## A comparison of landscape impacts from Great Smoky's May 2017 windstorm and Nov. 2016 wildfire caused by recurrent mountain waves



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#### **Objectives**

To better understand this recurring Mountain Wave weather hazard in and near the Park,

By employing new remote sensing <u>technologies</u> that can show disturbance <u>behavior</u> and <u>impacts</u> in new light,

And distinguish <u>ephemeral</u> from <u>impactful</u> change at 10m resolution.

### Great Smoky's peculiar hazard from Mountain Waves

![](_page_2_Figure_1.jpeg)

## Generalized Mountain Wave winds north of Gatlinburg

![](_page_3_Figure_1.jpeg)

![](_page_4_Picture_0.jpeg)

#### The Mountain Wave wildfire

<u>Date</u>: Nov. 28, 2016

<u>Methodology</u>: Comparison of growing season max-value composites for summer 2016 and 2017.

![](_page_4_Picture_4.jpeg)

Year 2

Year 1

Sentinel 2 10m

![](_page_4_Picture_7.jpeg)

![](_page_4_Picture_8.jpeg)

#### The Mountain Wave windstorm

*Date*: May 4, 2017

<u>Methodology</u>: Quantify the strength of the reversal of spring greenup before and after the wind event.

![](_page_4_Figure_12.jpeg)

Sentinel 2 true color May 2, 2017

Gatlinburg

Mt. LeConte

TN

NC

Sentinel 2 true color May 15, 2017

Gatlinburg

1 4 A A

Decline

Greening

TN

Mt. LeConte

NC

Greenup reversal May 2 vs. May 15, 2017

SS

![](_page_7_Figure_1.jpeg)

# Strength of the early May 2017 phenological reversal for the Great Smoky Mountains National Park region

![](_page_8_Figure_1.jpeg)

### Growing season impacts of the

# fire and windstorm

2016 vs. 2017 from Sentinel 2 composites

Seasonally-persistent windstorm damage

Gatinoline

Great Smoky Mountains National Park

![](_page_9_Figure_5.jpeg)

![](_page_10_Figure_0.jpeg)

![](_page_11_Figure_0.jpeg)

# Average growing season vegetation (rdNDVI) change from a fire and windstorm by elevation

![](_page_12_Figure_1.jpeg)

#### Average growing season vegetation (rdNDVI) change from a fire and windstorm by aspect (1,300-2,800 ft.) N=9,078 random Sentinel 2

![](_page_13_Figure_1.jpeg)

#### Average growing season vegetation (rdNDVI) change from a fire and windstorm by topographic position (1,300-2,800 ft.) N=9,078 random Sentinel 2

![](_page_14_Figure_1.jpeg)

# Conclusions

- This research has quantified vegetation impacts in the Park using a uniform NDVI measure at 10m resolution following the *Chimney Tops 2 Fire* and subsequent *May 4, 2017 windstorm*—two landscape disturbances caused by similar *Mountain Waves*.
- Topographic analysis reveals similarities and differences, with fire's response strongly linked to slope-associated fuels and windstorm effects suggesting slope exposure, valley channelization and sensitivity to the magnitude of the prior (fire) disturbance.
- As much as vegetation dynamics here depends on these extreme events, the mechanisms of disturbance and succession are spatially variable and mappable, *thus, are hazards and risks*.

![](_page_15_Picture_4.jpeg)