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High-resolution frontal rainfall detection by a cellular communication network

A. Zinevich (1), A. Rayitsfeld (2), H. Messer (3), P. Alpert (2)

(1) The Porter School of Environmental Studies, Tel Aviv University, Israel

(2) Department of Geophysics and Planetary Sciences, Tel Aviv University, Israel

(3) Department of Electrical Engineering, Tel Aviv University, Israel

(artemsin@post.tau.ac.il)

Rainfall measurements have been investigated worldwide because of their important applications in meteorology, hydrology and weather forecasting. Recently, we have presented a new tool for measuring rainfall based on commercial microwave radio networks.

Here we present a novel technique for reconstruction of rainfall spatial-temporal dynamics from a microwave network, by employing a stochastic space-time model based on a rainfall advection model. The technique is able to aggregate the data in time and space along the direction of motion of the rainfall field, which is recovered from the simultaneous observation of a multitude of microwave links.

This method can reveal fine-scale evolution of rainfall in space and time and allows observation of near-surface rainfall at spatial and temporal resolutions of 1 km^2 and 1 minute, without extra installation and maintenance cost. We compare the resulting rainfall estimates with weather radar and six high-resolution raingauges.