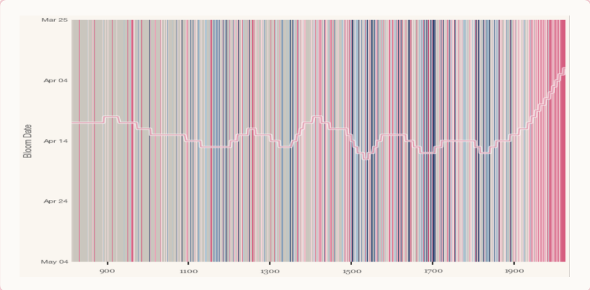
1,200 Years of Cherry Blossoms in Kyoto

A Visual Companion Guide

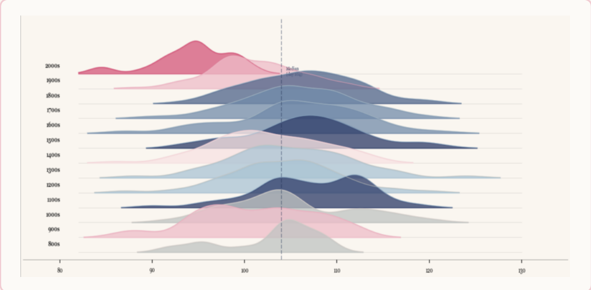
No instrument record spans 1,200 years — but cherry blossoms do.

Six interconnected data visualizations of the world's longest continuous phenological record



Sakura Stripes

Radial Calendar



Centuries Compared

Data: Dr. Yasuyuki Aono · Osaka Metropolitan University
Aono & Kazui (2008) · Aono & Saito (2010)

The Data

The dataset comes from Dr. Yasuyuki Aono of Osaka Metropolitan University. By combing through imperial diaries, aristocratic journals, monastic chronicles, and government records, Aono and colleagues reconstructed the full-flowering date (mankai) of cherry trees (*Prunus jamasakura*) in Kyoto from 812 CE to the present — roughly 837 bloom observations spanning over 1,200 years.

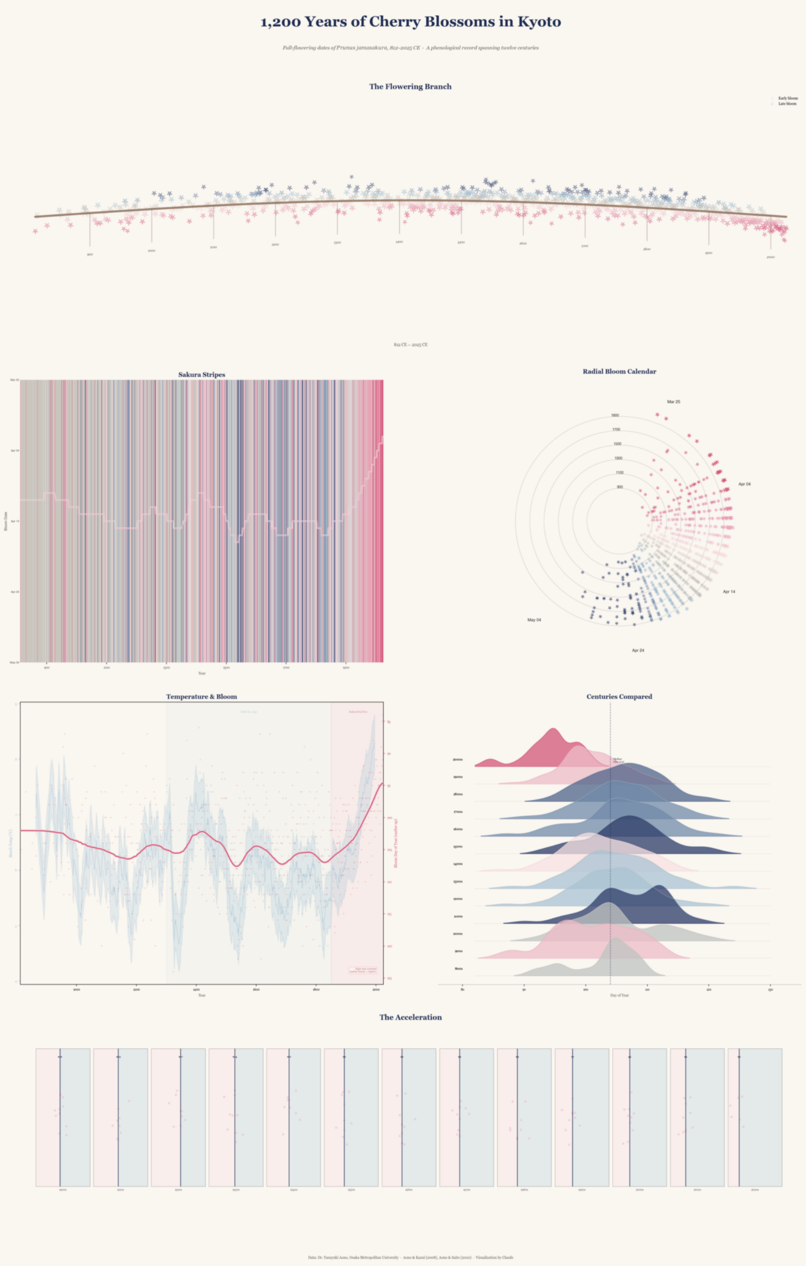
Each record contains three fields: the calendar year, the day of year on which full bloom occurred (e.g., day 104 ≈ April 14), and a reconstruction of mean March temperature in °C derived from the bloom date via a phenological model.

