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Influence of environmental noise on Virgo detector during O3

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Sources of geophysical and anthropogenic noise, such as wind, sea activity, earthquakes, local traffic, etc., can impact gravitational wave interferometers by causing sensitivity drops and lock losses. During the 1-year long O3 observation run, the Virgo Collaboration collected a statistically significant amount of data to study the response of the detector to a variety of environmental conditions. We used this dataset to correlate different environmental parameters to quantities that monitor detector performance, such as its observation range and duty cycle. Where possible, we identified weaknesses in the detector and worked out strategies to implement to improve Virgo robustness against external environmental disturbances for the next observing run O4, planned for summer 2022. The lessons learned could provide useful insights for the design of the next generation of ground-based interferometers.

Autori principali: LONGO, Alessandro (Istituto Nazionale di Fisica Nucleare); GIUNCHI, Carlo (INGV sez. Pisa); PAOLETTI, Federico (PI); DI RENZO, Francesco (P); FIORI, Irene (European Gravitational Observatory); KAMIEL, Janssens (Uni. Antwerpen, Artemis); OLIVIERI, Marco (INGV); TRINGALI, Maria Concetta (EGO-European Gravitational Observatory); ARNAUD, NICOLAS (LAL ORSAY CNRS-IN2P3); Sig. RUGGI, Paolo (EGO); DE ROSA, Rosario (NA)

Relatore: DI RENZO, Francesco (P)

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