



*AGU Earth and Space Science*

Supporting Information for

**Developing a detection and monitoring framework for wildfire regimes with L-Band Polarimetric SAR**

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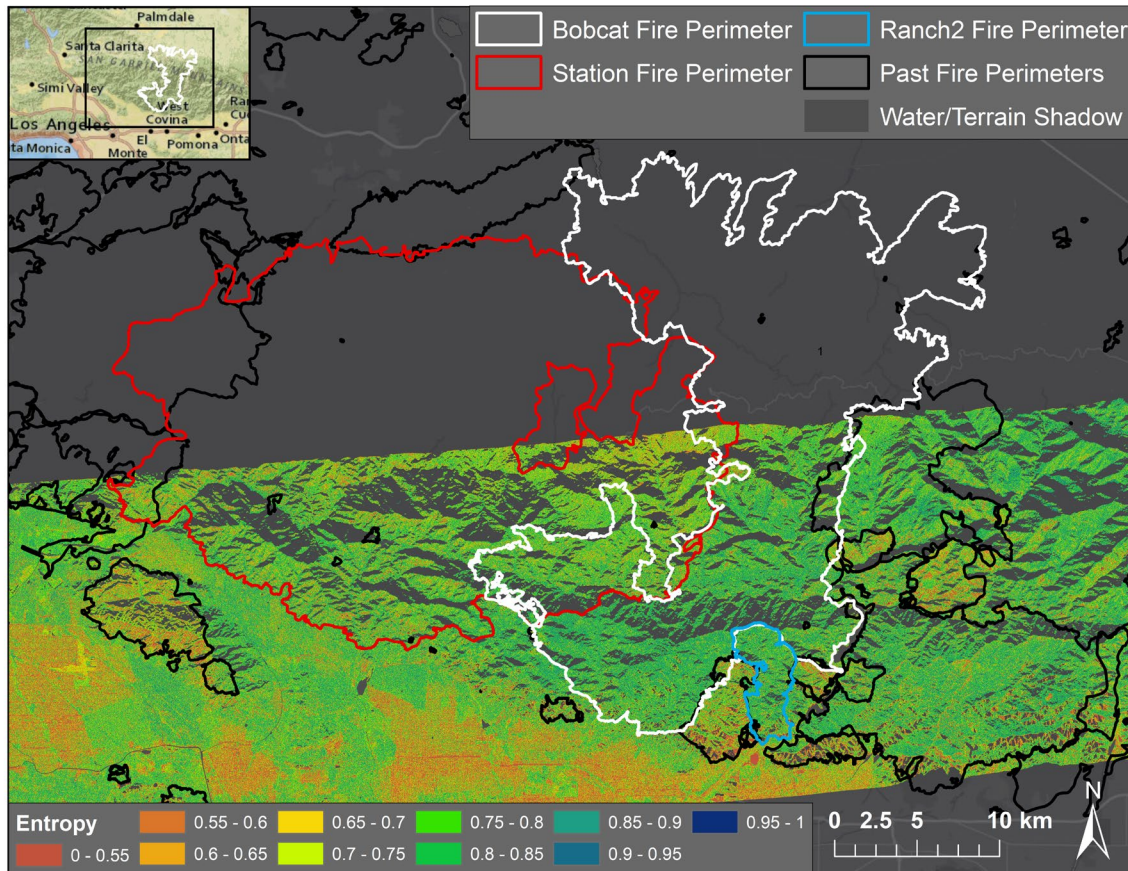
**Introduction**

Text S1 contains a short description of an error discovered in the PolSARpro software when preparing to run polarimetric decomposition routines. Figures S1-S6 show the H-A-Alpha decomposition results before the Bobcat Fire (Figures S1-S3) and after the fire (Figures S4-S6). Figure S7 shows the average slope per burn progression perimeter for Bobcat Fire. Figure S8 presents the different burn severity distributions for each vegetation type for Bobcat Fire. Figure S9 shows the burn severity map for the Station Fire. Lastly, Figure S10 compares burn severity class over time for each of the polarimetric parameters: HV, Eigenvector 1, Eigenvalue 1, and H-A-Alpha decomposition products.