The median bloom date across the full record is day 104 (approximately April 14). Earlier bloom dates indicate warmer springs; later dates indicate cooler springs.

Key Numbers

837 bloom observations · 812–2025 CE
Median bloom: Day 104 (April 14)
12 centuries of continuous data

The Complete Poster



Sources

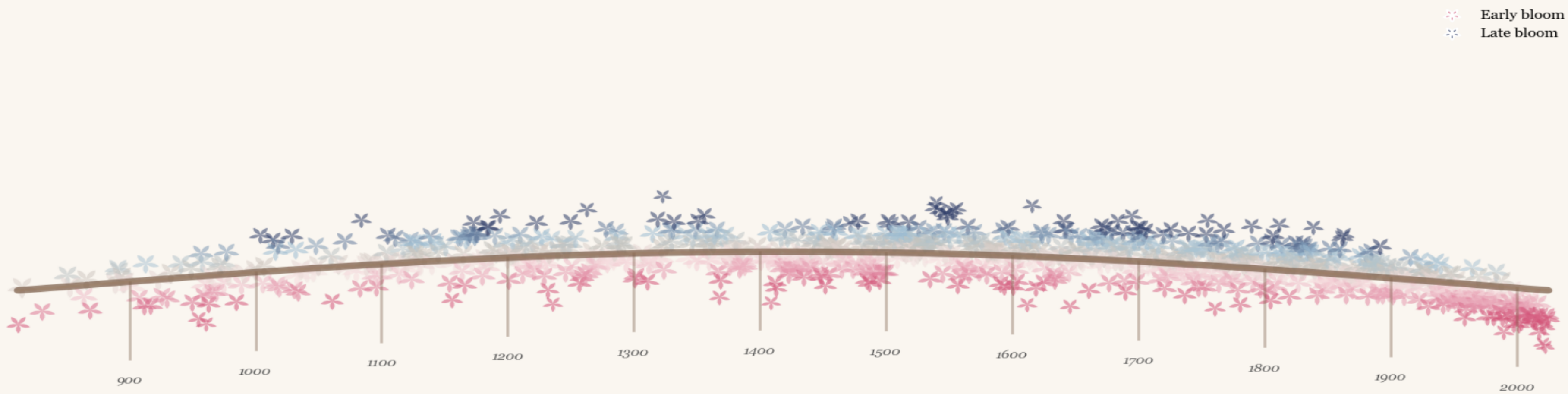
Aono, Y. & Kazui, K. (2008). Phenological data series of cherry tree flowering in Kyoto, Japan. Int. J. Climatology, 28, 905–914.

