Phase-speed spectra of tracer eddy fluxes linked to isentropic stirring in the UTLS

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The regions around the subtropical jets in the upper troposphere and lower stratosphere (UTLS) are characterized by strong isentropic stirring and mixing. In this work we examine the wave spectrum of the associated tracer eddy fluxes, using an artificial tracer advected by reanalysis non-divergent winds. The eddy diffusivity computed from the flux-gradient relation captures the main features of mixing observed in the effective diffusivity, and we investigate the behavior of eddy fluxes contributing to this transport. Eddy transport around the subtropical jets is strongest in the summer hemisphere, and weak eddy fluxes are found at the core and poleward of the jets, especially in the winter hemisphere. There is an important contribution of stationary eddies in the tropical upper troposphere linked to stationary planetary equatorial Rossby waves. The transient tracer eddy transport is primarily linked to synoptic-scale transient waves breaking in the regions of weak westerlies around the subtropical jets, and planetary-scale waves at high latitudes. The eastward propagating transient eddies are close to their critical lines, following the structure of the background zonal wind.

Key words: UTLS, tracer eddy flux, passive tracer transport, isentropic stirring, phase-speed spectrum (maximum 5)