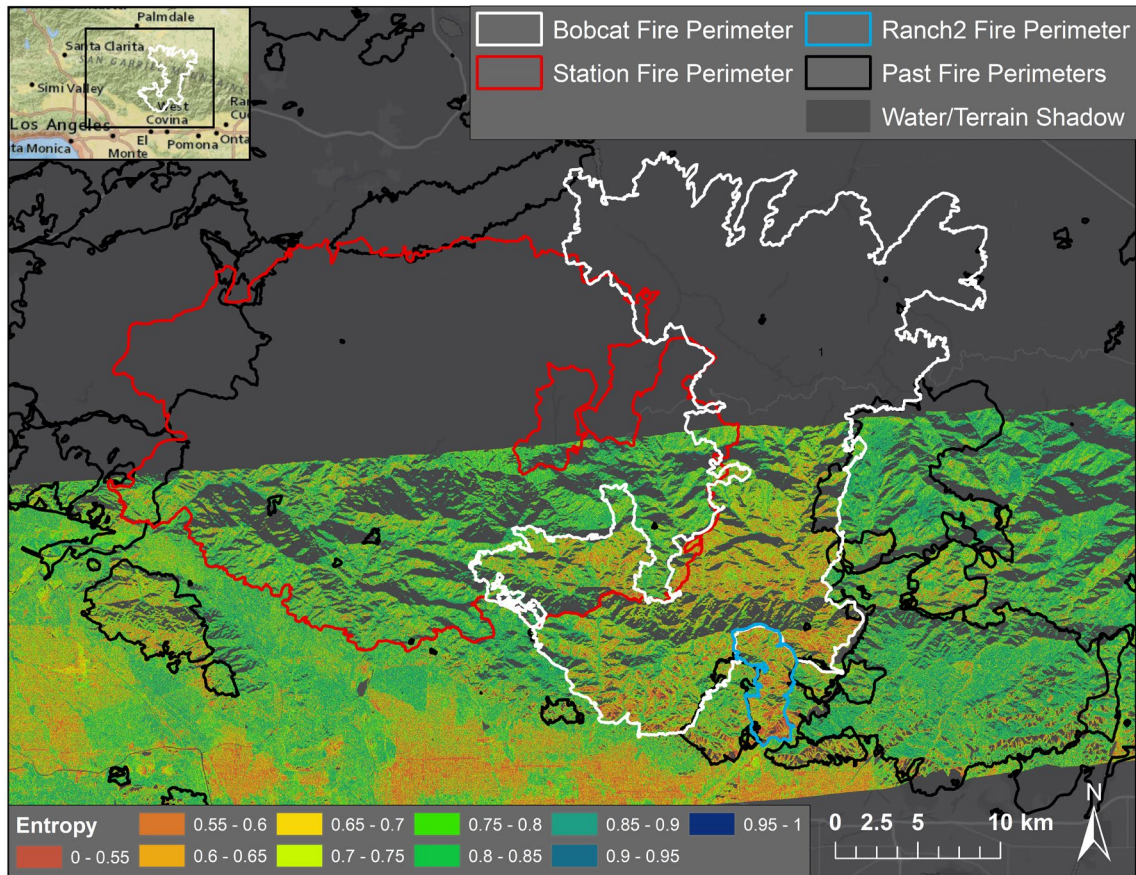
## Text S1 – PolSARpro T3 Coherency Matrix Fix

A mistake was discovered in the PolSARpro version 5.0 routine "uavsar\_convert\_MLC.c", which converts the UAVSAR input into a coherency matrix (T3) for use by the polarimetric decomposition routines. The version 5.0 code generates a T3 matrix for the UAVSAR data in which the T33, T13, and T23 components are incorrect. These errors were corrected and the routine was recompiled for our installation of PolSARPro before running the H-A-Alpha decomposition routine.

Preliminary testing showed the erroneous T3 matrix resulted in changes to the alpha decomposition result. For example, for Figure 6b in the main text, alpha angle values increased overall by about 5 decibels across the time-series (not uniform).

