Geophysical Research Abstracts
Vol. 21, EGU2019-10511, 2019
EGU General Assembly 2019

Vertical Air Motion and Disdrometer Derived Z-R Coefficients

Takis Kasparis (1), John Lane (2), and Silas Michaelides (3)

(1) Cyprus University of Technology, Limassol, Cyprus (tkasparis@gmail.com), (2) Southeastern Universities Research Association, Kennedy Space Center, FL, USA, (3) The Cyprus Institute, Nicosia, Cyprus

One meteorological variable which has a profound effect on the weather is the vertical velocity of the atmospheric motions. For synoptic-scale motions the vertical velocity component is typically of the order of a few centimeters per second. In general, the vertical velocity is not measured directly but must be inferred from other meteorological fields that are measured directly. The aim of the present research comprises an attempt to deduce information about the character of the vertical air motion w from the disdrometer data. In this respect, the results of combining measurements from a Joss-Waldvogel disdrometer, radiosonde measurements and fields from atmospheric reanalysis are presented and discussed. The present paper aspires to contribute towards the better understanding of the long standing vertical velocity estimation issue through the combined interplay of these three sources of data.
In the present study, a Joss-Waldvogel disdrometer was used in order to establish the Drop Size Distributions (DSD) at Athalassa, Cyprus. Data from a radiosonde station co-located with the disdrometer were also collected which were subsequently used to derive estimates of vertical velocities. Meteorological fields, including vertical velocities, were extracted from an atmospheric reanalysis, namely the ERA-Interim, for an area centered over the disdrometer and radiosonde station instrumentation. The disdrometer data were used to determine the Z-R disdrometer derived coefficients (which is the traditionally used pair of symbols denoting reflectivity and rain rate). To model the vertical air effect on the Z-R disdrometer derived coefficients, an idealistic notion of flux conservation of the DSD is adopted. It is demonstrated that vertical velocities can be extracted from radiosonde data if initial balloon volume is accurately measured, along with an accurate measurement of the mass of the complete radiosonde-balloon system. To accomplish this, vertical velocities from radiosonde data were equated to the ERA-Interim reanalysis vertical velocity fields. The resulting values of initial balloon volume are found to be within the range of measured values.