Aono, Y. & Saito, S. (2010). Clarifying springtime temperature reconstructions of the medieval period. Int. J. Biometeorology, 54, 211–219.

1

The Flowering Branch

Full-width hero panel · 812–2025 CE



What You're Looking At

A sinuous brown curve flows left to right, representing the passage of time from 812 CE to 2025 CE. Along this branch, each year with a bloom observation is plotted as a custom five-petal cherry blossom marker. Small side-branches drop down at each century mark.

What It Means

Early centuries show no strong directional bias. The 1400–1800 period shifts indigo — the Little Ice Age. The 20th century pivots decisively pink: modern warming is rewriting the phenological calendar.

How to Read It

Color encodes bloom-date anomaly: deep pink = earlier than the 1,200-year median, indigo = later. Vertical position also encodes anomaly — blossoms above the branch bloomed early. Size scales inversely with anomaly magnitude.

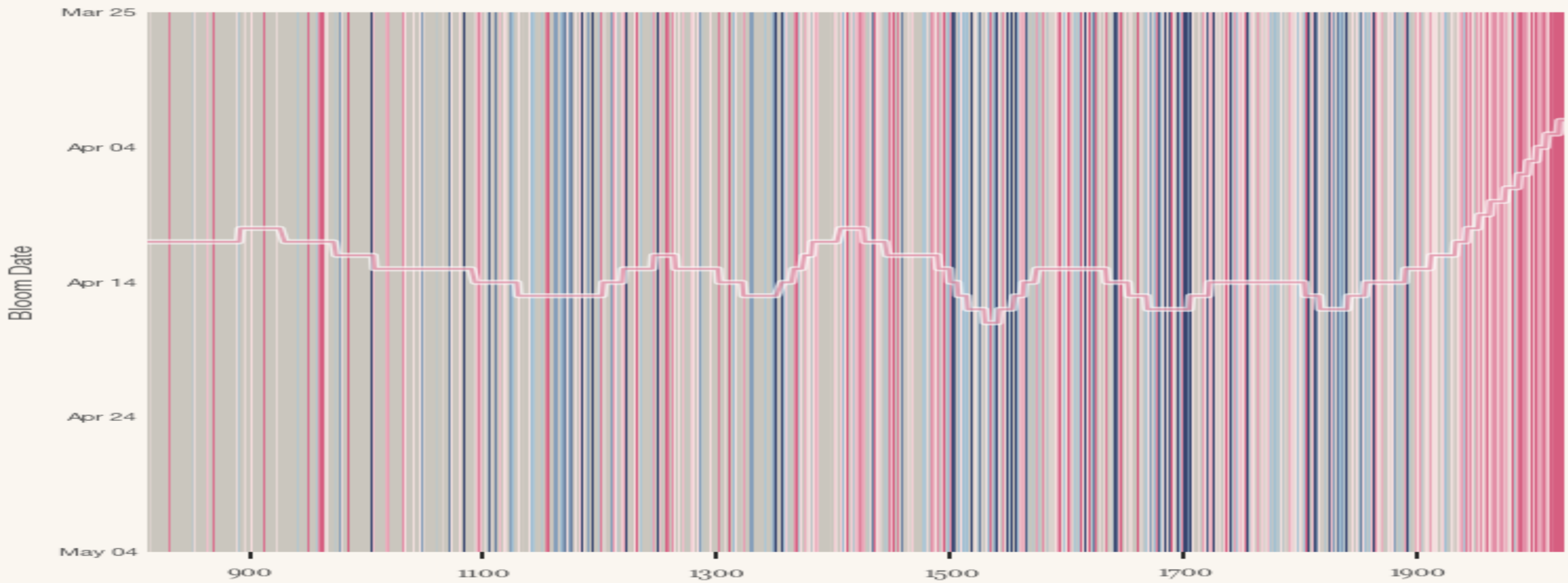
How It Was Built

Branch: composite sine wave. Marker: matplotlib.path.Path with 5 quadratic Bézier petals. Color: custom diverging colormap sakura to cream to indigo.

