Seismic noise characterization of the Sos Enattos Mine (Sardinia), a candidate site for the next generation of terrestrial gravitational waves detectors

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We present some preliminary results from ongoing seismic measurements aimed to assess the seismic noise levels in the Sos Enattos Mine (Sardinia). Due to his geologic setting, low population density and lack of significant industrial activity, Sardinia is characterized by very low anthropogenic noise and very low seismic activity. These unique combinations of factors make Sardinia, and in particular the Sos Enattos site, suitable to host instruments that must be placed in particularly seismically quiet locations in order to meet their targeted sensitivity. This is certainly the case of gravitational waves detectors, whose next generation, called Einstein Telescope (ET), is planned to be able to measure a strain, induced by the passing wave on the interferometer’s arm, of the order of \(2 \times 10^{-25} \text{Hz}^{-1/2}\). Three broadband seismometers has been installed since May 2019 both at surface and at different depths along the mine tunnels. We analyse the spectral distribution of the seismic noise with a special focus on the frequency bands that may affect the operation of a gravitational waves interferometer. We also study the correlation of seismic noise with the observed sea waves in the Mediterranean Sea. The results enlighten very low seismic noise levels at the surface and attenuation at the depths foreseen to build ET. Further, seismic noise levels appear to be strongly correlated with sea waves in NW Mediterranean Sea. We conclude that the selected site may meet the stringent seismic requirements needed to realize the ET infrastructure.