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Real time integrated water vapour observations from Global Navigation Satellite Systems

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Water vapour plays a crucial role in the atmosphere. The distribution of water vapour is tightly related to the distribution of clouds and rainfall. Until recently, radiosonde observations are the only operational upper air atmospheric humidity observations. These observations are of high quality, but are restricted to specific locations and are deployed only 2 or 4 times per day. The observation frequency diminishes the use of these observations for nowcasting in between the observations times. Humidity observations from the Global Navigation Satellite System (GNSS) may fill this lack of information. These observations are obtained using a groundbased of GNSS receivers; the observation frequency can be several minutes the observed parameter, however is not a profile but the total amount of water vapour above the receiver. In this paper, real time operational observations of a dense GNSS network in The Netherlands are presented; the observations frequency is four times per hour with a latency of around 5 minutes (comparable to the satellite and radar observations). The quality and the possible use for nowcasting of these observations will be discussed by presenting some examples.