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Intraseasonal variability in the midlatitudes: The role of the stratosphere

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Meridional dipoles of zonal wind and geopotential height are found extensively in analysis of intraseasonal variability in the midlatitude circulation. Notable examples are the North Atlantic Oscillation and annular modes, or Arctic and Antarctic Oscillations. Such patterns chiefly characterize variation in the latitude of the extratropical jets. Analysis of simple models based on purely random motion demonstrates that these patterns can arise naturally from the conservation of mass and momentum, and thus suggests caution in ascribing too much dynamical significance to their structure. Observational analysis, however, indicates that the annular modes provide a convenient measure of the coupling between the stratosphere and the extratropical troposphere. This coupling is investigated in an idealized general circulation model, where the link between changes in the stratospheric circulation (in particular, the break down of the polar night jet in a stratospheric sudden warming) and the tropospheric circulation is clearly demonstrated.