



A new model of tropospheric directional gradients and its application to investigate specific extreme weather events

Salim Masoumi, Simon McClusky, Achraf Koulali, and Paul Tregoning
Australian National University, Australia (salim.masoumi@anu.edu.au)

Troposphere is usually considered azimuthally symmetric in mapping functions used in Global Positioning System (GPS) modelling. To compensate for this assumption, horizontal gradients are generally estimated together with other parameters. However, the gradient model currently in use by most analysts is a simple planar model. While such a planar model is sufficient in most cases, there are specific cases where a plane is not truly representative of the troposphere. A new model of gradients is developed and implemented in which the gradients are estimated at different directions around the site with a piecewise linear function between the nodes. The new model has the capability to detect isolated rapid spatial changes in specific azimuth angles. Simulations are performed to validate this capability of the model and to evaluate the effect of the new model on other parameters. A real case study of the 9 September 2002 extreme precipitation in Southern France is used as an example of how the directional gradients can provide information about the local variability of the troposphere around a GPS site, and how they might potentially be used for investigating specific extreme weather events.