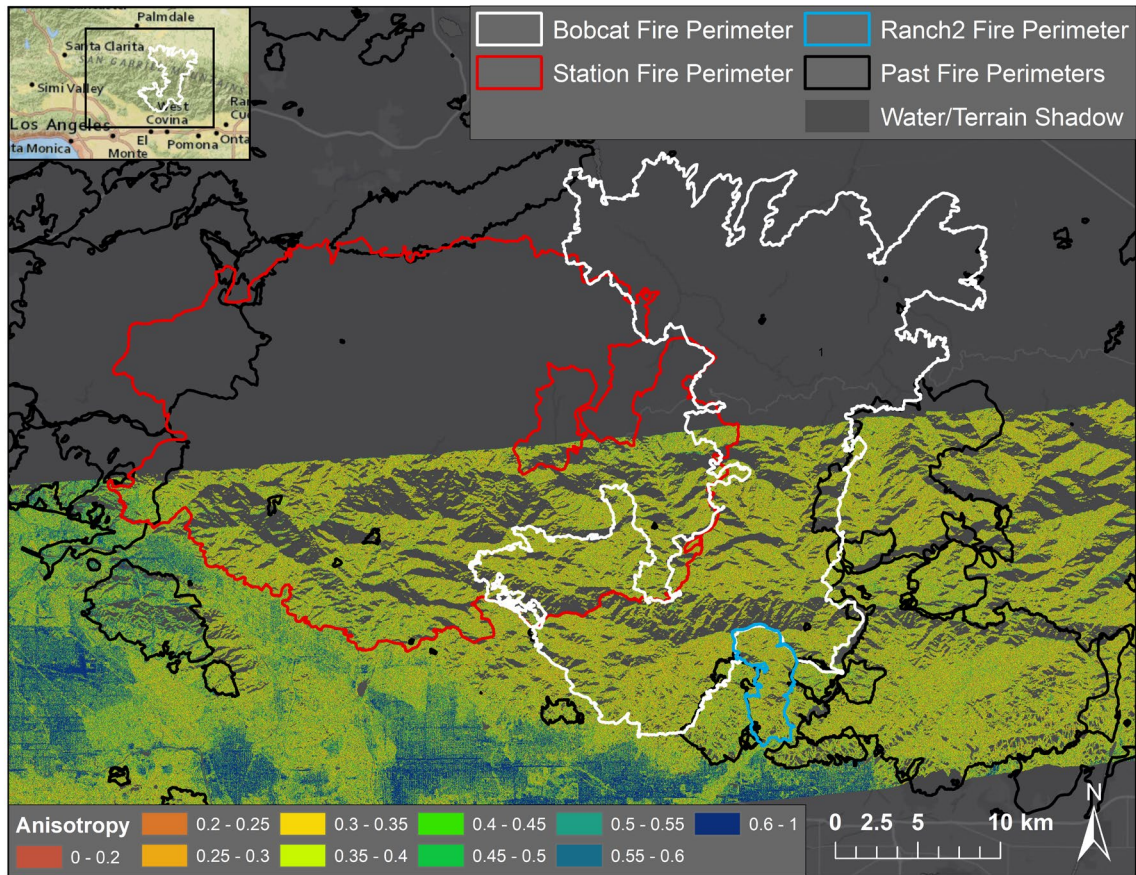


**Figure S1.** Entropy for October 2018 (southern flight line) derived from H-A-Alpha decomposition. Historic fires (black outlines) are shown, including the Station Fire (red outline) and Bobcat Fire (white outline). High entropy values are shown in green-to-blue and low entropy values are shown in orange-red colors.

