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Motivation

- Blowing dust, often overlooked in operational meteorology, adversely affects human health, transportation, and agriculture.
- Examining approximately 150,000 global large wildfires, Yu and Ginoux (2022) reveal that 54% of them are followed by enhanced dust emissions.

Background

Burn Scar Imagery -Terra/MODIS Dec. 13th, 2022

- On Sunday, October 23rd, 2022, a grass fire raged Nuckolls through County, Nebraska. Burning over 10,000 acres. The fire left a burn scar that stretched approximately 7 miles long and 3 miles wide.
- Following the wildfire, the Hastings NWS identified

recurring dust events from this burn scar and sought tools for forecasting future events in order to keep citizens surrounding the area safe and informed.

Data & Methods

- Hastings' National Weather Service's (NWS) Area Forecast Discussions (AFDs) were utilized to identify potential dates of dust lofting events.
- These dates were subsequently analyzed using the Dust RGB product to validate the occurrence of such events.
- A meteorological and soil analysis was conducted on these events to determine critical threshold conditions for dust lofting from burn scars.
- **Meteorological Analysis:**
- Soundings (UWYO/Sharppy), 500mb maps (UWYO), Surface Maps (NWS WPC)

Soil Analysis: Soil Type (Silt/Silt Loam, STATSGO), Drought Conditions (USDM), Vegetation (Enhanced Vegetation Index (L3, 16-Day) Terra/MODIS)

• This process was repeated to track the occurrence of dust events during the regrowth process of the burn scar and its surrounding region.









The left portion of this figure depicts satellite imagery of the burn scar undergoing the healing process.

- The right portion illustrates the Enhanced Vegetation Index (EVI) of the burn scar area.
- •As the burn scar heals, EVI values remain between 0.01 - 0.15,indicating sparse vegetation.
- Despite the gradual increase in vegetation, the occurrence of dust events remain consistent, and the strength of these events do not waiver.

EVI range: [-1 to 1] Healthy vegetation: 0.20≤0.80

- Drought conditions ranged from moderate
- No precipitation occurred within 24 hours.
- Volumetric Soil Moisture (VSM) values ranged from 10-20%.
- For this area's soil type, the capacity of VSM is 35 to 45%.

- 20

1.0



Meteorological Analysis

• The events lasted between 2 to 5 hours.

• In most cases, boundary layers exhibited stable conditions. • Vertical wind shear was observed in all three instances, which could potentially impact horizontal vorticity.



Conclusion

• The threat of a dust event lofted from a burn scar persists as the scar undergoes the healing process. • The Dust RGB demonstrates effective detection of hazardous dust events originating from burn scars, showing promising potential for future forecasting. These cases exhibited similarities that could be correlated with the critical threshold criterion for dust lofting from burn scars.

Future Work

• The occurrences of these dust events will be incorporated into a training dataset for machine learning to enhance detection specifically related to burn scars.

 Further research is necessary to determine and identify the critical conditions that result in dust lofting from post-fire burn scars.

knowledge with Armed about meteorological and soil conditions conducive to dust events, forecasters could potentially utilize the Dust RGB to track and monitor dust events occurring in healing burn scars.

For more information on this topic, scan the QR Code below to view a poster by Connor Welch (UAH, NASA SPoRT) on the Development and Application of NASA SPoRT's DustTracker-Al model for Real-time Identification Tracking of Dust in Geostationary Satellite Imagery.

