Interannual patterns of climate variability: the annular modes
Discussion of Thompson and Wallace (2001)
- Impacts of the NAM on surface climate
What is the associated geostrophic circulation?

Reanalysis-2 (Kanamitsu et al. (2001); Source: IRI Data Library (iridl.ldeo.columbia.edu))
Tank experiment: with faster rotation rate

Key:
Green dye: cold water
Red dye: warm water

Variance: 500mb geopotential height surface

Where are annular mode-related circulation anomalies found?

Reanalysis-2 (Kanamitsu et al. (2001); Source: IRI Data Library (iridl.ldeo.columbia.edu))
Nature and origin of the annular modes

• Origin: internal dynamics of mid-latitude atmosphere
• Responsible for 20-30% of total variance in hemispheric geopotential height and wind anomalies


Left: Sea-level pressure regressed on an index of the NAM; right: 850-hPa height regressed on an index of the SAM
Summary

- Much of the extratropical large-scale atmospheric circulation can be explained in terms of the storm tracks: waves associated with the jet stream. Similar turbulent features are found in the oceans where there are strong currents.

- The most important extratropical interannual variations are known as the annular modes, because they are anomalies relative to the ringlike structure of the westerly winds in the subpolar regions of both hemispheres.

- Next: discussion of Thompson and Wallace (2001)
  
  - From Fig 2: describe the differences in surface temperature, precipitation and surface pressure associated with high and low NAM composites.
  
  - Is the NAM predictable? Could climate change be affecting it? How/why/why not?

- Next week: Water in the climate system
Consequences of NAM variations

Thompson and Wallace (2001); based on daily JFM data, 1958-1997, RA-1

P(cm/mo)

SLP (3mb contours)

SAT(5 degC contours)

high index days

low index days
How predictable is the NAM from year to year? Decade to decade?