A recent summer wave pattern in the Arctic explains co-occurrences of European heat waves, and wildfires in Siberia, Alaska, and Canada

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In recent years, we have often seen the news on European heat waves, and wildfires in/around the Arctic region such as Siberia and Alaska. Those would be hazards and also induce disasters, depending on their magnitude. Wildfire emits massive air pollutions (i.e., $PM_{2.5}$) into the atmosphere and causes significant air pollutions in the downwind region [1,2]. Therefore, heat waves and wildfires are of large concern in general public these days.

In this presentation, we focus on when the Arctic air pollution reaches significant degrees and what the causes of the worse air quality for more than a recent decade. However, long-term assessment of air pollution in the Arctic region has been very difficult until recently because of the absence of continuous and extensive $PM_{2.5}$ data. Using the latest NASA’s re-analysis data, MERRA-2 (https://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/), this long-term assessment of air pollutions (aerosols) in the Arctic has become possible because of high quality aerosol data based on the aerosol data assimilation with satellite data (especially more satellite data from 2003) [3].

Here we analyze the 20 worst air quality months in the Arctic in 2003-2017, showing that 13 months were the summer months (July and August) with significant wildfire occurrences. The 13-month mean atmospheric fields (composites) show the simultaneous surface warmth and high-pressure anomaly patterns in the lower and free troposphere over Europe, Siberia, and North America (i.e., Alaska and Canada), which was similar to an independently analyzed climate pattern observed in recent years. This climate (i.e., Arctic wave) pattern in summer was not seen before 2003 and only seen after that. Investigating more on this climate pattern would likely be a better index to predict the co-occurrences of European heat waves and wildfires across Siberia, Alaska, and Canada in summer in the future.

References:

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