Visualizing Time Series Data

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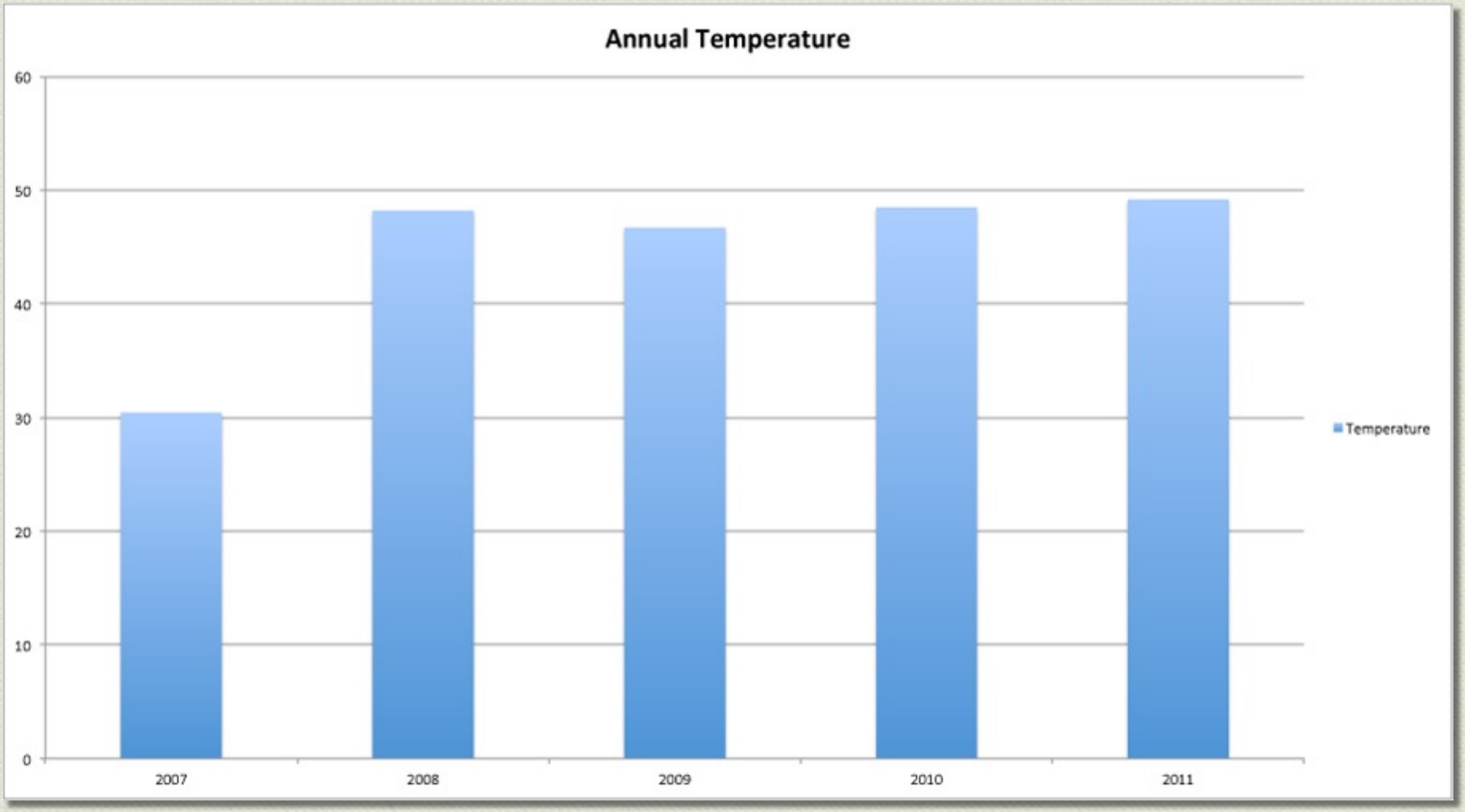
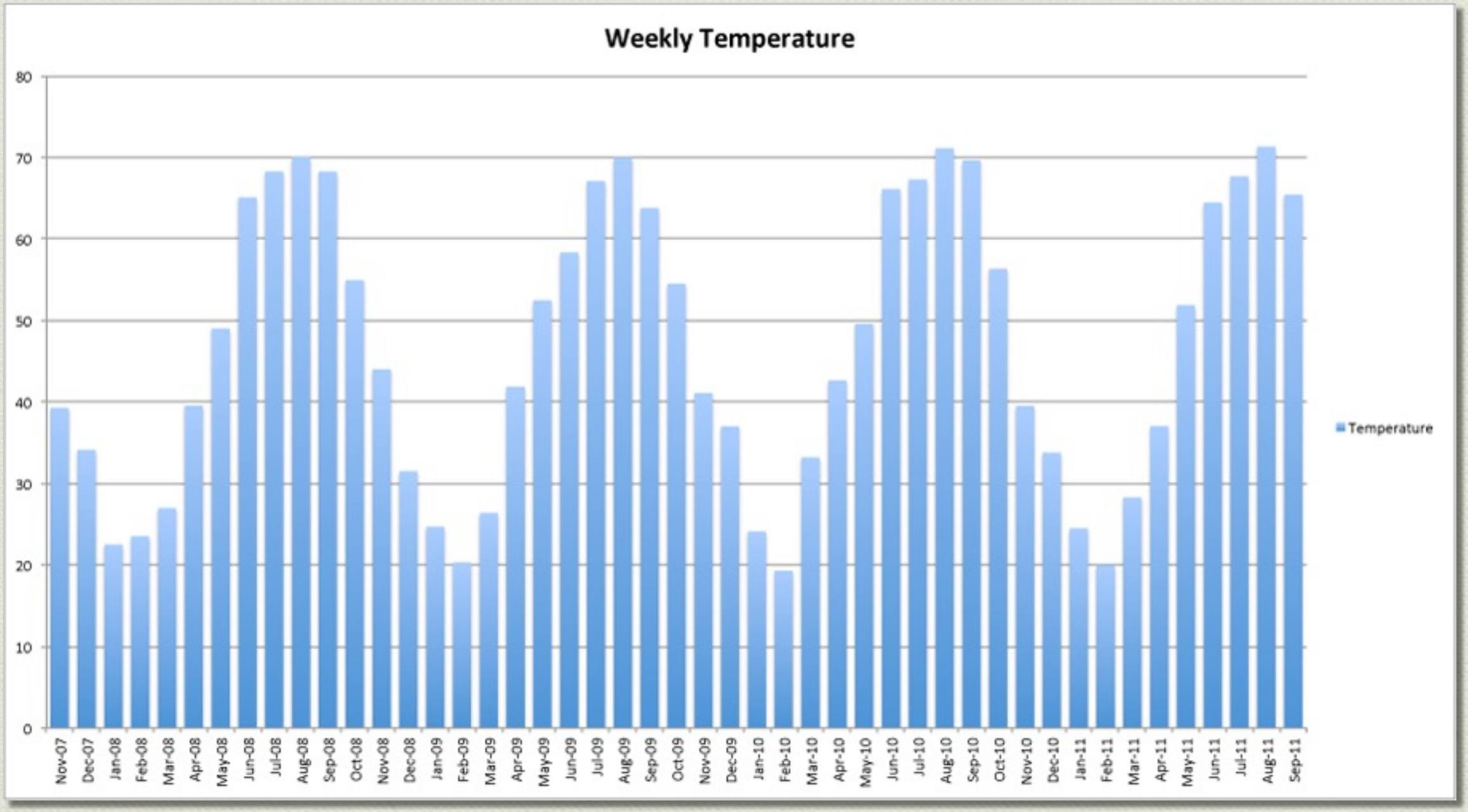
Introduction

