



Multi-scale temporal variations of the conduction current density during fair weather days in Israel

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The fair weather conduction current (J_z) is one of the major components in the Global Electrical Circuit (GEC). The average current density at the earth's surface is ~ 2 pA m⁻². We report here, for the first time, the results of observations of the atmospheric current density in fair weather in Israel. Earlier results by Elhalel et al. (2014) found an increase in the J_z at Mitzpe Ramon during times of disturbed weather (strong surface winds) and during solar events. We focus on fair-weather days, and compare the behavior of the conduction current with that of the vertical component of the electric field (E_z), reported to exhibit diurnal variations affected by global lightning activity and by local meteorology (Yaniv et al 2016, Yaniv et al 2017).

The Geometrical Displacement and Conduction Current Sensor (GDACCS) measures the vertical conduction current (J_z) in the atmosphere. It was developed at the Meteorology Department in the University of Reading, UK (Bennett and Harrison 2008). Two permanent GDACCS stations are located in Israel next to other atmospheric electricity measuring instruments (Electric field meters, Gamma spectrometers and cosmic rays detectors) - The first station is situated at the Wise observatory located on a high plateau in the central part of the Negev desert, 5 km west of the town of Mitzpe Ramon (30°35'N, 34°45'E, altitude 850 meter above sea level), and the second station is located at the Cosmic Ray Observatory located on the western slopes of Mt. Hermon in northern Israel (33°18'N 35°47.2'E, altitude of ~ 2100 meter above sea level).

A multi-scale temporal analysis of the electric field behavior in fair weather days was already conducted on data collected since 2013 in Mitzpe Ramon, and since 2015 on the Hermon Mountain. The present work focuses on the multi-scale temporal behavior of the conduction current density, looking for global and local signatures and their relation to both periodic and instantaneous changes of the electric field and gamma emission rate during fair weather days in Israel.