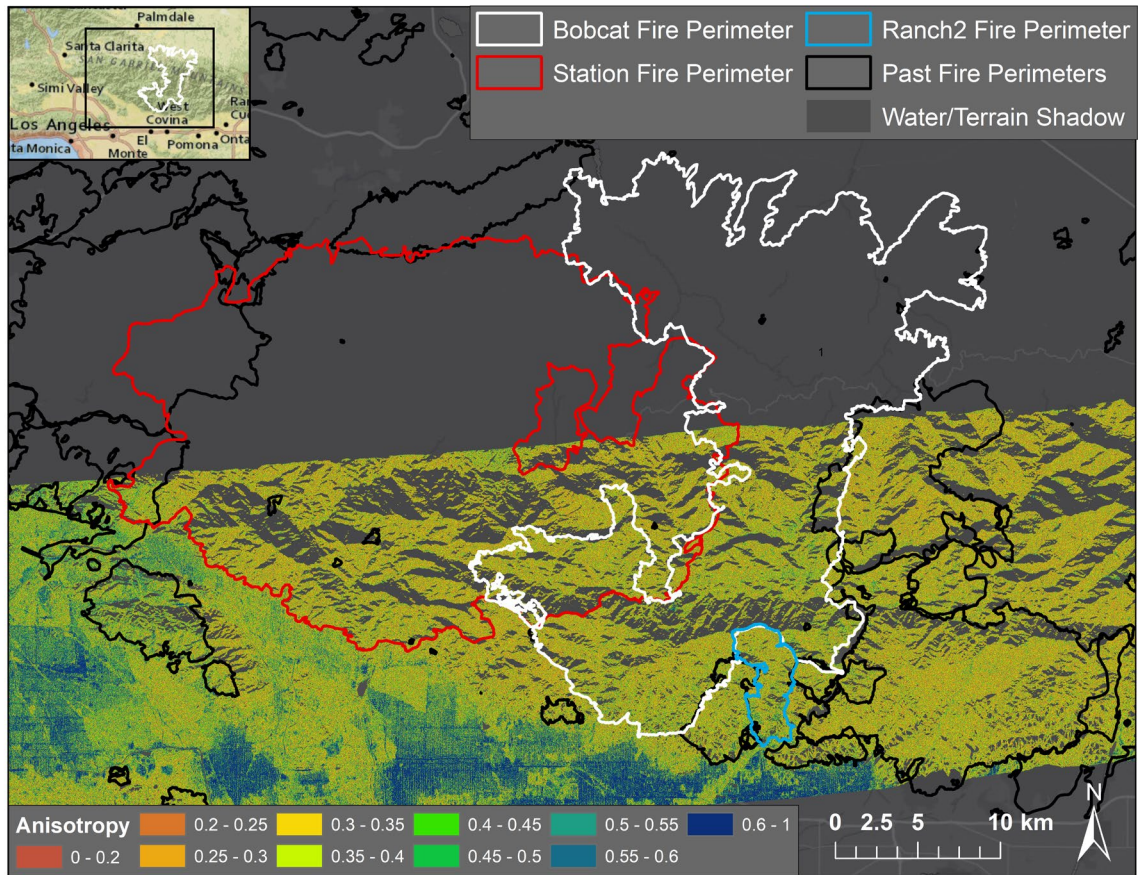


**Figure S2.** Entropy for November 2021 (southern flight line) derived from H-A-Alpha decomposition. Historic fires (black outlines) are shown, including the Station Fire (red outline) and Bobcat Fire (white outline). High entropy values are shown in green-to-blue and low entropy values are shown in orange-red colors.



