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A new Technique for Volcanic Tremor Location during the 2004 Lava Effusion at Mt. Etna, Italy

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The persistent seismic signals recorded on several basaltic volcanoes, known as volcanic tremor, have proven to be one of the most significant measures for volcanic surveillance. The continuous monitoring of seismic activity on Mt. Etna started in the middle 1970s. The importance of tremor in seismic monitoring of Mt. Etna was put forward by Schick and Riuscetti (1973), who were the first to postulate the strict link between this signal and the volcano feeder. Tremor is commonly addressed to as the RMS-amplitude of the seismic signal measured over a time window within a defined frequency band. Being a persistent signal, the location of its sources with traditional event location methods fails. The recent efforts of the INGV - which improved the equipment both with respect to data quality and reliability of data acquisition - have allowed us to tackle the location problem using the spatial tremor amplitude distribution. Rough estimates on source location can be obtained using a simplified attenuation law. In this study, we propose a new method we applied to monitor the migration of tremor sources at Mt. Etna from January 2004 on, including the recent on-going eruption, which started on September 7, 2004. The sources identified from the tremor amplitude distribution cannot be easily related to the theatre of the eruption. On the other hand, from the composition of the erupted magma, we infer that this last volcano unrest is due to a superficial phenomenon, with weak or no links to the deep internal dynamics of the magma feeder.