High resolution climatology
- towards climate change services

Novel method for water vapour monitoring using wireless communication networks measurements

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We propose a new technique for monitoring near-surface water vapour, by estimating humidity from data collected through existing wireless communication networks.

Weather conditions and atmospheric phenomena affect the electromagnetic channel, causing attenuations to the radio signals. Thus, wireless communication networks are in effect built-in environmental monitoring facilities. The wireless microwave links, used in these networks, are widely deployed by cellular providers for backhaul communication between base stations, a few tens of meters above ground level. As a result, if all available measurements are used, the proposed method can provide moisture observations with high spatial resolution and potentially high temporal resolution. Further, the implementation cost is minimal, since the data used are already collected and saved by the cellular operators. In addition – many of these links are installed in areas where access is difficult such as orographic terrain and complex topography. As such, our method enables measurements in places that have been hard to measure in the past, or have never been measured before. The technique is restricted to weather conditions which exclude rain, fog or clouds along the propagation path. Strong winds that may cause movement of the link transmitter or receiver (or both) may also interfere with the ability to conduct accurate measurements.

We present results from real-data measurements taken from microwave links used in a backhaul cellular network that show very good correlation with surface station humidity measurements (comparisons were performed for several links, found at different locations, during different time periods, showing correlations in the range of 0.5-0.9).