We describe a technique to simplify moist isentropic analyses based on a decomposition of the isentropic mass flux joint distribution. Our decomposition splits the joint distribution into directional components according to whether mass fluxes are poleward or equatorward. We apply this decomposition to the joint distribution computed from ERA40 reanalysis data. We project the directional components onto dry isentropes and obtain a decomposition of the dry isentropic meridional circulation. In midlatitudes, they uncover fluxes that would otherwise be cancelled in a dry isentropic average. We observe that the Ferrel cell represented by directional components reaches to the tropopause and deep within the subtropics. Simultaneously, our method produces profiles of equivalent potential temperature corresponding to the directional components. The directional equivalent potential temperature profiles show midlatitudes eddies with an asymmetrical distribution of moisture. We show that poleward components are moist and equatorward components are dry in the mid troposphere but moist in the lower troposphere. The difference in equivalent potential temperature between the directional profiles is large, more than twice the equivalent potential temperature standard deviation. This indicates that the midlatitudes moist stability can be explained using poleward profiles of equivalent potential temperature and we show that these profiles are less stable than profiles obtained from simpler climatological averages. Because these profiles provide sensitive measures of moist stability, we can determine whether deep convective adjustments or slantwise convective motions are more likely in different regions. Finally, we use our technique to explain the connection between surface temperature statistics and midlatitudes moist stability.