Observations of GPW PWV Variability during the Sequence of 2010 Eyjafjallajökull Eruption

Wayan Suparta[1], Faizatul Noor Abu Bakar[1,2] , Mardina Abdullah[2], Akira Kadokura[3], Natsuo Sato[3] and Gunnlaugur Bjornsson[4]

[1]*Institute of Space Science (ANGKASA), Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor Darul Ehsan, Malaysia*
[2]*Department of Electrical, Electronics and Systems Engineering, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor Darul Ehsan, Malaysia*
[3]*National Institute of Polar Research, 10-3, Midoricho, Tachikawa, Tokyo 190-8518, Japan*
[4]*Science Institute, University of Iceland, Dunhagi 3, IS-107 Reykjavik, Iceland*

Water vapor is a natural greenhouse gas that can spit out by a cloud of volcanic ash into the atmosphere and potentially increase the global warming and can be regarded as attenuation in communication systems, especially in the GPS signal. GPS signals attenuation in the atmosphere near the Earth's surface can be calculated through a parameter called the water vapor content or precipitable water vapor (PWV). Recently, it is known that the Eyjafjöll volcano (also known as Eyjafjallajökull) which is located in the southern part of Iceland has erupted from 20 March of 2010 until the volcanic ash subsided on 25 May 2010. Indeed, this study is focused in order to monitor the effects of water vapor volcanic ash that has been sprayed into the atmosphere which possibly influences the performance of the GPS signal. For this purpose, the GPS signals and the surface meteorological data for four-month periods from 1 March to 30 June 2010 at three stations in Iceland that are at Husafell (HUSA), Reykjavik (REYK) and Hoefn (HOFN) is analyzed to observe the distribution of atmospheric water vapor on the tropospheric ash clouds during the eruption events. Monitoring results showed that the surface temperature and PWV have increased during the disturbed day of volcanic ash about average of 2.1°C and 0.6 mm in comparison to the average values during the quiet day, respectively. Pressure measurement showed significant dropped before and after the eruptions in a range of 30 mbar to 45 mbar, while relative humidity was fluctuated higher and almost reaches 100% at HOFN station. There are 2.3 cm and 1.8 cm of GPS signal displacement of the local crust in northward and eastward directions, respectively started on 20 March 2010 recorded at SKOG indicated as fissure eruption and lava flows. In future work, study a possible connection between the PWV variation with solar induced geomagnetic activity can be carried out in order to look at a reasonable coupling between the upper and lower atmosphere levels of the atmosphere.