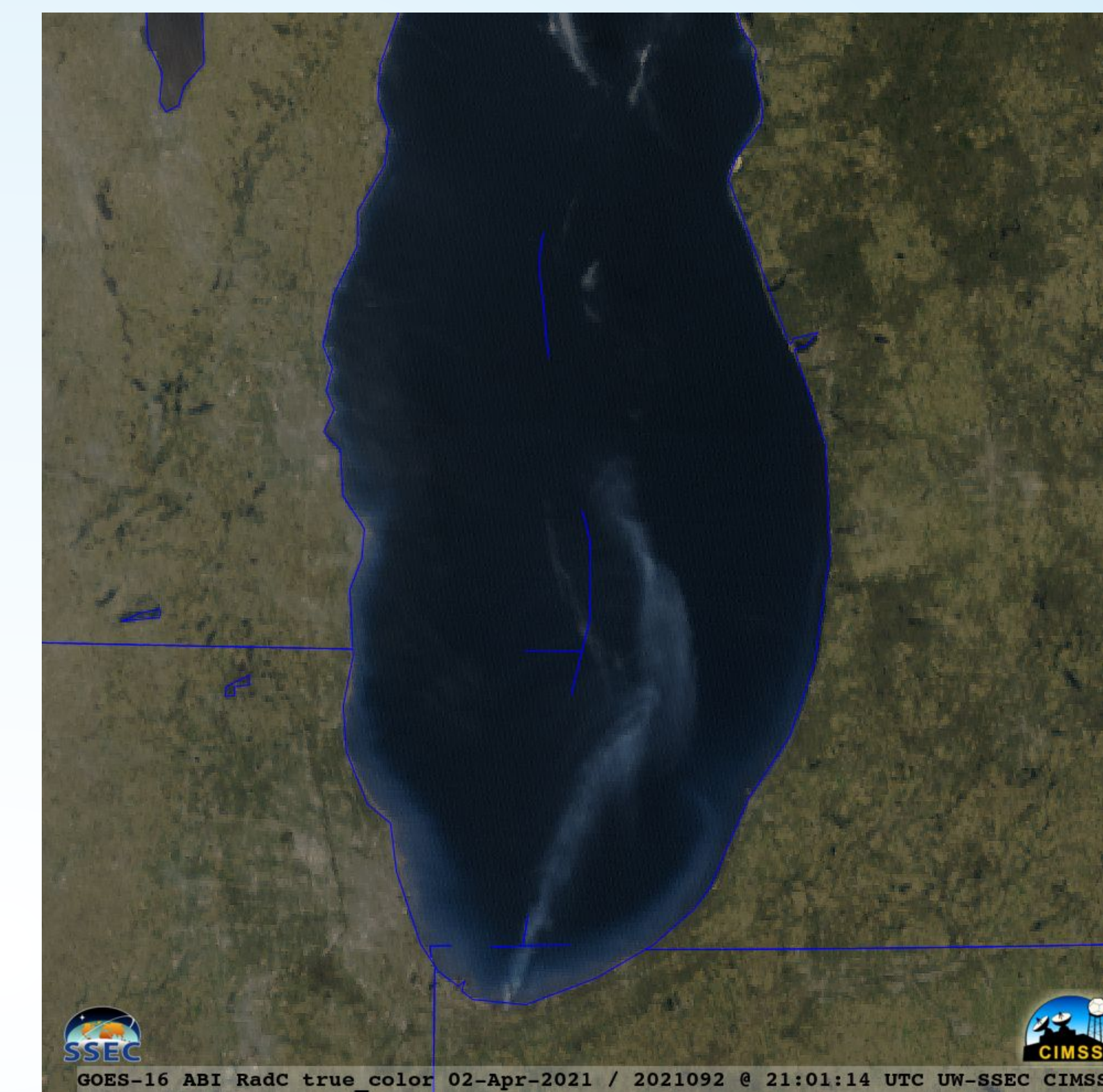


Image 3: This image shows a very long smoke plume drifting northward across the southern part of Lake Michigan. GOES-16 True Color RGB images indicate that 2 smaller smoke plumes merged into one. It continued to travel northeastward toward the west coast of Lake Michigan. ABI Bands 1, 2, and 3 are being used. This image has a simulated green component.