2

Sakura Stripes

Climate-stripe visualization · One stripe per year, 812–2025



What You're Looking At

Inspired by Ed Hawkins' famous warming stripes. One thin vertical stripe for every year from 812 to 2025. Years with bloom data are colored; missing years appear in warm gray.

What It Means

Reads like a phenological textile. Medieval: mixed tones. 1400–1800: distinctly cooler — the Little Ice Age in color. Post-1900: erupts in pink. Gray density in early centuries traces the evolution of record-keeping itself.

How to Read It

Pink stripes = early bloom (warm spring). Indigo stripes = late bloom (cool spring). Gray = missing data. A translucent white curve with pink center line traces a 30-year smoothed trend.

How It Was Built

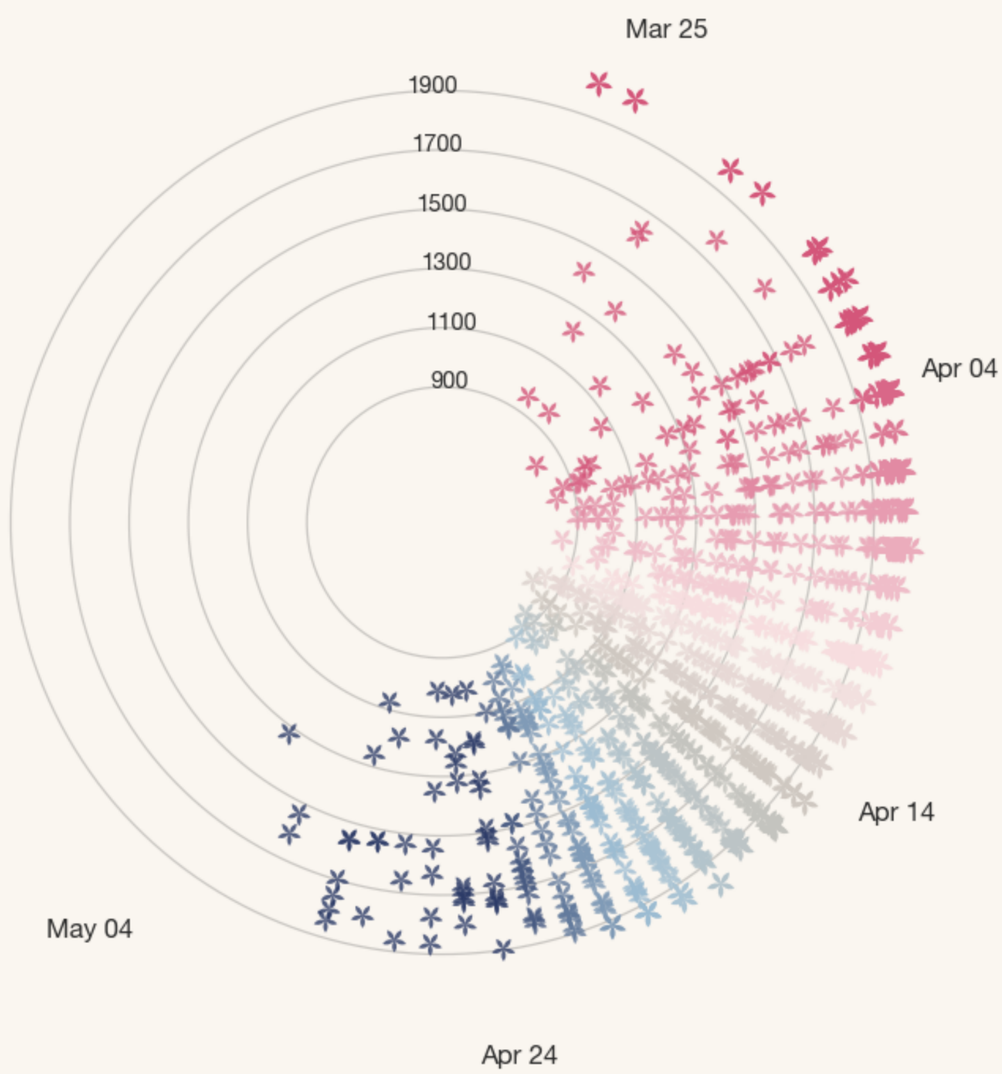
Each year: axvspan 1 unit wide. DOY normalized to 5th-95th percentile, mapped through 6-stop custom colormap. Smoothed trend: gaussian_filter1d with sigma=15 (~30-year window).

