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Using advanced geophysical data processing to improve low detection data in archaeological sites

Rui Jorge Oliveira^{1,2,3}, Bento Caldeira^{1,2,3}, José Fernando Borges^{1,2,3}, and Mourad Bezzeghoud^{1,2,3}

¹Institute of Earth Sciences, University of Évora, Évora, Portugal (ruio@uevora.pt)

²Physics Department, University of Évora, Évora, Portugal

³Earth Remote Sensing Laboratory – EaRSLab, University of Évora, Évora, Portugal

Geophysical data with noise issues are quite common, resulting in low detection conditions. This prevents the ground content from being evaluated to determine the existence of structures buried in the ground in an archaeological site. Standard processing on ground-penetrating radar and magnetic data does not effectively eliminate or mitigate this effect. The use of advanced and customized data processing is a viable solution to the problem. This processing can be applied using mathematical transforms in conjunction with data decomposition techniques, allowing for easier and less computationally intensive data manipulation. The circular symmetry of the data is enabled by the 2D Fourier transform, making operations like filtering easier to implement. In the transformed domain, factoring techniques such as singular value decomposition can be used (SVD). After analyzing the decomposed signal, the components can be matched to the signal and noise. The 2D wavelet transform allows for data decomposition, with operations such as multiresolution SVD and multidirectional gradient calculation applied to each channel to select the most informative content from a dataset. The chain application of these operations allows for the improvement of geophysical data despite an apparent lack of information. Testing on field data obtained at Villa Romana de Pisões (Beja, Portugal) is an example of successful application. Advanced geophysical data processing operations can improve the data and should be used in conjunction with standard operations.

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