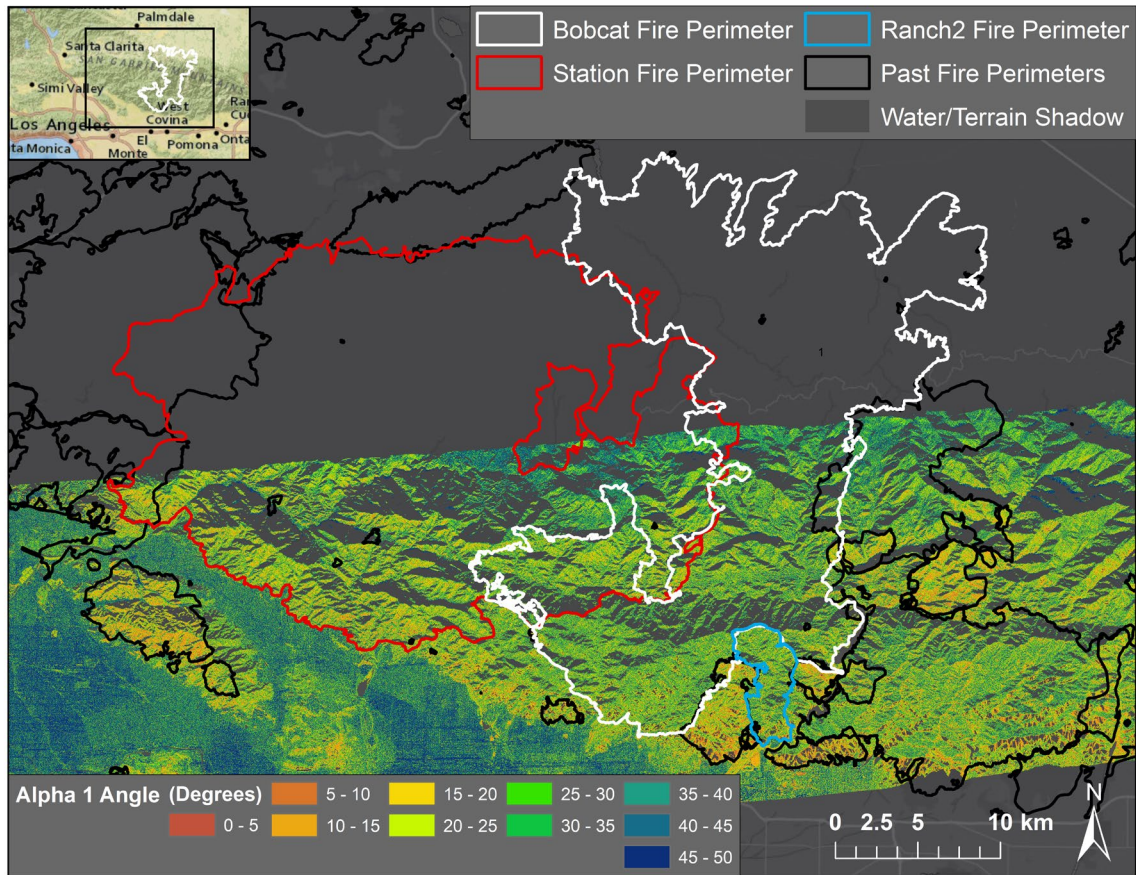


**Figure S3.** Anisotropy for October 2018 (southern flight line) derived from H-A-Alpha decomposition. Historic fires (black outlines) are shown, including the Station Fire (red outline) and Bobcat Fire (white outline). High anisotropy values are shown in green-to-blue and low anisotropy values are shown in orange-red colors.

