

EGU22-8872

<https://doi.org/10.5194/egusphere-egu22-8872>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Relationship between the time series of cosmic ray data and aerosol optical properties: (Case study: southern Italy, 2016-2020)

Faezeh Karimian Sarakhs^{1,2}, Fabio Madonna², Marco Rosoldi², and Salvatore De Pasquale¹

¹University of Salerno, Department of Physics, Italy (fkarimiansarakhs@unisa.it)

²National Research Council of Italy- Institute of Methodologies for Environmental Analysis (CNR-IMAA)

Abstract

High energy Cosmic Ray (CR) particles are capable of ionizing the Earth's atmosphere, which leads to changes in the atmospheric physical and chemical properties. One of the most important effects of interactions between the CR particles and atmospheric molecules is the formation of aerosol and its subsequent condensation nuclei processes. These interactions are known with considerable uncertainty yet and may translate into even bigger uncertainties in future climate predictions. Laser Detection and Ranging (LIDAR) is currently the best suited technology to retrieve aerosol optical and microphysical properties is also used for the atmosphere correction of high energy cosmic ray observatory data. LIDAR measurements are available from single stations or from networks at continental scale like the European Aerosol Research Lidar NETwork (EARLINET). Sun photometer data are the most suitable complement to LIDAR measurements for the study of aerosol properties due to the extensive coverage of their measurements available through the AErosol RObotic NETwork (AERONET) network. The purpose of this study is to find the correlation between the aerosol properties and the CR data. The aerosol properties retrieved from two databases for the period of 2016-2020: I) the multi-wavelength LIDAR system Potenza EARlinet Raman Lidar (PEARL) which operates at the CNR-IMAA (Tito Scalo (Italy) and contributes to the EAELINET); and II) the AERONET sun photometer data from the stations located at Southern Italy i.e. Potenza (40.60° N, 15.72° E, 820m), Naples (40.83° N, 14.30° E, 50 m) and Lecce (40.33° N, 18.11° E, 30m). whereas, the CR data made available in Italy from the Extreme Energy Events project (<http://eee.centrofermi.it/monitor>). Air mass back-trajectories were used to confirm the observed aerosol types and support the correlation study. Our study showed promising results in understanding the relationship between cosmic ray and aerosol properties.

Keywords: Cosmic Ray, Aerosol, Lidar, Sun Photometer, Back-trajectory