

Measurement of momentum flux Using two meteor radars in Indonesia

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Two nearly identical meteor radars were operated at Koto Tabang (0.20°S, 100.32°E), western Sumatra, and Biak (1.17°S, 136.10°E), western Papua in Indonesia, separated by approximately 4,000 km in longitude on the equator. The zonal and meridional momentum flux, $u'w'$ and $v'w'$, where u , v and w are the eastward, northward and vertical wind velocity components, respectively, were estimated at 86 to 94 km altitudes using the meteor radar data by applying a method proposed by Hocking [2005]. The observed $u'w'$ at the two sites agreed reasonably well at 86, 90 and 94 km during the observation periods when the data acquisition rate was sufficiently large enough. Variations of $v'w'$ was consistent between 86, 90 and 94 km altitudes at both sites. The climatological variation of the monthly averaged $u'w'$ and $v'w'$ was investigated using the long-term radar data at Koto Tabang from November 2002 to November 2013. The seasonal variations of $u'w'$ and $v'w'$ showed a repeatable semiannual and annual cycles, respectively. $u'w'$ showed eastward values in February-April and July-September, and $v'w'$ was northward in June to August at 90-94 km, which were generally anti-phase with the mean zonal and meridional winds, having the same periodicity. Our results suggest the usefulness of the Hocking method.

Keywords: Meteor radar, Momentum flux, Mesosphere and lower thermosphere, Hocking method, Equator, Semi-annual variation