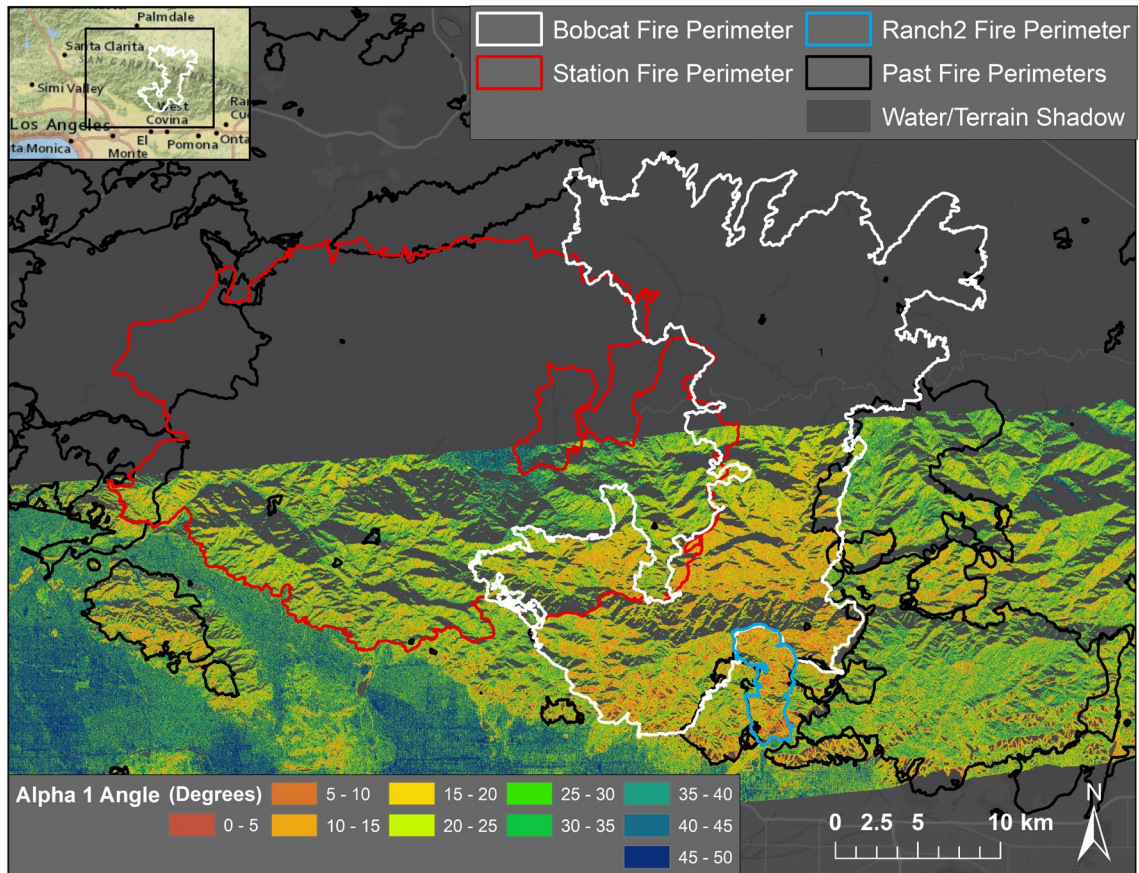


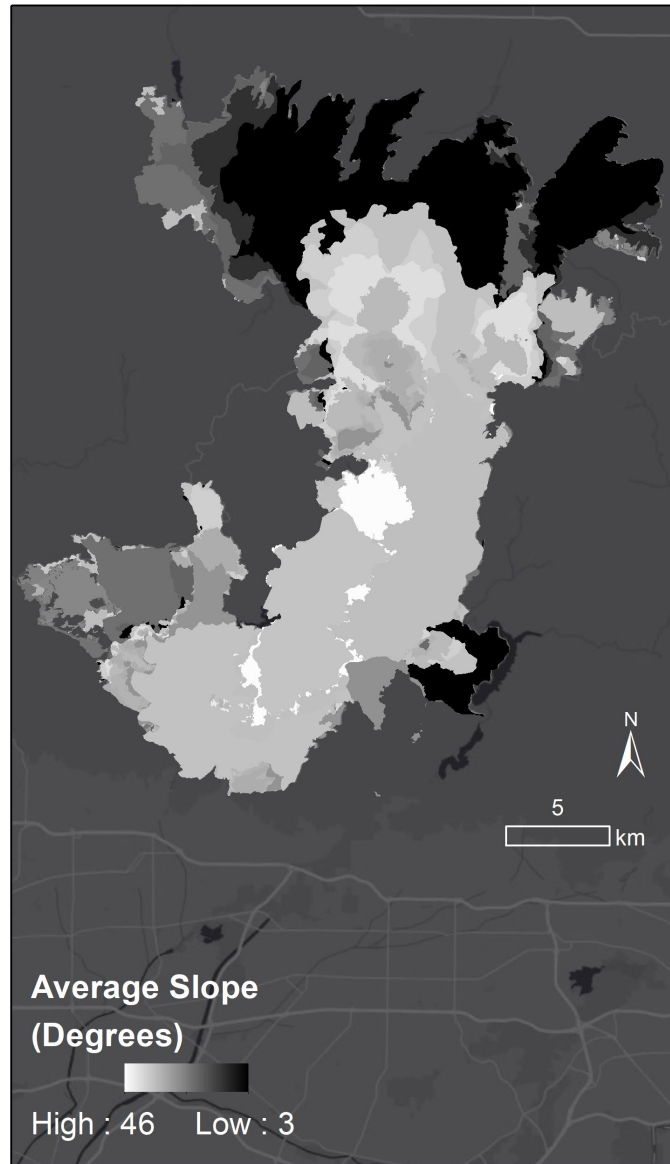
**Figure S4.** Anisotropy for November 2021 (southern flight line) derived from H-A-Alpha decomposition. Historic fires (black outlines) are shown, including the Station Fire (red outline) and Bobcat Fire (white outline). High anisotropy values are shown in green-to-blue and low anisotropy values are shown in orange-red colors.





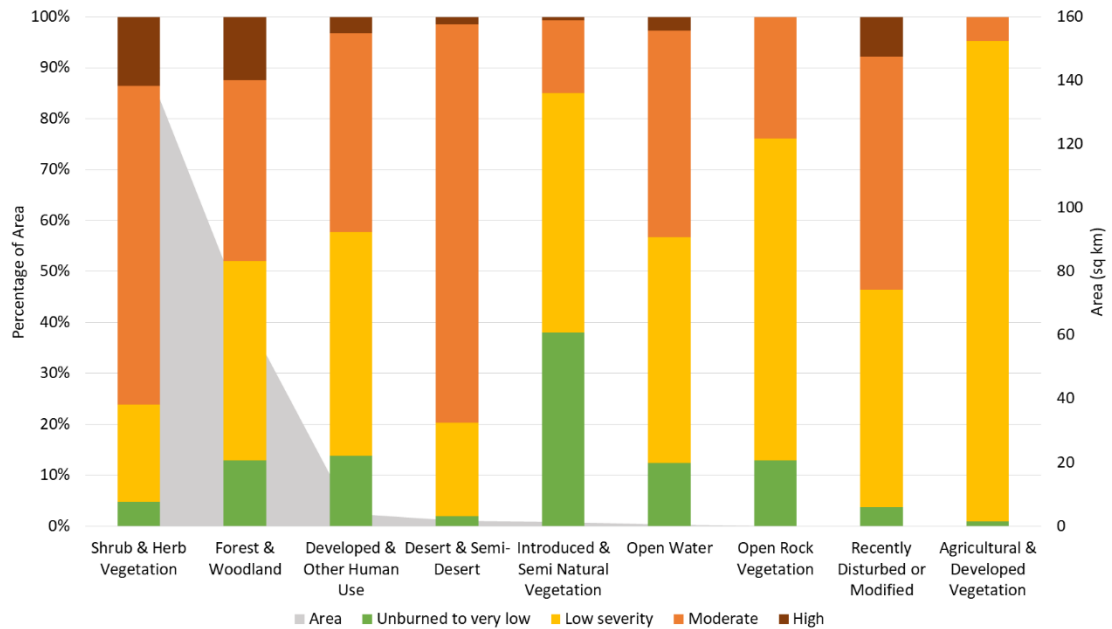
**Figure S5.** Alpha Angle 1 for October 2018 (southern flight line) derived from H-A-Alpha Eigenvector decomposition. Historic fires (black outlines) are shown, including the Station Fire (red outline) and Bobcat Fire (white outline). High alpha angle values are shown in green-to-blue and low alpha angle values are shown in orange-red colors.



