Interpretation of the zonally-averaged Eliassen-Palm flux vector and the local “E vector” in terms of the kinetic energy cycle.

Be able to describe the mechanisms that determine the shape and polarity of the stationary waves induced by mountain ranges and the wintertime continent-ocean temperature difference.

Be able to describe the stationary planetary wave structure in Northern Hemisphere winter: the latitude belt in which the waves are strongest, the positions of the major ridges and troughs (or highs and lows) at the Earth’s surface and at the jet stream level, the positions of the climatological-mean jet streams, the vertical tilts of the wave axes in the zonal (x, z) plane and the horizontal (x, y) plane.

Explain why we believe that both mountains and land-sea temperature differences contribute to the forcing of the climatological-mean stationary waves.

Do the momentum and heat fluxes induced by baroclinic waves tend to maintain or weaken the climatological-mean stationary waves in the Northern Hemisphere winter?

Quantification of anisotropy of the transients in terms of the eddy correlation tensor and the metrics derived from it.

Definition and interpretation of the 3-dimensional “E-vector” and, specifically, how it relaters to the fluxes of wave activity and zonal momentum and to the barotropic energy conversion C_K.

Diagnosis of the forcing of the mean flow by the baroclinic waves based on the analysis of “E vectors” and the geopotential tendency equation at the 1000 and 300 hPa levels.

Why do the high frequency transients tend to be meridionally oriented, whereas the low frequency transients tend to be zonally elongated.

Why is the horizontal scale of the low frequency transients so much smaller in the oceans than it is in the atmosphere?

The leading EOF’s of the 300 hPa zonal (u) and meridional (v) components of the hemispheric wind field are dramatically different. In what way are they different? Explain why they are different.

Contrast the evolution of atmospheric variations with periods of a few days with that of atmospheric variations with periods on the order of a few weeks and explain why they are different

Summarize the evidence that points to the existence of preferred “teleconnection patterns” in the low-frequency nonseasonal variability of the Northern Hemisphere wintertime flow.

Why are teleconnection patterns of scientific and practical interest?

Why are teleconnection patterns seasonally dependent?

Describe at least one dynamical mechanism that gives rise to teleconnection patterns.

Describe two Northern Hemisphere wintertime teleconnection patterns and their impacts on the fields of surface air temperature and precipitation.