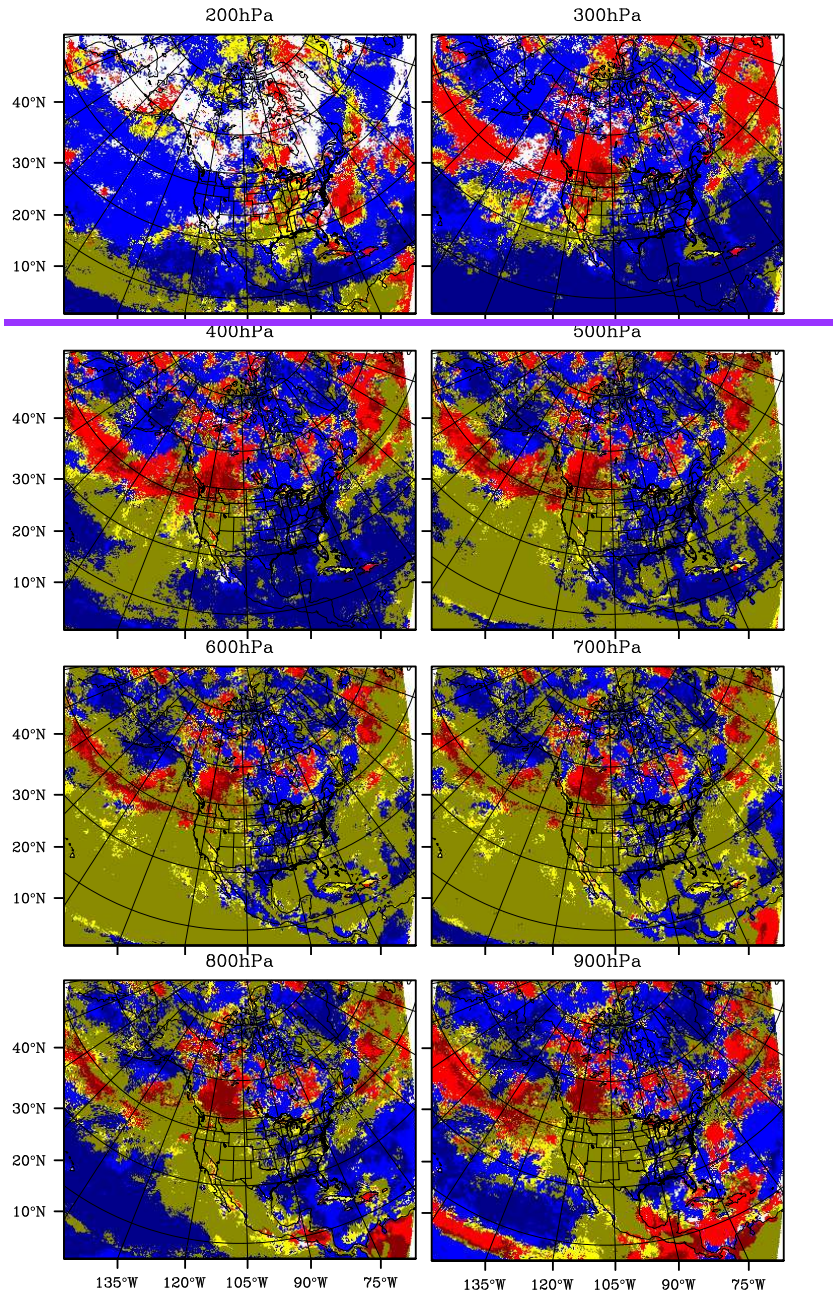


Fall precipitation

white areas – Cvap<Ctem

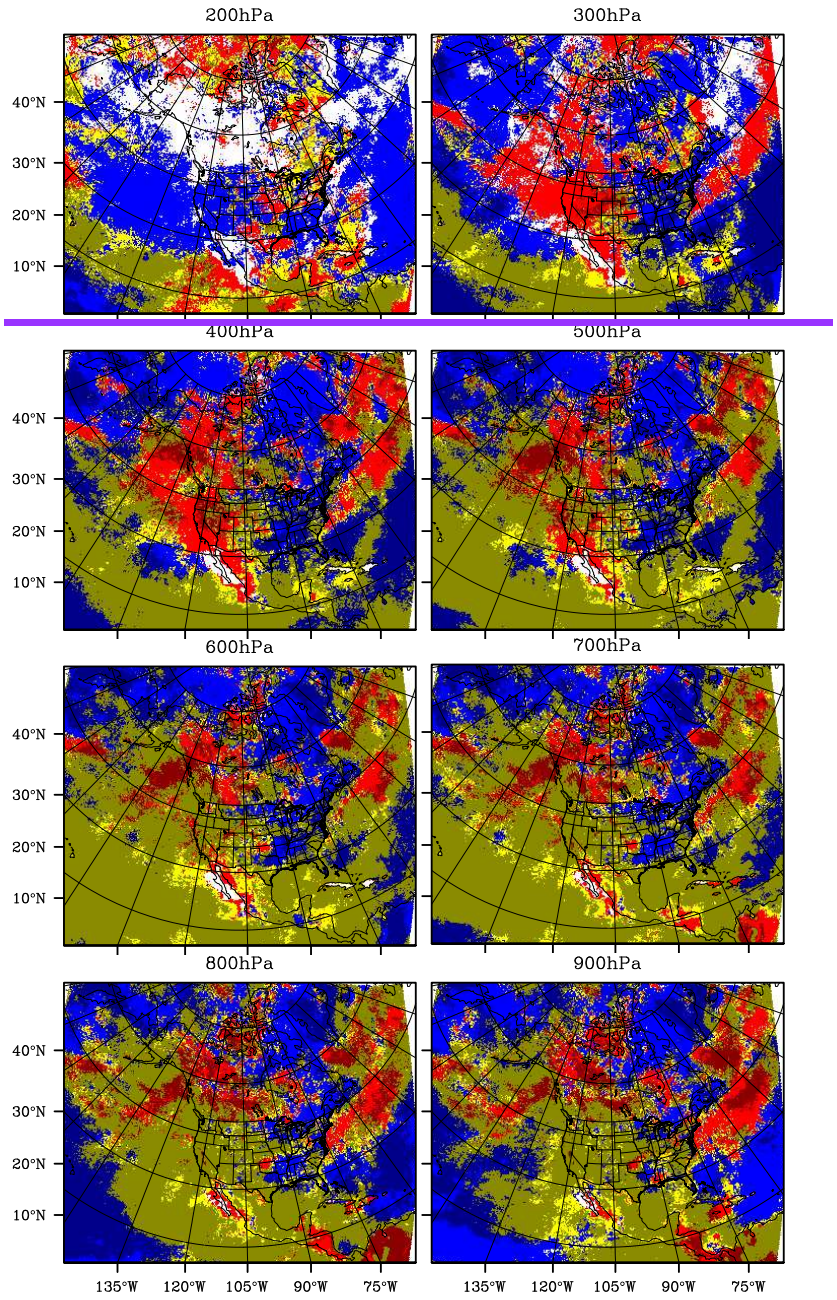
Moistening pattern

Cooling pattern

Moistening-cooling pattern

dark colors – 95% significance

Transition between the contributions for winter and summer precipitations.