- What to search for:
  - temporal trends and patterns
  - spikes, dips
  - outliers
- Charts, graphs, tables
  - bar chart, line chart, tables, Theme River, spiral timelines, bubble trails
- Animation
  - in-place, addition

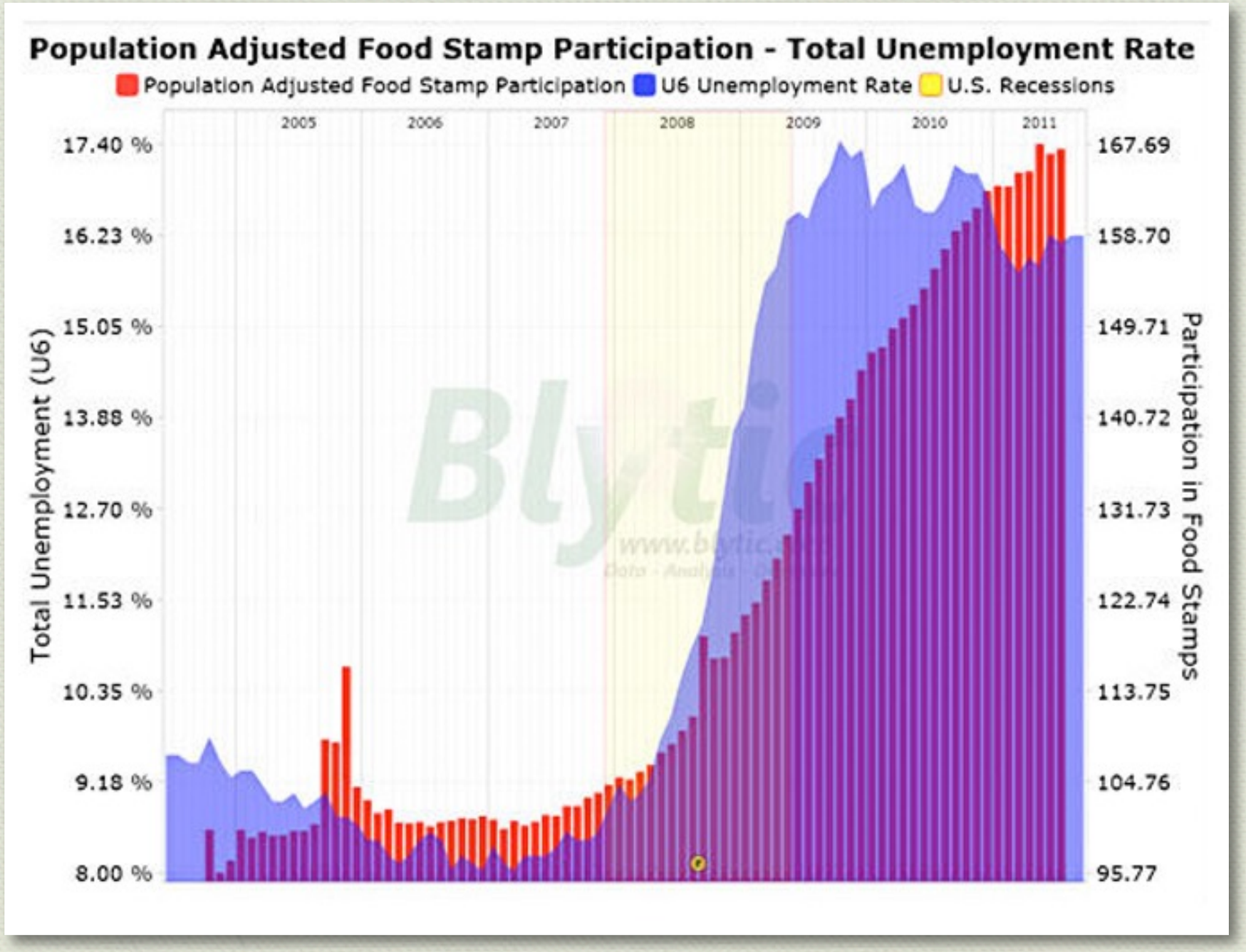
Overview Bar Graph



Detail Bar Graph



Correlated Bar Graphs



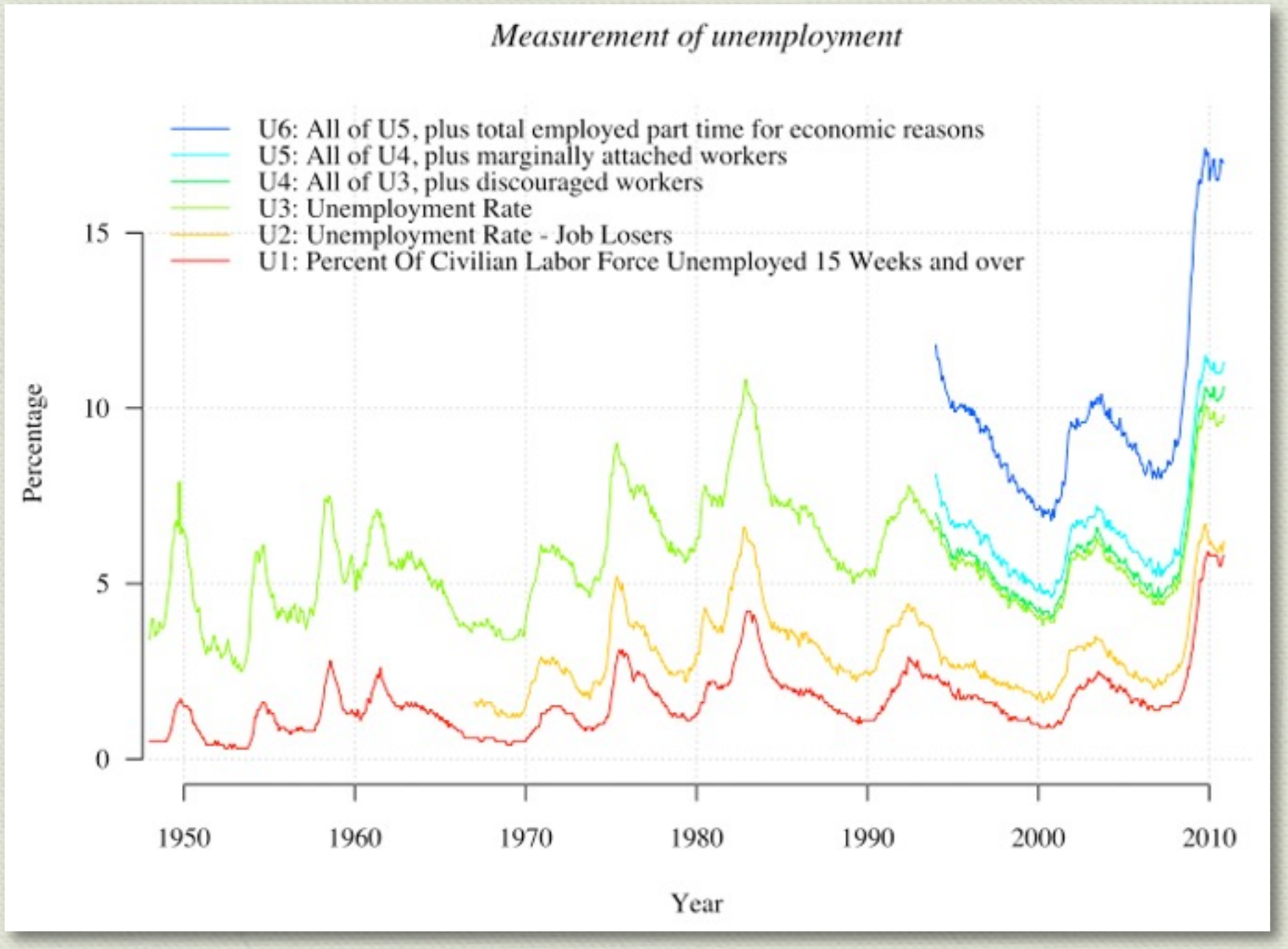
Table

Unemployment Rate - U6

2000 - 2011