<https://cimss.ssec.wisc.edu/satellite-blog/?s=prescribed+burns>

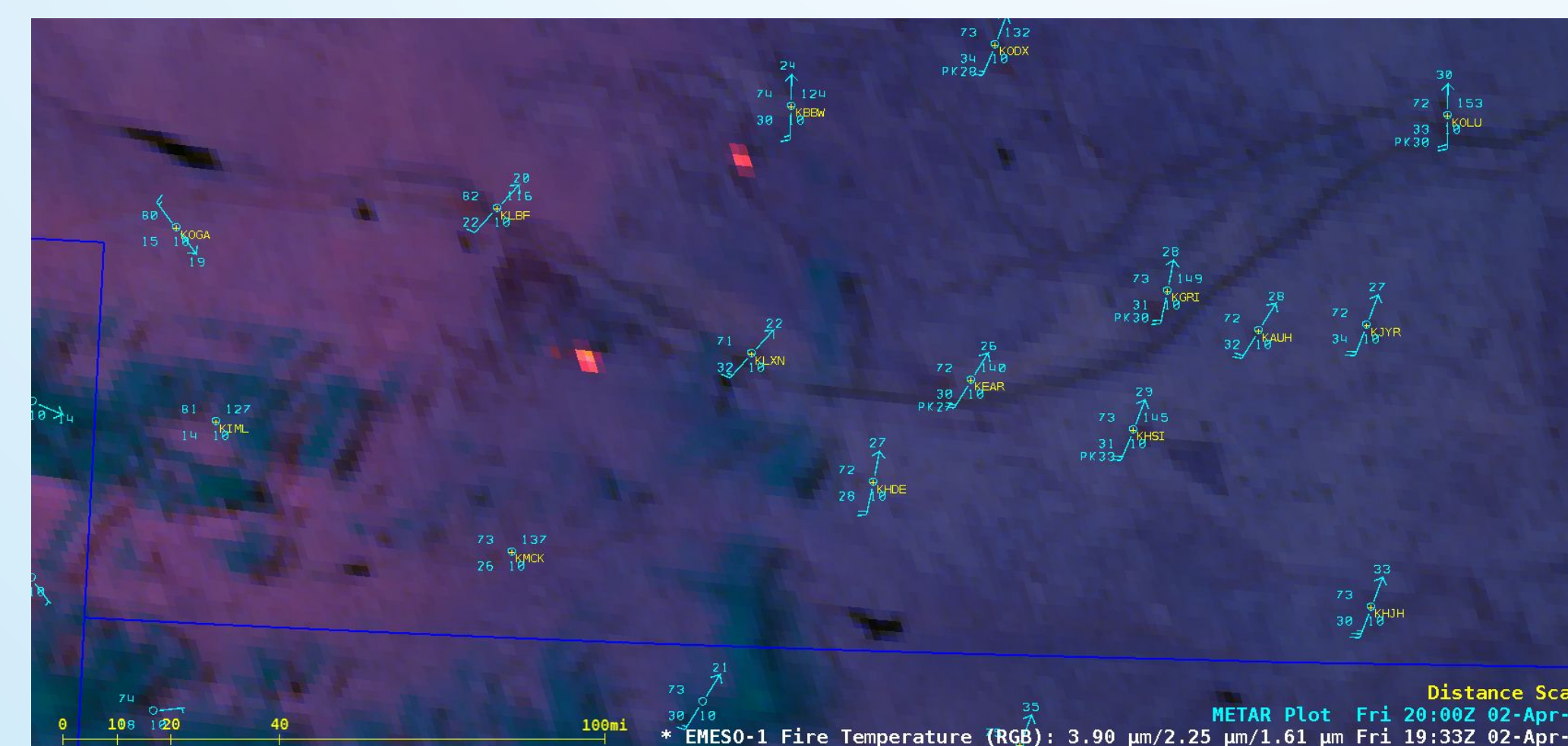
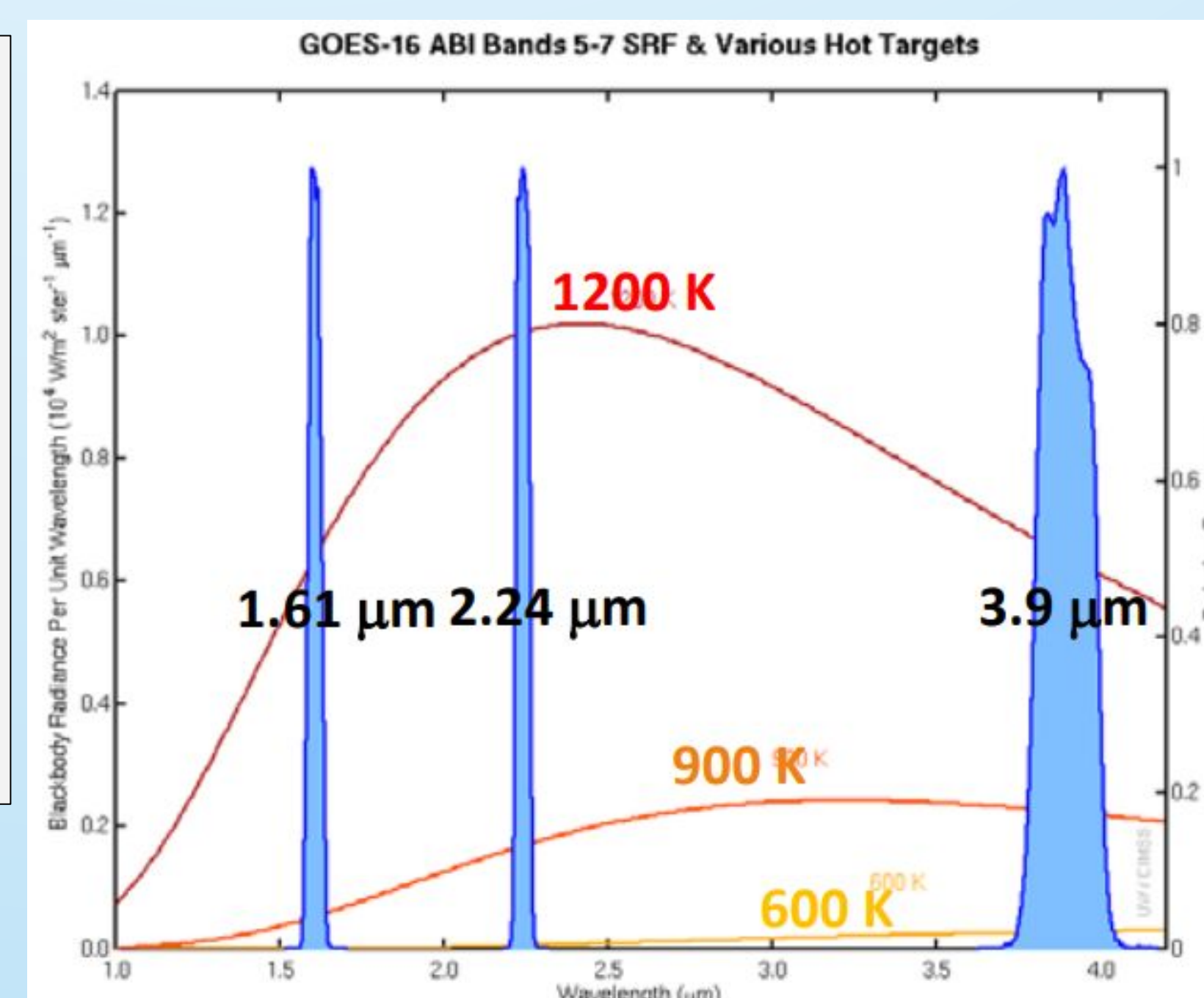