The stripe pattern is a phenological barcode — a 1,200-year record compressed into a single visual ribbon.

3

Radial Bloom Calendar

Polar projection · Angular = bloom date, Radial = year



What You're Looking At

A polar plot where each data point is a small blossom marker. The plot uses a 270° arc to map the bloom date window, with date labels from late March to early May around the perimeter.

How to Read It

Angular position = Day of Year (clockwise = earlier bloom). Radial position = year (center = 800s, outer edge = 1900s). Concentric rings mark every 200 years. Color = bloom anomaly, same pink-to-indigo scale as the branch panel.

What It Means

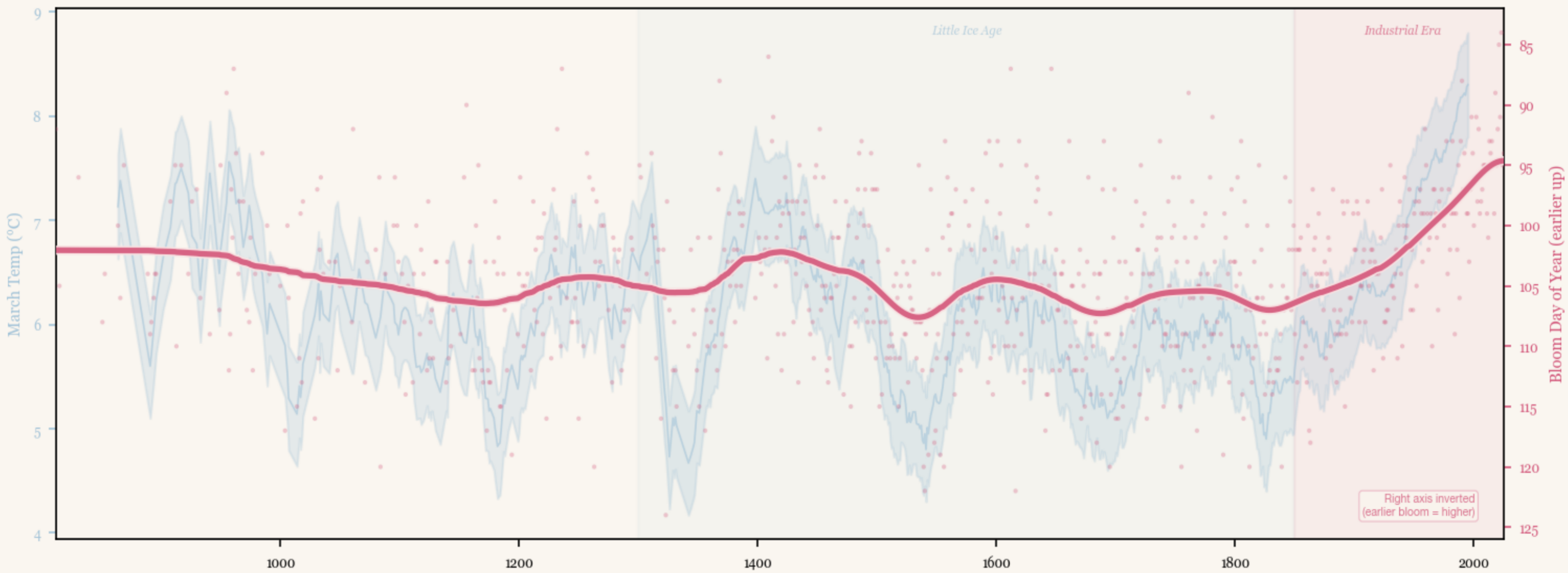
The spiral tells the story. Inner rings scatter widely; the outer modern ring clusters tightly in pink, clockwise toward earlier dates. Twelve centuries of drift, made visceral.