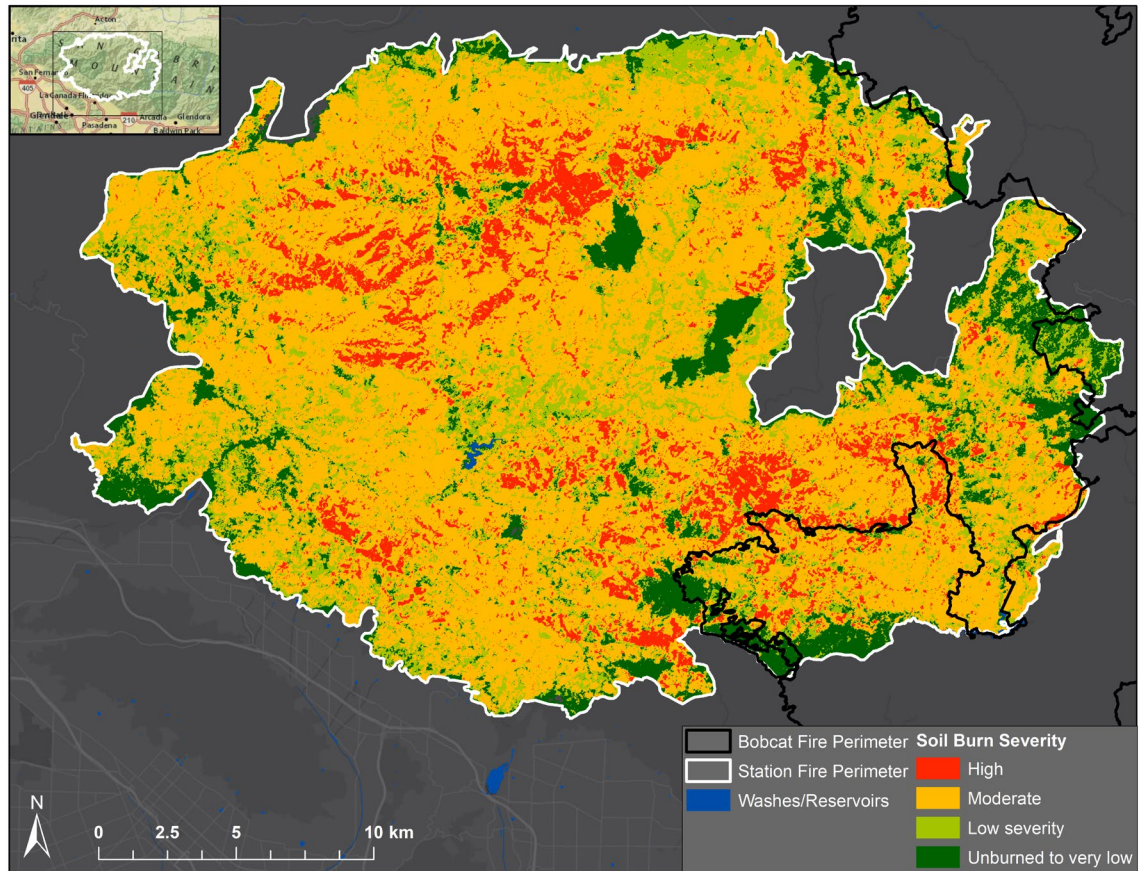


**Figure S7.** Average slope value (in degrees) for each burn progression polygon (see Figure 10 in main text for original perimeters). White areas show high average slope and black areas show low average slope.

