



The tropospheric delay of the GPS signal and its correlation with the solar cycle

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The INGV operates a network of about 60 permanent GNSS stations to monitor the Neapolitan volcanic area (southern Italy), which includes three active volcanoes: Somma Vesuvio, Campi Flegrei and the island of Ischia. In this study we consider only the GPS constellation, whose signals are transmitted in the microwave band. Therefore, they suffer a delay while propagating in the troposphere. Bearing in mind that the refractive index in the atmosphere is a function of the water vapour content, pressure and temperature, tropospheric delay can be assimilated into short-term weather forecast models and used in long-term climate studies. We analyse a data set ranged about 14 years (2006-2019) of continuous GPS data, to evaluate the tropospheric delay to be used as a probe tool to quantify precipitable water and track its spatial-temporal evolution. We limit the analysis to the area of Somma Vesuvio, a strato-vulcano that covers an area of 165 km² and is about 1200 meters high, to study also the effect of the steep topography on the spatial distribution of the precipitable water content. The data are analysed in terms of empirical functions (IMF), organised in ascending order with a parameter ranging from 0 to 15, plus the trend. The trend found is not a linear growth, but grows to a maximum that is in the middle of the time range of about 11 years and then decreases. It is very interesting that the correlation with the solar cycle is high. Therefore, the next developments will be to analyze other data sets to verify the generality of this result.