# Solar Activity and Sakura

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## Introduction

Solar activity affects the Earth in various ways from weather to flora. Solar storms emit radiation that affects particularly sensitive plant life, namely cherry blossoms. The blooming period of the cherry blossoms are correlated with the cycle of sunspots.

## Data & Methods

Sakura (*Prunus serrulata*) are particularly sensitive to temperature such that warmer temperatures lead to earlier blooms while cooler temperature delay blooming **(Leamon and Kim 2024)**. Bloom development has been observed, studied, and recorded since at least 812 AD **(Aono and Kazui 2008)**.

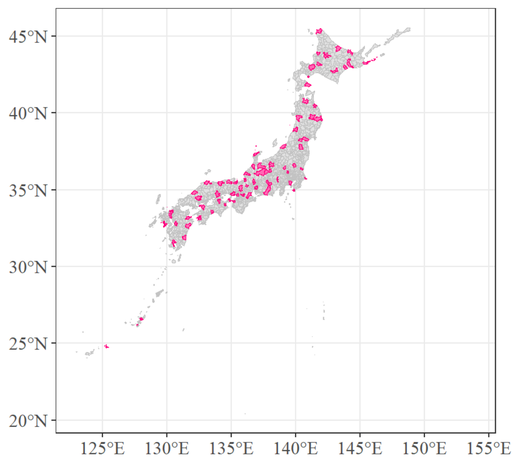


*Figure 1. locations of cherry blossom observations*

71 years of loom dates from 101 sites were compared to solar cycles, patterns emerged.

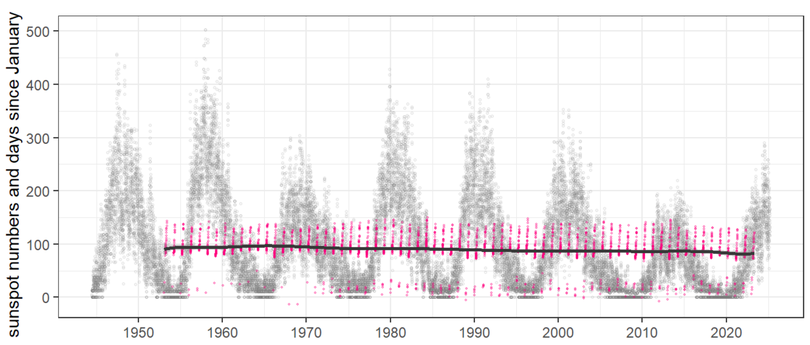


*Figure 2. bloom dates versus sunspot counts*

Omitting the southernmost five locations in the islands, 96 sites remain. Earliest date each year were considered to be leading edge frontier for evaluation.

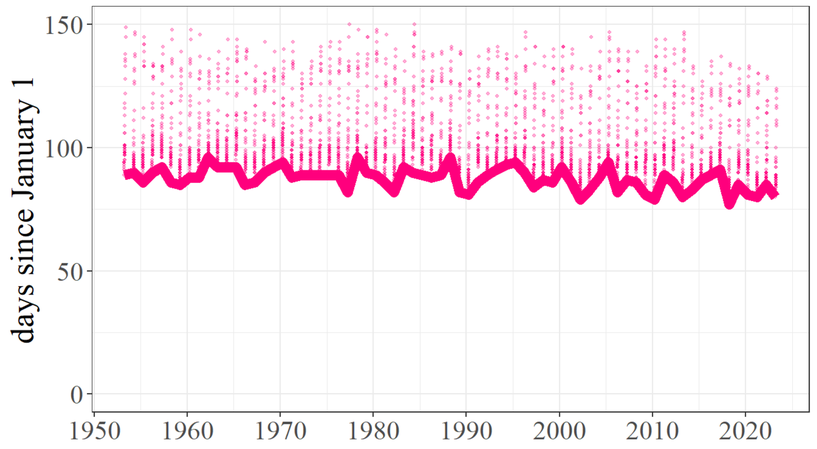


*Figure 3. earliest bloom dates leading edge*

## Analysis

Bloom dates **(Glasnapp 2024)** vary in similar pattern as solar sunspot cycle **(Vanlommel et al. 2004)** with peaks and valleys albeit out-of-sync. Peaks in sunspot activity are associated with temperature and precipitation, e.g., terrestrial weather. Minimums in activity, in contrast, cooler. Subtle temperature differences are sufficient to affect blooming dates.

