

## Measurement of momentum flux Using two meteor radars in Indonesia

Naoki Matsumoto<sup>1</sup>, Atsuki Shinbori<sup>1</sup>, Dennis M Riggan<sup>2</sup>, \*Toshitaka Tsuda<sup>1</sup>

1. Research Institute for Sustainable Humanosphere (RISH), Kyoto University, 2. GATS, Inc.

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