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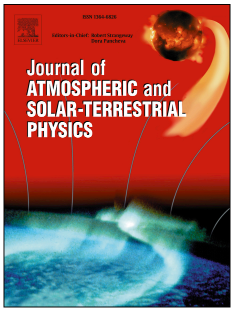

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Qingzhi Zhao, Yibin Yao, Wan Qiang Yao, Zufeng Li

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Near-global GPS-derived PWV and its analysis in the El Niño event of 2014-2016

Qingzhi Zhao[1*], Yibin Yao[2], WanQiang Yao[1] and Zufeng Li[3]

[1]College of Geomatics, Xi'an University of Science and Technology, Xi'an, China.

[2]School of Geodesy and Geomatics, Wuhan University, Wuhan, China.

[3]Powerchina Northwest Engineering Corporation Limited, Xi’an, China

Abstract: Precipitable water vapour (PWV) is a key factor in activities related to climate monitoring and the global hydrologic cycle. In this paper, the PWV time series with an accuracy of about 1.3 mm is obtained on a global scale using the zenith total delay (ZTD) derived from International GNSS Service (IGS). A theoretical error formula from ZTD to PWV reveals that the PWV error induced by errors in ZTD, surface pressure (P_s) and weighted mean temperature (T_m) is about 1 to 1.5 mm. P_s and T_m are two key factors during the convertion of ZTD to PWV, which can be derived from the Global Geodetic Observing System (GGOS) Atmosphere. The GPS-derived and radiosonde-derived PWV time series are compared at 97 collocated stations on a global scale, which shows the maximum/minimum/mean root mean square (RMS) errors and Bias of 1.8/0.6/1.3 mm and 2.6/2.9/4.0/5.2 mm, respectively with a data utilisation rate of 96.8%. By analysing the periodograms of GPS-derived PWV time series using the Lomb-Scargle method, preliminary result shows the various oscillations characteristics of PWV time series at different stations. Finally, the diurnal variations of PWV time series during the El Niño event of 2014-2016 are analysed and revealed an interesting climate signal.

Keywords: ZTD; PWV; Radiosonde; IGS

1 Introduction

Atmospheric water vapour is one of the most important factors influencing the atmospheric radiation, thermodynamics and hydrological cycles. The integral of water vapour through the vertical depth of the troposphere is commonly known as the precipitable water vapour (PWV), which can be estimated based on the Global Positioning System (GPS) technique and used to