Figure 1. Domain mean vertical profiles from observations, CM1, ED-O, and PM-O for horizontal wind components (\(u\) and \(v\), panels a. and c.) and vertical turbulent fluxes of horizontal momentum (\(v'\ h\ w'\), panels b. and d.).

Figure 2 displays mean profiles of both \(u\) and \(v\), and horizontal wind speed (\(|U_h|\)) for both CAM configurations, along with corresponding vertical profiles of the biases and root mean squared errors associated with these variables. For both the bias (middle row) and RMSE (lower row), values closer to zero are desirable and reflect better agreement with the sounding data.

As implied by Figs. 1a,b (reproduced as the top row of Fig. 2), it can be seen that although PM-O has a stronger jet maximum than ED-O, it has a reduced maximum easterly bias when compared to ED-O since its jet placement matches observations better (Fig. 2d). It can also be seen that the reduced easterly bias in PM-O corresponds with a reduced overall \(|U_h|\) bias (Fig. 2f). There is a noticeable decrease in the RMSEs of \(u\) and \(|U_h|\) of about 0.3 m/s moving from ED-O to PM-O in the region immediately above the modeled jet maximum (roughly 1 to 2 km altitude) (Figs. 2g,i). Both the RMSE profile for \(v\) and the RMSE profile for \(u\) far from the modeled/observed jet maxima are quite similar between ED-O and PM-O, which implies that other model biases are important drivers in solution error rather than \(u'\ h\ w'\).

Upgradient fluxes are not apparent in any mean momentum profile in Fig. 1 as vertical wind shear (\(\partial u_h / \partial z\)) sign changes occur at nearly the same altitudes where \(u'\ h\ w'\) sign changes occur in both ED-O and PM-O (although not exactly because of linear interpolations working on model levels of inconsistent heights). Upgradient fluxes are, however, present in individual

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**Figure 1a:** Mean U-Wind Velocity vs. Altitude (km) for Observations, CM1, ED-O, and PM-O.

**Figure 1b:** Mean U-Wind Vertical Turbulent Flux vs. Altitude (km) for Observations, CM1, ED-O, and PM-O.

**Figure 1c:** Mean V-Wind Velocity vs. Altitude (km) for Observations, CM1, ED-O, and PM-O.

**Figure 1d:** Mean V-Wind Vertical Turbulent Flux vs. Altitude (km) for Observations, CM1, ED-O, and PM-O.