How It Was Built

DOY mapped to 270-degree arc (4.71 rad) sweeping clockwise. Radial: year mapped linearly 0.2-0.9 with Gaussian jitter (sigma=0.005). Native matplotlib polar subplot.

4 Temperature & Bloom

Dual-axis time series · March temperature vs. bloom timing



What You're Looking At

A dual-axis time series spanning the full record. March mean temperature appears as an ice-blue confidence ribbon. Bloom day of year appears as scattered pink points with a smoothed curve.

What It Means

Temperature and bloom are tightly coupled. The Little Ice Age (1300–1850) shows cooler temps and later blooms. The Industrial Era shows rising temperatures and dramatically earlier blooms. The smooth curve drops from ~day 108 (medieval) to below day 100 (modern) — a shift of over a week.

How to Read It

Ice blue ribbon (left axis) = March temperature ±0.5°C. Pink scatter + curve (right axis, inverted) = bloom DOY. Earlier bloom appears higher, aligning visually with warmer temperatures. Shaded bands mark the Little Ice Age and Industrial Era.

How It Was Built

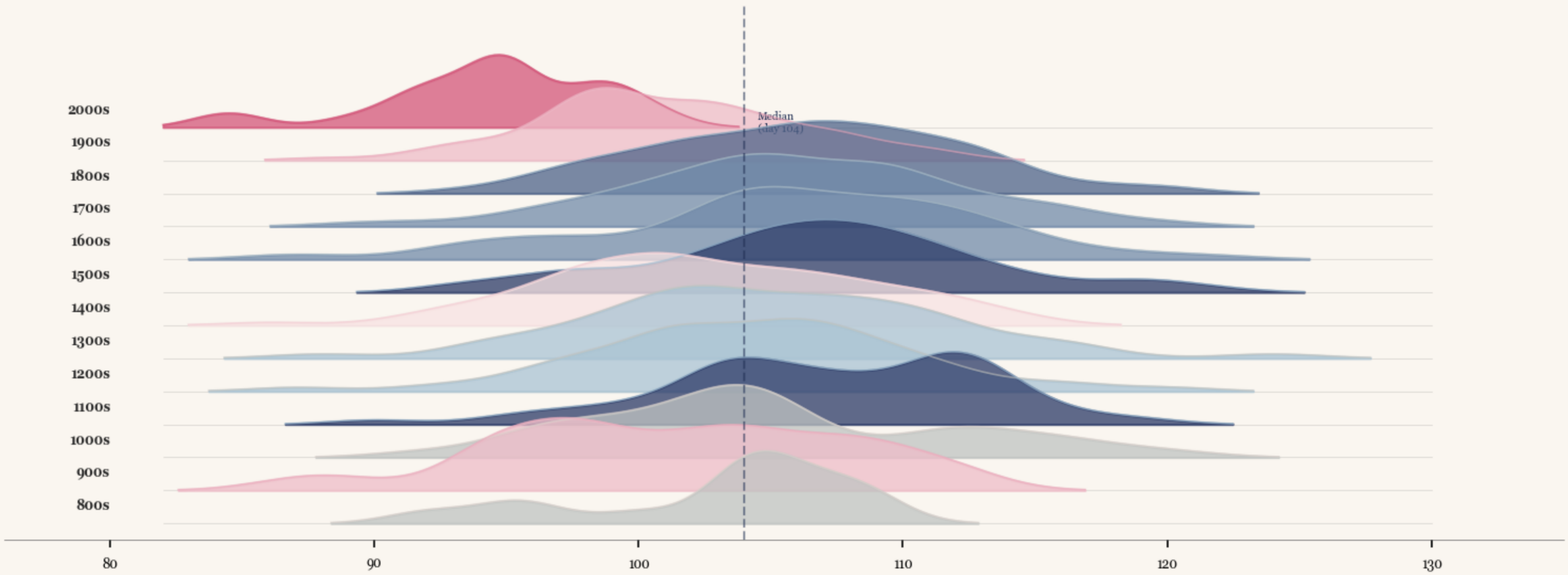
Temperature ribbon: fill_between with +/-0.5C bounds. Bloom curve: gaussian_filter1d (sigma=20) with patheffects glow. Dual axes via twinx() secondary axis inverted. Era labels positioned with get_xaxis_transform().