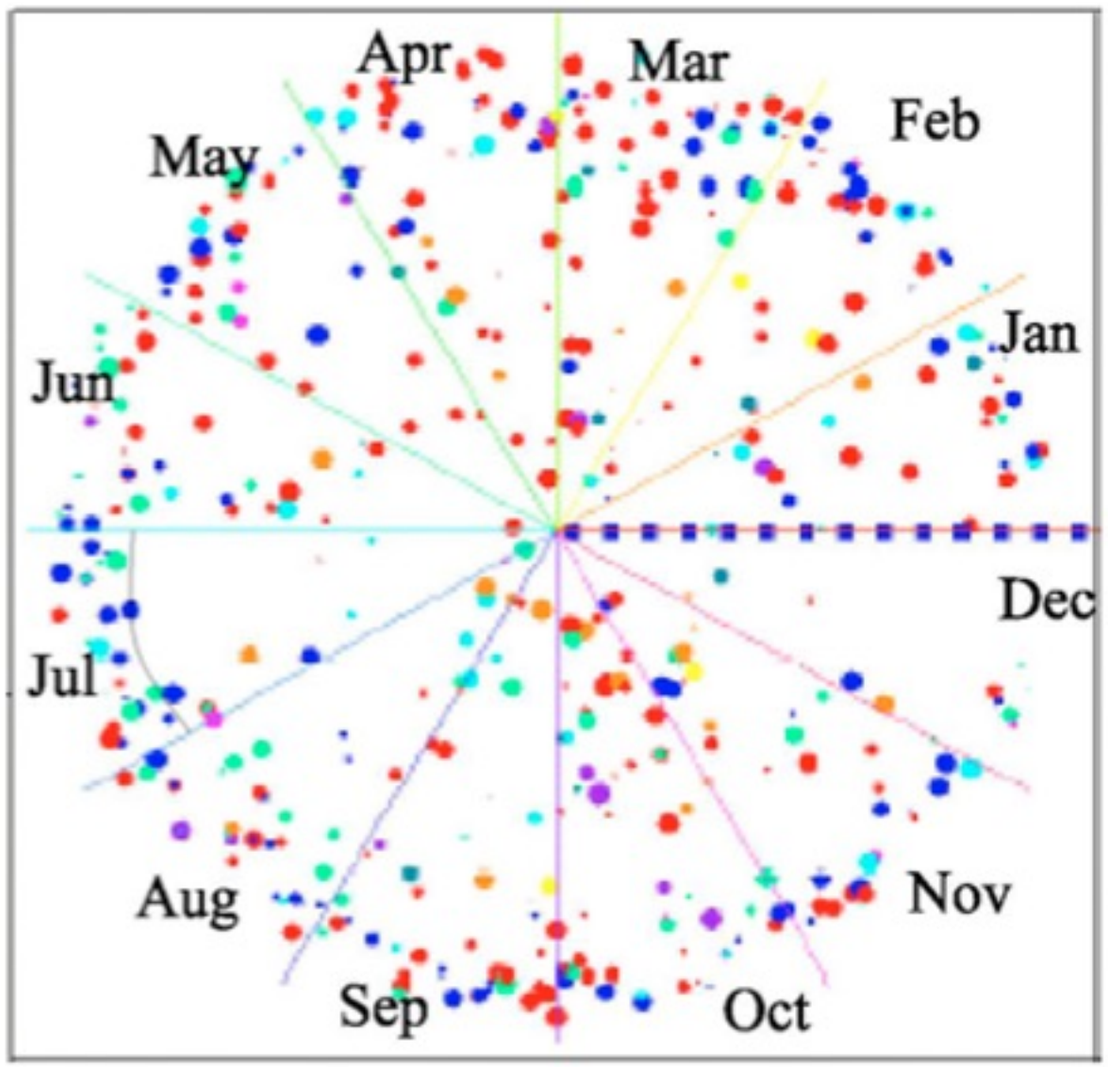
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
2000	7.1	7.2	7.1	6.9	7.1	7.0	7.0	7.1	7.0	6.8	7.1	6.9	2000
2001	7.3	7.4	7.3	7.4	7.5	7.9	7.8	8.1	8.7	9.3	9.4	9.6	2001
2002	9.5	9.5	9.4	9.7	9.5	9.5	9.6	9.6	9.6	9.6	9.7	9.8	2002
2003	10.0	10.2	10.0	10.2	10.1	10.3	10.3	10.1	10.4	10.2	10.0	9.8	2003
2004	9.9	9.7	10.0	9.6	9.6	9.5	9.5	9.4	9.4	9.7	9.4	9.2	2004
2005	9.3	9.3	9.1	8.9	8.9	9.0	8.8	8.9	9.0	8.7	8.7	8.6	2005
2006	8.4	8.4	8.2	8.1	8.2	8.4	8.5	8.4	8.0	8.2	8.1	8.0	2006
2007	8.3	8.1	8.0	8.2	8.2	8.2	8.3	8.5	8.4	8.4	8.5	8.8	2007
2008	9.1	8.9	9.0	9.2	9.7	10.0	10.5	10.9	11.2	11.9	12.8	13.7	2008
2009	14.0	15.0	15.6	15.8	16.4	16.5	16.4	16.8	17.0	17.4	17.2	17.3	2009
2010	16.5	16.8	16.9	17.1	16.6	16.5	16.5	16.7	17.1	17.0	17.0	16.7	2010
2011	16.1	15.9	15.7	15.9	15.8	16.2	16.1	16.2					

