

A Case Study of Relationship between GPS PWV and Solar Variability during the Declining Phase of Solar Cycle 23

Wayan SUPARTA¹ and Grahame J. FRASER²

¹Institute of Space Science (ANGKASA), Universiti Kebangsaan Malaysia, Bangi, Selangor Darul Ehsan, Malaysia; e-mail: wayan@ukm.my

²Department of Physics and Astronomy, University of Canterbury, Christchurch, New Zealand

A b s t r a c t

Water vapor plays an important role in the global climate system. A clear relationship between water vapor and solar activity can explain some physical mechanisms of how solar activity influences terrestrial weather/climate changes. To gain insight of this possible relationship, the atmospheric precipitable water vapor (PWV) as the terrestrial climate response was observed by ground-based GPS receivers over the Antarctic stations. The PWV changes analyzed for the period from 2003 to 2008 coincided with the declining phase of solar cycle 23 exhibited following the solar variability trend. Their relationship showed moderate to strong correlation with $0.45 < R^2 < 0.93$ ($p < 0.01$), on a monthly basis. This possible relationship suggests that when the solar-coupled geomagnetic activity is stronger, the Earth's surface will be warmer, as indicated by electrical connection between ionosphere and troposphere.

Key words: GPS PWV, solar activity, climate, relationship.