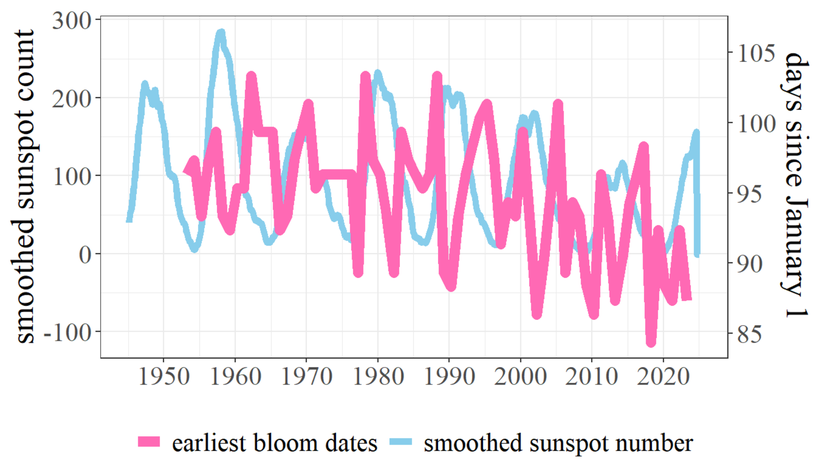


*Figure 4. earliest bloom versus sunspot cycles*

During declining phase of solar cycle, bloom dates were earlier. While not perfectly aligned, it can be implied sunspot activity has a delayed affect on global temperature and, therefore, cherry blossoms. Cycle correlograms indicated offset inverse correlation between blooming dates and solar cycles. Lagged variables were statistically significant beginning at 3 years, but correlation maximized at 5 years.

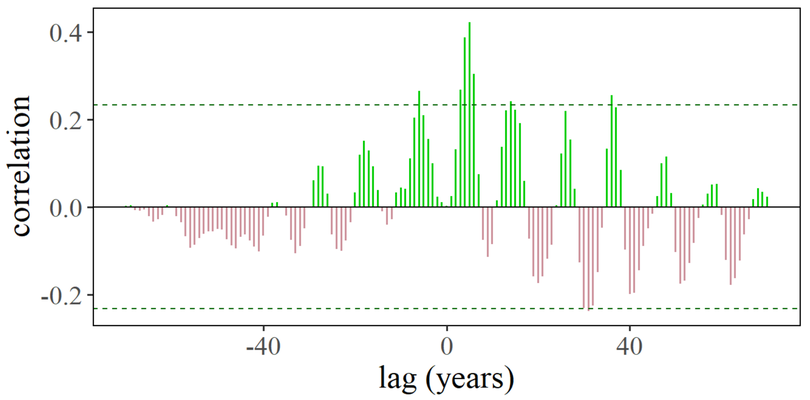


*Figure 5. bloom date and sunspot correlogram*

## Results & Conclusions

Radiation emitted during solar storms impacts the Earth ever so slightly. Because of solar sunspot cycles, Sakura blooms arrive early during peak solar activity delayed blooms during low activity. Sakura blooms are directly affected by these solar storms.

## Acknowledgement & Bio

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Data and inspiration obtained from:

- Github **Schumacher (2021)**
- Kaggle **Glasnapp (2024)**
- Lynker-Space **Leamon and Kim (2024)**

Griffin is an undergraduate senior at Kansas State University majoring in biochemistry.

## References

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