Stacked Line Graph

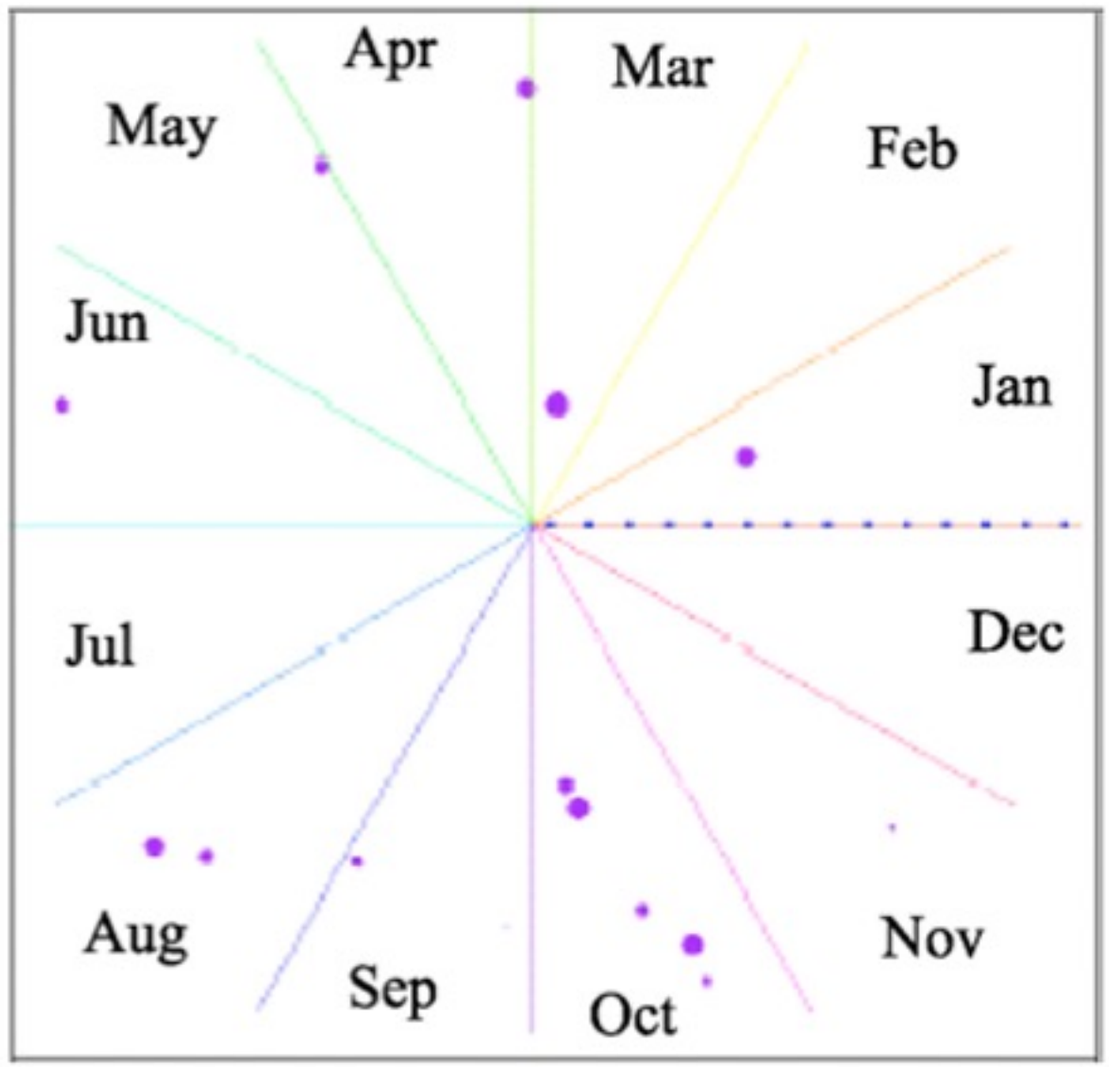


Spiral Timeline

all movies

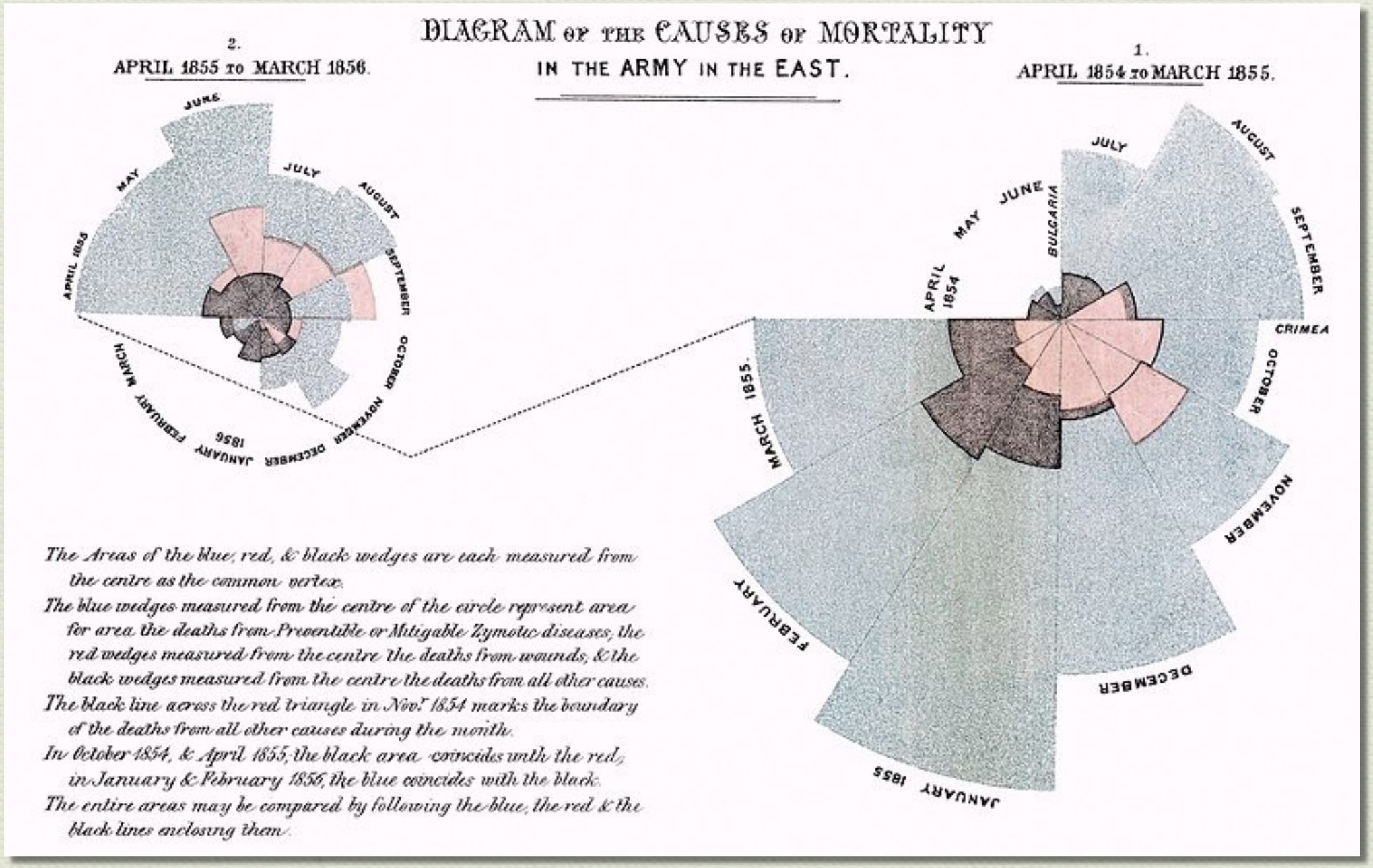


horror movies

