STORM MOTION TRACKING OVER THE ARNO RIVER BASIN THROUGH MULTISCALE RADAR REFLECTIVITY CLASSIFICATION AND CORRELATION

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A method is presented for analyzing the storm motion through the application of a nowcasting technique based on radar echoes tracking through multiscale correlation. The application of the correlation principle to weather radar image processing - the so called TREC (Tracking Radar Echoes by Correlation) and derived algorithms - is described in [1] and in references cited therein. The block matching approach exploited there is typical of video compression applications, whose purpose is to remove the temporal correlation between two subsequent frames of a sequence of images. In particular, the wavelet decomposition approach to motion estimation seems particularly suitable for weather radar maps. In fact, block matching is particularly efficient when the images have a sufficient level of contrast. Though this does not hold for original resolution radar maps, it can be easily obtained by changing the resolution level by means of the wavelet decomposition. The technique first proposed in [2] (TREMC - Tracking of Radar Echoes by means of Multiscale Correlation) adopts a multiscale, multiresolution, and partially overlapped, block grid which adapts to the radar reflectivity pattern. Multiresolution decomposition is performed through 2D wavelet based filtering. Correlation coefficients are calculated taking after preliminary screening of unreliable data (e.g. those affected by ground clutter or beam shielding), so as to avoid strong undesired motion estimation biases due to the presence of stationary features. Such features are detected by a previous analysis carried out as discussed in [2]. In this paper, motion fields obtained by analyzing precipitation events over the Arno river basin are compared to the related Doppler velocity fields in order to identify growth and decay areas and orographic effects. Data presented have been collected by the weather radar station POLAR 55C sited in Montagnana (Firenze-Italy), a polarimetric C-band system providing absolute and differential reflectivity maps, mean Doppler velocity and Doppler spread maps with a resolution of 125/250 m [3].

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