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Cause-and-effect relations between cosmic rays, electric field, aerosols and clouds

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Here we examine the cause-and-effect relations between galactic cosmic rays, electric field, aerosols and clouds over a region of Atlantic Ocean, during a Forbush Decrease (FD) event on 07/12/2015, using Convergent Cross Mapping (CCM) method. For this purpose, we used FD data from the Neutron Monitor Database (NMDB), Potential Gradient data (PG) from Global Coordination of Atmospheric Electricity Measurements (GLOCAEM) and remote sensing data from MODIS/Aqua, namely Aerosol Optical Depth at 550nm (AOD), Cloud Fraction (CF), Cloud Optical Thickness (COT), Cloud Top Pressure (CTP), Cirrus Reflectance (CR) and Cloud Effective Radius-Liquid (CERL). A cause-and-effect relation was found between FD and AOD, CERL, CF and PG, over the region. On the other hand, no causal effect was found between FD and COT, CTP and CR. This research is funded in the context of the project "Cosmic and electric effects on aerosols and clouds" (MIS: 5049552) under the call for proposals "Support for researchers with emphasis on young researchers - Cycle B" (EDULL 103). The project is co-financed by Greece and the European Union (European Social Fund - ESF) by the Operational Programme Human Resources Development, Education and Lifelong Learning 2014-2020.