

The derivation of the meridional momentum flux arising from a multi-scale zonal velocity field in the IPESD multi-scale models of the equatorial troposphere is presented. It is shown that, due to the balance dynamics on the synoptic scales, the synoptic scale component of the meridional momentum flux convergence must always vanish at the equator. Plausible MJO models are presented along with their planetary scale meridional momentum fluxes. These models are driven by synoptic scale heating fluctuations that have vertical and meridional tilts. Irrespective of the sign of the synoptic scale meridional momentum flux (direction of the tilts) in each of the four MJO examples, the zonal and vertical mean meridional momentum flux convergence from the planetary scales always drives westerly winds near the equator: this is the superrotation characteristic of actual MJOs. We demonstrate that equatorial superrotation occurs when the planetary scale flow due to the upscale momentum flux from synoptic scales reinforces the horizontally convergent flow due to planetary scale mean heating.