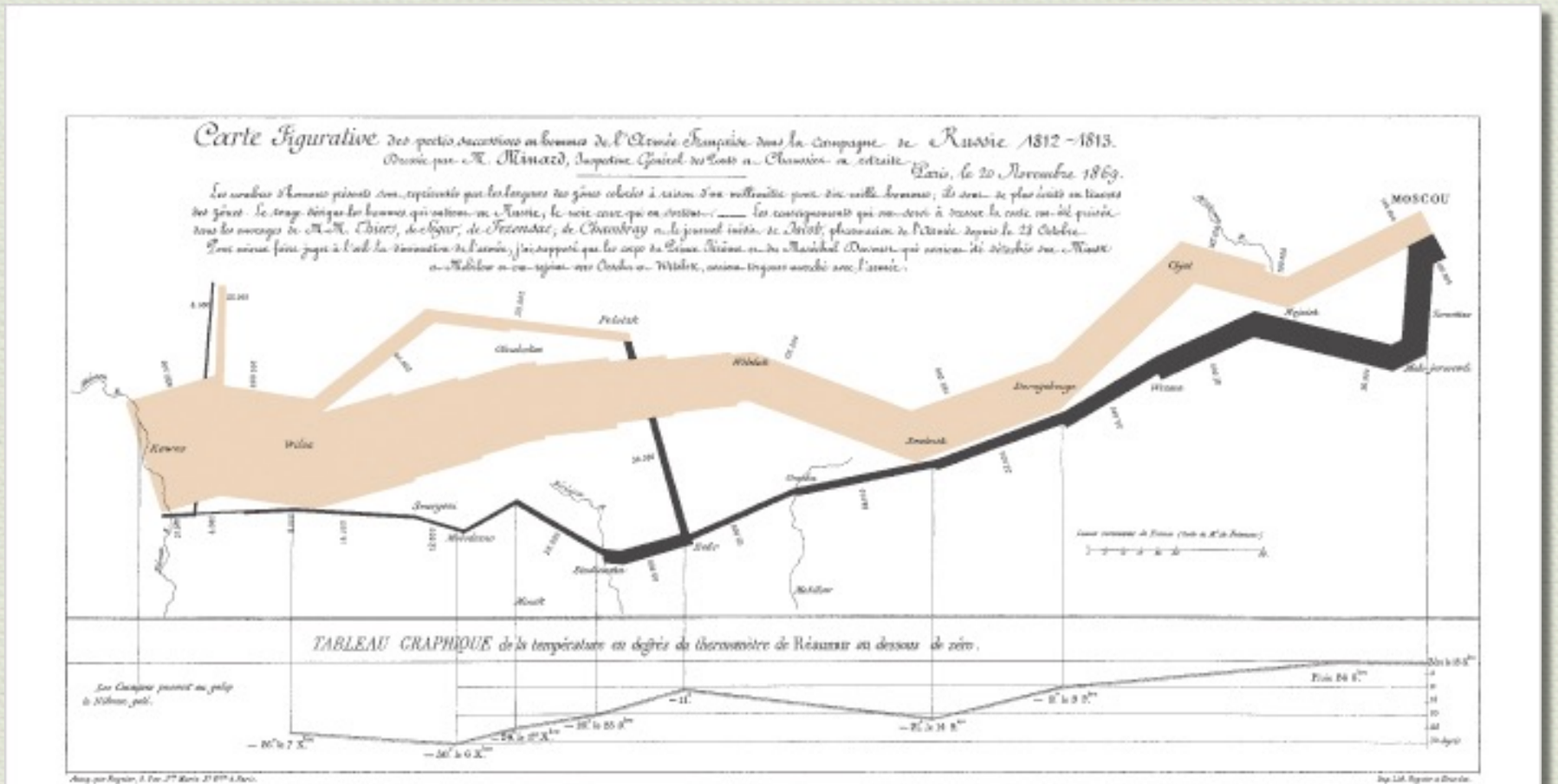


Movie release dates (1930-1996, more recent dates farther from the spiral's center):
date of release → movie position on spiral, movie type → colour