The inverted right axis is a deliberate design choice — it makes temperature and bloom move in visual harmony, revealing their tight physical coupling.

5

Centuries Compared

Ridgeline / joy plot · Kernel density estimate per century



What You're Looking At

A ridgeline plot with one row per century. Each row shows the kernel density estimate (KDE) of bloom dates for that century's observations. Rows stack vertically with slight overlap.

What It Means

Perhaps the clearest panel. The bottom rows (800s–1100s) center near the median. The middle rows (1200s–1700s) shift rightward — later blooms during the Little Ice Age. The top rows (1800s–1900s) shift dramatically left. The 1900s curve barely overlaps with medieval distributions at all.

How to Read It

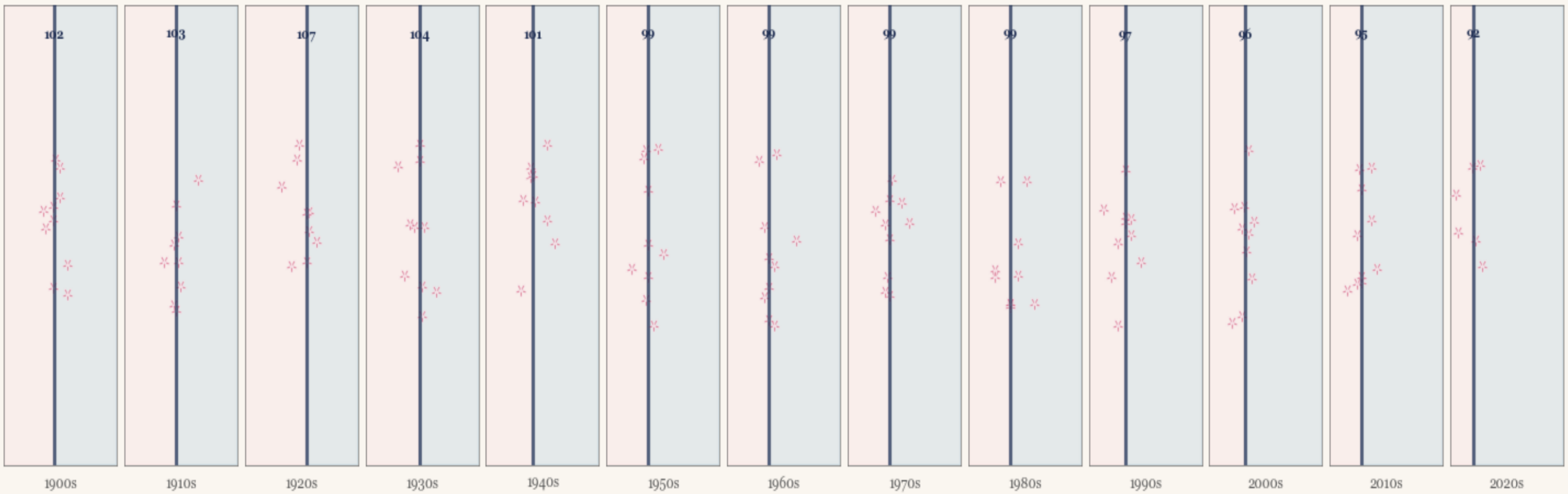
Horizontal axis = Day of Year (left = earlier bloom). Each pink curve = probability distribution of bloom dates within a century. Color gradient: pale pink (earliest) to deep sakura (most recent). Vertical dashed line = all-time median (day 104).