Spring precipitation

white areas – Cvap<Ctem

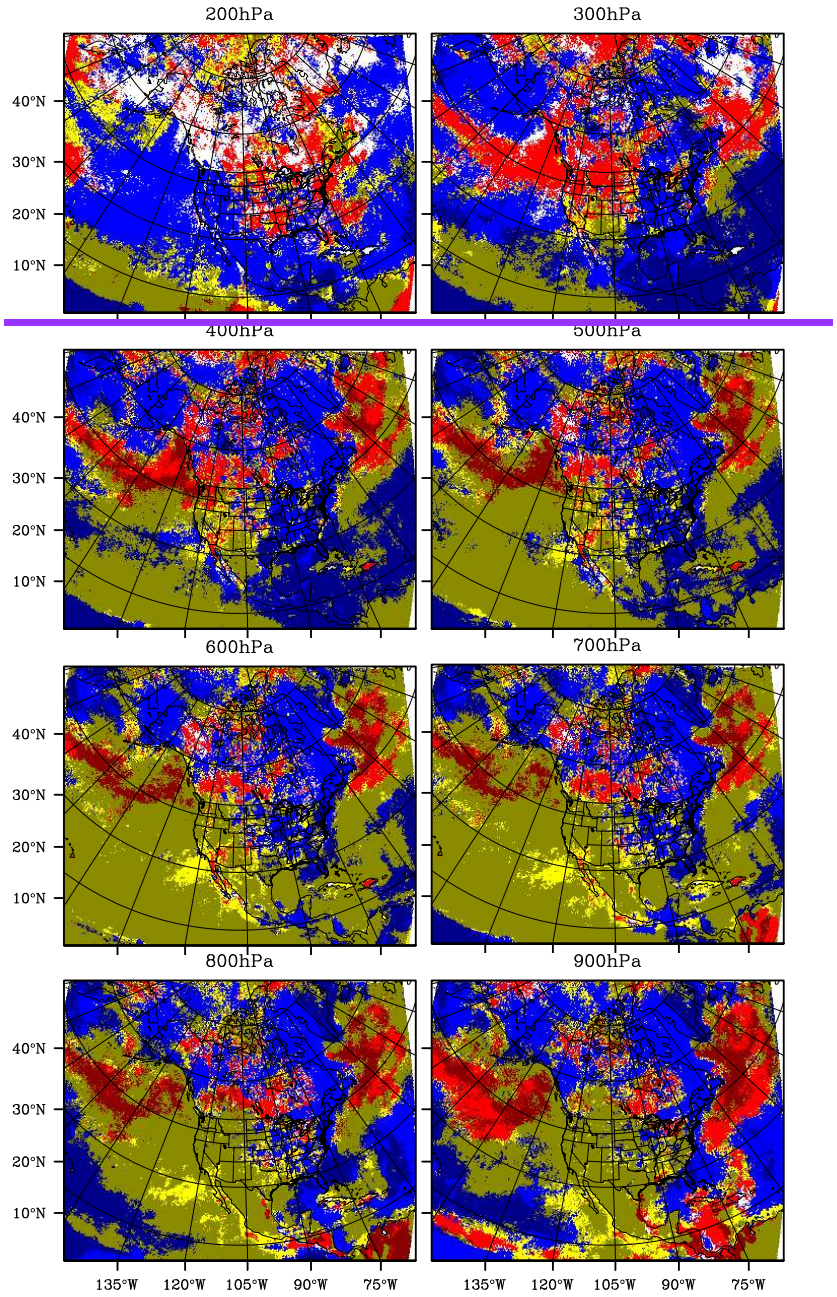
Moistening pattern

Cooling pattern

Moistening-cooling pattern

dark colors – 95% significance

Transition between the contributions for winter and summer precipitations.