Image 4: GOES-16 Fire Temperature RGB images offered a view of the relative intensities of a few prescribed burns in southwestern Nebraska. The red and yellow pixels shown are the prescribed burns. The yellow pixels are relatively warmer than the red pixels. The greenish-blue pixels in the lower left corner are clouds, more specifically ice clouds. ABI Bands 7, 6, and 5 are being used in this image.

<https://cimss.ssec.wisc.edu/satellite-blog/?s=prescribed+burns>

Figure 1: The wavelength measurements are shown at the bottom of this figure. Shorter wavelengths are to the left and longer wavelengths are to the right. Since more intense / warmer fires emit radiation at a shorter wavelength (K stands for kelvin), Band 5 can detect the more intense, warmer fire since it is emitting shorter wavelengths.



http://cimss.ssec.wisc.edu/goes/OCLOFactSheetPDFs/ABIQuickGuide_Band06.pdf

DISCUSSION AND CONCLUSION

After reviewing the data and research, the following conclusions were made:

- Bands 1, 2, and 3 (Blue, Red, and Veggie bands), or the GOES-16 True Color RGB images are best used to analyze the smoke emitted from the prescribed burns
- Bands 7, 6, and 5 (Shortwave Infrared, Cloud Particle Size, and Snow/Ice bands), or the GOES-16 Fire Temperature RGB images are best used to analyze the intensity, size, behavior, and specific location of the fires
- Even though the GOES-16 Fire Temperature image is used to look at the intensity and behavior of the fire, the bands do not capture smoke emitted from the burns

This is because with 3.9 µm to shorter wavelengths, solar radiation from the sun increases as well as the amount of light reflected from the surface of the earth. This is called surface reflectance. Therefore, to be detected by the 2.2 and 1.6 µm bands, fires need to be more intense because more intense fires emit more radiation at these wavelengths. Cooler fires will only show up on band 7 or 3.9 µm, so these fires appear red. When the fire's intensity grows, contributions of the other channels will make the fire appear white. In image 4 or the Fire Temperature RGB image for the prescribed burns, the fire appears red. This is because the intensity is low and so the fire appears at 3.9 µm, making the burn look red.



Image 1: Above is an example of a prescribed burn. A prescribed or controlled burn is set on purpose and is for forest management, farming, parities restoration and/or greenhouse gas abatement.

REFERENCES

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