How It Was Built

Gaussian KDE (bandwidth=0.3) per century, evaluated over days 82-130, max-normalized to height 2.2, tails clipped below 0.02. fill_between at stacked baselines. Z-order reversed for cascade. Sakura gradient colormap for progressive coloring.

6 The Acceleration

Decade small multiples · 1900s–2020s bloom timing



What You're Looking At

A row of small-multiple panels, one per decade from the 1900s to the 2020s. Each panel shows individual bloom observations as blossom markers with a vertical median line. Background color warms from cream to pink across the decades.

How to Read It

Each small panel spans days 82–128 on the x-axis. Pink blossom markers show individual years; the indigo vertical line marks the decade's median bloom date. The number at the top of each line is the median day of year. Watch the median shift left (earlier) across the century.

What It Means

The 1900s median sits around day 107. By the 2010s it has dropped to around day 95 — nearly two weeks earlier. The acceleration is not gradual: most of the shift occurs after the 1980s, coinciding with rapid warming. The background gradient makes the warming trajectory viscerally clear.

How It Was Built

Parent axes with inset_axes for each decade. Blossom markers with vertical jitter. Median via axvline. Background: cream-to-sakura LinearSegmentedColormap indexed by decade position.

Color Palette

A Japanese-inspired palette of sakura, indigo, and natural tones

Sakura Light	`#F9E4E4`	Backgrounds, early-bloom tint
Sakura Mid	`#E8A0B4`	Mid-range bloom encoding
Sakura Deep	`#D4567A`	Early bloom, primary accent
Deep Indigo	`#2B3A67`	Late bloom, titles, emphasis
Ice Blue	`#A3C4D9`	Temperature data
Warm Gold	`#C9A84C`	Highlights, reserved
Warm Brown	`#7A5C47`	Branch artwork
Cream / Paper	`#FAF6F0`	Background
Gray	`#C8C4BC`	Missing data

Custom Colormaps

`BLOOM_CMAP` Diverging: sakura pink - neutral - indigo

`BLOOM_CMAP_R` Reversed diverging for scatter plots

`SAKURA_GRADIENT` Sequential for ridgeline fills

Technical Details

Requirements

Python 3.8+
matplotlib, numpy, pandas, scipy, Pillow
Internet connection for first run (data cached locally)

Running

```
python3 kyoto_cherry_blossom_poster.py
```

Output Files

kyoto_cherry_blossoms.pdf — 24×36" at 300 DPI (print-ready)
kyoto_cherry_blossoms.png — Same layout at 150 DPI (web)

Data Pipeline

1. Download from GitHub-hosted CSV mirror
2. Fall back to Aono's university HTML table
3. Fall back to local CSV cache
4. Auto-detect and standardize column names
5. Save local copy for future offline runs

Poster Layout

Row 0 Title + subtitle (full width)
Row 1 Panel 1: The Flowering Branch (full)
Row 2 Panels 2–3: Stripes | Radial (split)
Row 3 Panels 4–5: Temp | Centuries (split)
Row 4 Panel 6: The Acceleration (full)
Row 5 Footer / attribution (full)

The Blossom Marker

A custom matplotlib Path with 5 petals, each built from quadratic Bézier curves radiating from center. Petals at 72° intervals, width 0.38, midpoint factor 0.55 — tuned to approximate the rounded shape of real *Prunus* petals.