11.3 COMPARISON OF CLUTTER DETECTION SCHEMES FOR NON-DOPPLER, NON-POLARIMETRIC X BAND RADARS

S. MELANI[1], A. ANTONINI[2], F. CAPARRINI[1], A. TELLESCHI[3], A. LOMBARDI[3], A. MAZZA[1], A.ORTOLANI[1]

[1] CNR-IBIMET, ITALY
[2] LAMMA CONSORTIUM, ITALY
[3] ELDES S.R.L, ITALY
s.melani@ibimet.cnr.it

Weather radars are the key instruments to be used for early detection of rainfall fields. C and S-band radar systems require high installation and maintenance costs and sometimes they need impressive infrastructures that limit their use in complex orography and urban areas. For the X-band weather radars, both costs and the installation complexity decrease, especially for non-coherent systems, which are very compact.

Among the main error sources, clutter echoes can seriously limit the observational capability of a radar system; thus, a proper signal processing has to be implemented to minimize the effects of clutter without reducing the echoes from desired targets.

This work presents some studies performed on a non-coherent X-band radar (WR10X-ELDES) for implementing a signal processing scheme for ground and sea clutter removal. Ground clutter and weather signals have different statistical properties, as the stability of reflectivity echoes relative to very close volumetric cells is much higher in case of clutter than of weather signals. More complex is the identification of the sea clutter because it changes very fast in the horizontal direction, and present a radial attenuation as the distance from the radar increases. In addition, sea clutter values decrease as a function of height, so vertical gradient signatures can be used in the clutter identification process.

Starting from a literature analysis, different algorithms (statistical and not) have been tested and compared, introducing also some empirical adaptations.

The performances of the clutter removal algorithms have been discussed for a number of case studies, under different meteorological conditions. Results show that the analysed algorithms are strongly dependent on the radar site and must be necessarily customized to each radar location, because the ground and sea clutter signatures are strongly dependent on the height above and proximity to the sea, surrounding orography etc.