Nightingale's Rose Chart



Minard's Flow Timeline



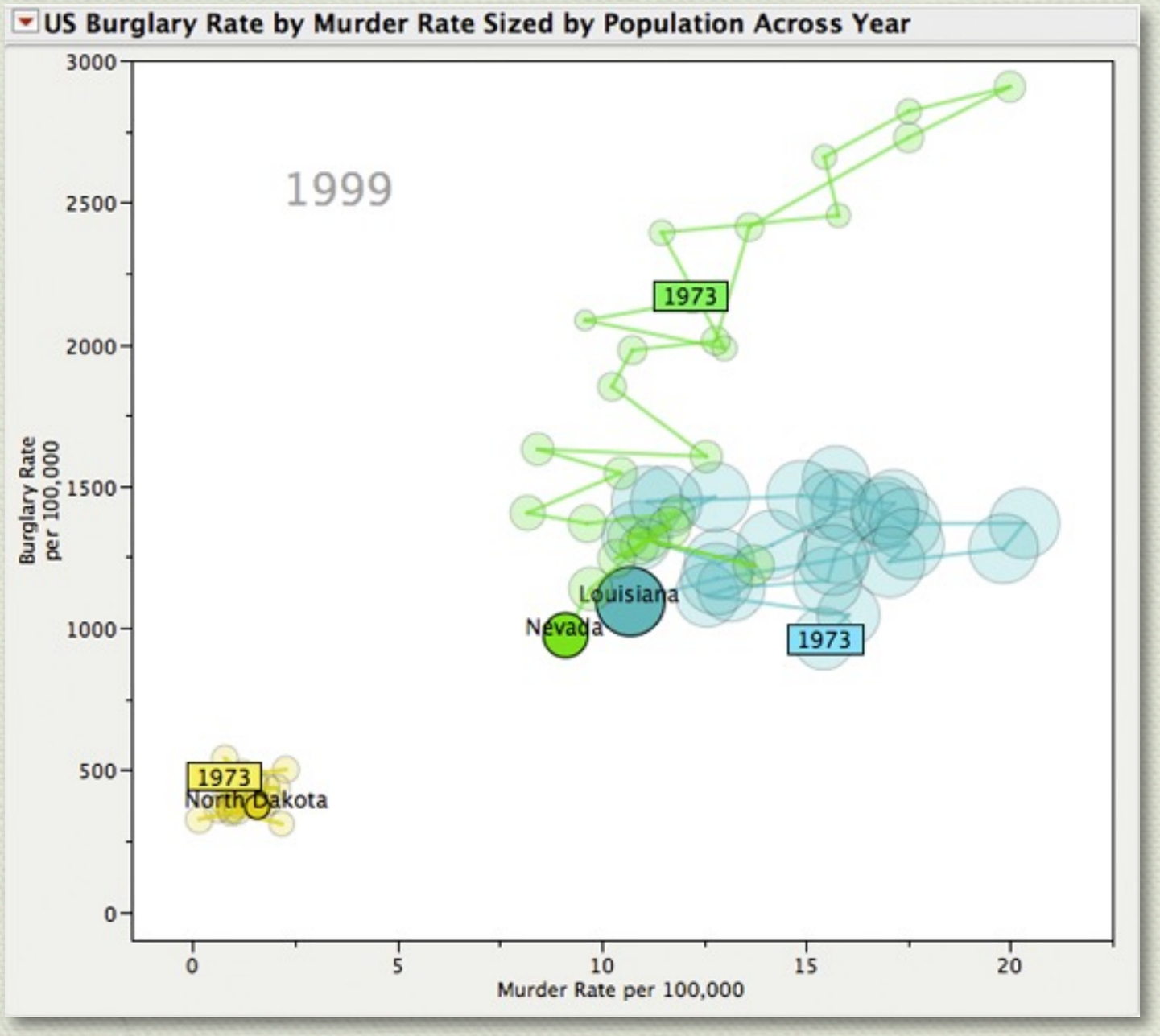
Napoleon's March to Moscow The War of 1812

