



## **TREMOrEC: a software utility for automatic classification of volcanic tremor**

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Volcanic tremor is a seismic radiation recorded on several volcanoes worldwide. Its analysis and interpretation have proven to provide reliable information in case of volcano unrest and/or modifications of eruptive activity. Hence, an automatic system able to recognize different states of volcanic activity from the analysis of volcanic tremor could play an important role in handling the flow of data coming out from the seismic monitoring of a volcano. To this purpose, the application of a Support Vector Machine (SVM) classifier was proposed to tremor data recorded at Mount Etna in 2001 (Masotti et al., 2006). The results achieved from this application - based on supervised learning - showed that spectrograms of volcanic tremor were correctly classified as representative of pre-eruptive, lava fountain, eruptive, or post-eruptive states, with less than 6% of error with respect to the a-priori classification. Here, we describe the implementation of this system as a stand-alone software utility named TREMOrEC. The design which characterizes TREMOrEC offers ease of use and short time processing. TREMOrEC is developed in Visual C++ for Microsoft Windows. It can directly handle ready-to-use spectrograms of volcanic tremor as well as compute them from the original time series. TREMOrEC carries out the training of the SVM classifier with different parameters and kernels, and allows evaluating the performance of the classifier either on an independent test set or using a leave-one-out procedure. Classification results are presented by means of a graphical user interface in the form of overall classification accuracy, confusion matrices, and with the help of graphs showing the a-priori and assigned class for each considered pattern.

## References

Masotti, M., S. Falsaperla, H. Langer, S. Spampinato, and R. Campanini (2006), Application of Support Vector Machine to the classification of volcanic tremor at Etna, Italy, *Geophys. Res. Lett.*, 33, L20304, doi:10.1029/2006GL027441.