Annual precipitation

white areas – Cvap<Ctem

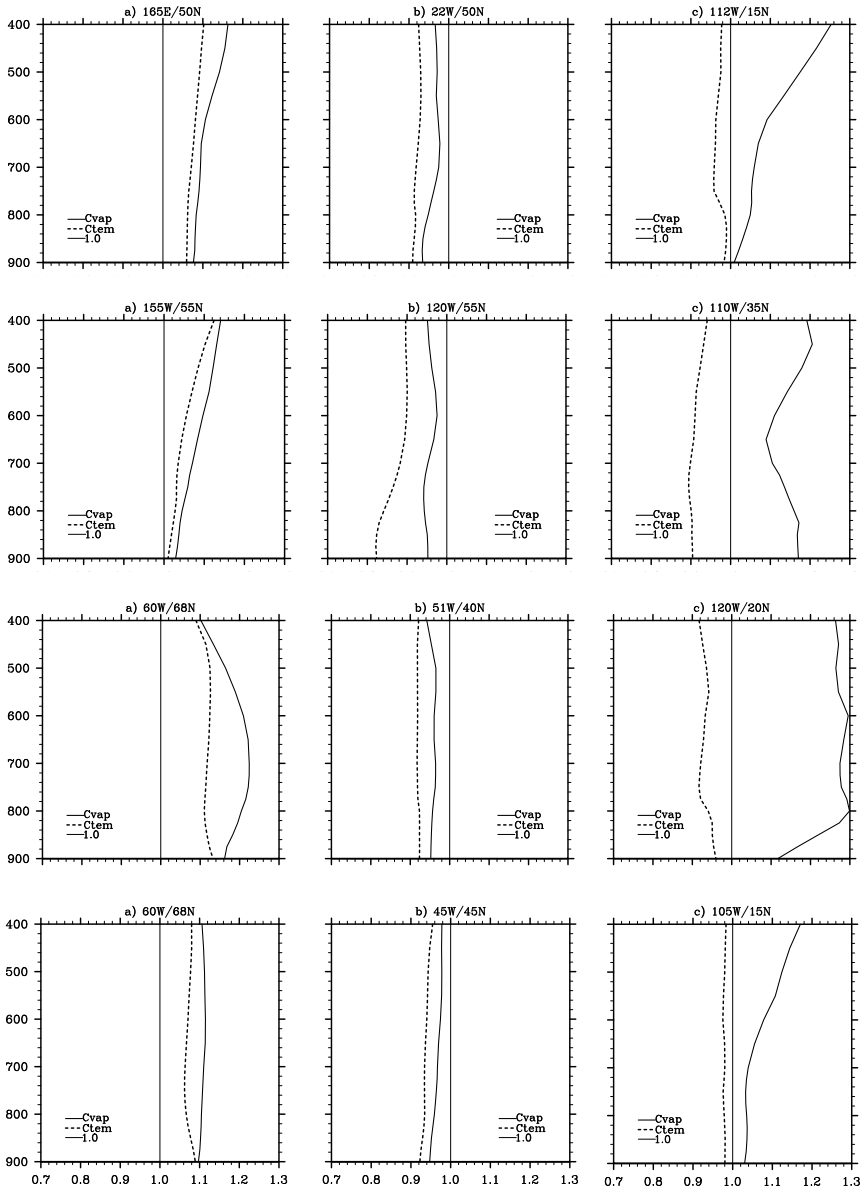
Moistening pattern

Cooling pattern

Moistening-cooling pattern

dark colors – 95% significance

Transition between the contributions for winter and summer precipitations.



summer

fall

spring

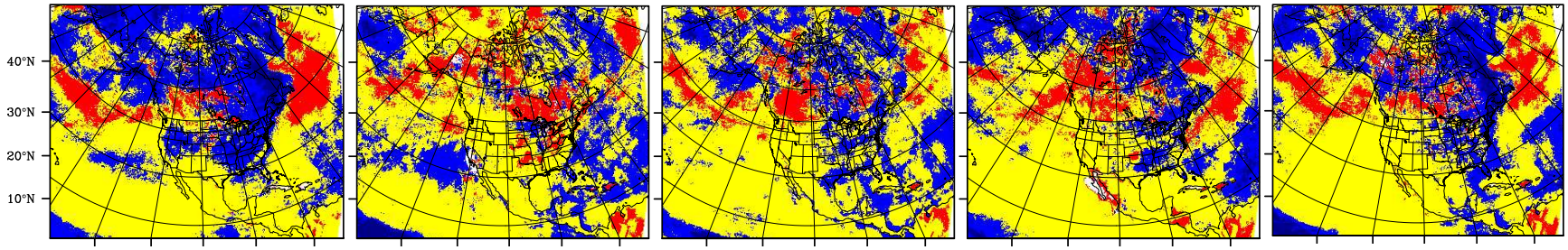
annual

There are places where the same contribution pattern controls the entire atmospheric column below 350hPa.

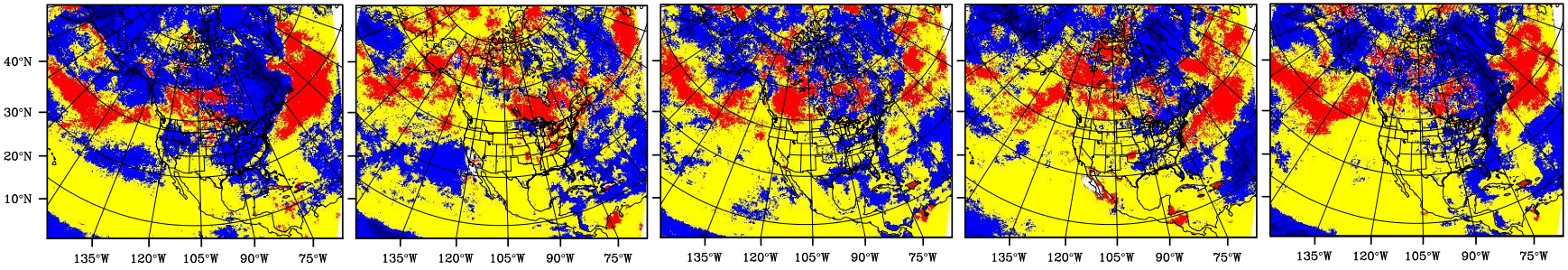
Contributions of water vapor and temperature of a layer/column

winter summer fall spring annual

850-500hPa



1000-100hPa



Moistening pattern

Cooling pattern

Moistening-cooling pattern

Summary

- By using relative humidity to reflect the interannual variability of precipitation, the contributions of water vapor and temperature to the interannual variability are evaluated.

- To have more precipitation in winter, water vapor is important in high-latitudes, temperature is important in mid-latitudes, and both are important in low-latitudes.

- For summer precipitation, cooling pattern is mainly in mid-high latitudes, moistening pattern is mainly in low-latitudes, and moistening-cooling pattern can be in all latitudes.

- The distributions of the contribution patterns for precipitations in spring, fall, and the whole year all show a transition between the contributions for winter and summer precipitations.

- Role of atmospheric circulation (warm/moist & cold/dry airflows) – e.g., in winter mid-latitudes, when there is cold/dry air coming from the north, the cooling effect is more significant than its drying effect.