Charles Joseph Minard

This classic of Charles Joseph Minard (1781–1870), the French engineer, shows the terrible fate of Napoleon's army in Russia. Described by E. J. Marey as seeming to defy the pen of the historian by its brutal eloquence, this combination of data map and time-series, drawn in 1869, portrays the devastating losses suffered in Napoleon's Russian campaign of 1812. Beginning at the left on the Polish-Russian border near the Niemen River, the thick band shows the size of the army (422,000 men) as it invaded Russia in June 1812. The width of the band indicates the size of the army at each place on the map. In September, the army reached Moscow, which was by then sacked and deserted, with 100,000 men. The path of Napoleon's retreat from Moscow is depicted by the darker, lower band, which is linked to a temperature scale and dates at the bottom of the chart. It was a bitterly cold winter, and many froze on the march out of Russia. As the graphic shows, the crossing of the Berezina River was a disaster, and the army finally straggled back into Poland with only 10,000 men remaining. Also shown are the movements of auxiliary troops, as they sought to protect the rear and the flank of the advancing army. Minard's graphic tells a rich, coherent story with its multivariate data, far more enlightening than just a single number bouncing along over time. Six variables are plotted: the size of the army, its location on a two-dimensional surface, direction of the army's movement, and temperature on various dates during the retreat from Moscow. It may well be the best statistical graphic ever drawn.

Edward R. Tufte, *The Visual Display of Quantitative Information* Graphics Press, Box 430 Cheshire, Connecticut 06410

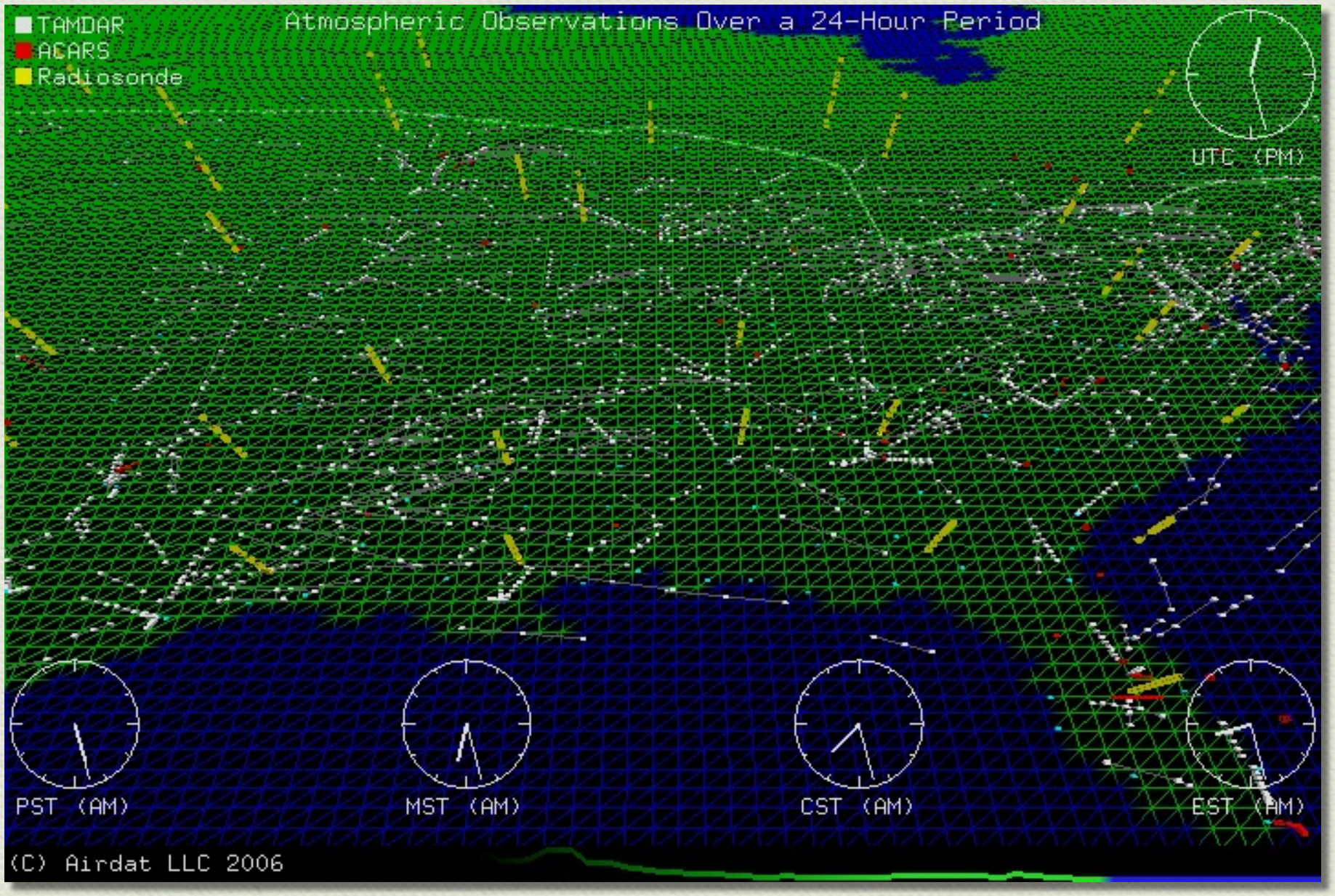
Bubble Plot Trails



http://blogs.sas.com/jmp/index.php?/archives/53-Connected-Trails-in-Bubble-Plot.html

Animation

Animation


TAMDAR
ACARS
Radiosonde
Atmospheric Observations Over a 24-Hour Period
UTC (PM)
PST (AM)
MST (AM)
CST (AM)
EST (AM)
(C) Airdat LLC 2006

Adding Content

Animated Map