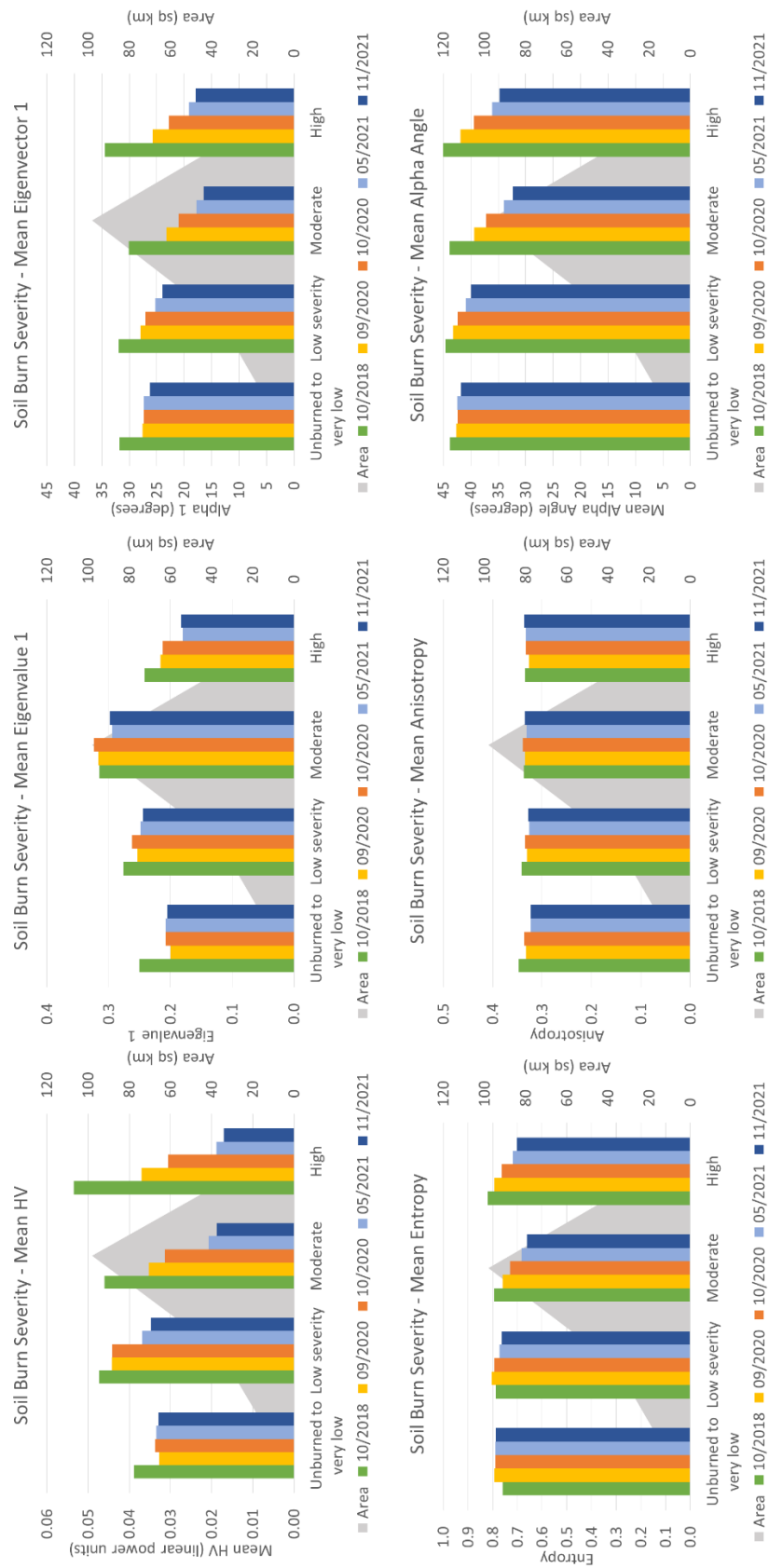




**Figure S8.** Burn severity distribution for each vegetation type. Each vegetation class shows the percentage area (for the Bobcat Fire) that burned for each burn severity class from the BAER dataset: unburned to very low (green), low (yellow), moderate (orange), and high (dark red). The secondary y-axis on the right side shows the area in square km that each class covers.



**Figure S9.** Station Fire GIS soil burn severity from USDA/BAER showing each burn severity class: high (red), moderate (yellow), low (light green), and unburned to very low (dark green). The Station Fire perimeter is shown as a white outline and the overlapping Bobcat Fire perimeter is shown in black.





**Figure S10.** Bar chart showing the six polarimetric parameters tested for this study: HV, Eigenvalue 1, Eigenvector 1, and the H-A-Alpha decomposition results (entropy, anisotropy, and mean alpha angle). For each parameter, pixels within each burn severity class are shown for each date, with dates during the fire (2020) in green-yellow-orange and dates after the fire (2021) in shades of blue. Each plot background shows the area covered by each burn severity class. This area is general distribution, as it differs per flight date due to slightly different pixels being masked for terrain shadow.