6.3 MONITORING DOPPLER DUAL-POLARIZATION RADAR USING AN INDIVIDUAL AND SINGULAR GROUND CLUTTER CELL

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"Bright" scatterer are useful for monitoring modern Doppler and dual-polarization weather radars: in order to be "Bright", a target should have a large radar cross section, be located in the radar near range and hit by the antenna beam axis. In this note, a statistical analysis based on data of seven clear sky days (2016 samples with spatial resolution of 1°1°83.33 m) of one of the "Bright" scatterers in Switzerland is presented. It is a metallic tower located at Cimetta, at 18 km range and the same altitude as the Monte Lema radar. Its spectral (Doppler) and polarimetric signatures are impressive: the 2nd Doppler moment (spectrum width) is perfectly stable (always the same, lowest-allowed, Digital Number). The 1st Doppler moment (mean radial velocity) is very stable: only two Digital Numbers, out of 255 possible values, are found within the 31431483.33 m3 radar cell that contains the bright scatterer; as expected, one value corresponds to zero radial velocity (the other value corresponds to quasi zero velocity). The 0th Doppler moment (radar reflectivity) is also quite stable, with vertical (V) polarization being more variable (the Log-transformed ratio between the 90th percentile and the mean, $90\xi\mu$, is typically ˜1.5 dB) than the horizontal (H) polarization ($90\xi\mu$ ˜1 dB). Regarding the polarimetric information, the daily average of the differential reflectivity is positive (slightly larger than +1 dB) and also stable (standard deviation smaller than 1 dB). The co-polar correlation coefficient between H and V is remarkably large (0.9963, on average) and stable: the (MAX) min daily difference between the 90 percentile and the mean is as small as (0.0030) 0.0010. The daily standard deviation of the differential phase shift is typically 5° (910 Digital Numbers out of 65536). In addition to characterizing the polarimetric properties of this monitoring-oriented, target using classical descriptive statistics, we are currently investigating them using Fourier analysis and the power spectrum. Detailed results will be presented at the conference; as an example, the H and V reflectivity values are found to follow the variability of Fractional Brownian Motion signals: they are characterized by a slope of the power spectrum exponent $\approx 1.4(\pm 0.3)$, which would correspond to a fractal dimension of 1.8. It is then argued that these peculiar and stable ground clutter signals can be used to monitor and check the quality of operational dual-polarization weather radars.