Geophysical Research Abstracts
Vol. 17, EGU2015-13571, 2015
EGU General Assembly 2015

Seasonal Characteristics of Planetary Boundary Layer in Qatar.

Luis Ackermann, Mohammed A. Ayoub, Daniel P. Astudillo, and Dunia A. Bachour
Qatar Environment and Energy Research Institute, Qatar Foundation, Doha, Qatar (lackermann@qf.org.qa)

Understanding the mechanisms driving the Planetary Boundary Layer (PBL) development as well as its seasonal characteristics is essential for predicting meteorological and air quality phenomena. Using data from the vertical backscatter profile of the atmosphere above Qatar from a ceilometer, coupled with a novel Layer Identification Algorithm (LIA) developed by QEERI, a continuous time series of the PBL has been attained. This data has been carefully validated against in-situ measurements via coinciding radiosonde launches. These launches were performed weekly at 13:00 local time during 2014; with occasional launches at 07:00. The detected PBL depth from the sondes show good correlation with LIA. This algorithm uses image recognition methods to identify boundary layers not only by their vertical characteristics; but also by their temporal and spatial signatures. This algorithm was written in Python and is designed to process the ceilometer's output data in real time or as a post-process.
The behavior of the PBL depth diurnal variation in Qatar was observed to vary in correlation with the change in seasons. During the winter months the mean PBL depth was higher compared to the summer months; in addition, the diurnal amplitude was higher during winter. Apart from seasonal variations in the PBL depth behavior, short term fluctuations in the daily signature of the PBL structure were observed; with some days exhibiting a well-developed PBL followed by a day with no significant PBL variation. This behavior of the summer PBL (lower daily mean depth and lower diurnal amplitude relative to winter) was explained after looking at diurnal humidity and temperature variations. During these months, the intense temperature and humidity enhances the energy flux towards latent heat, actually diminishing the effect of the high insolation towards the development of the PBL. Lower mean PBL depths during the months of higher photochemical activity affect surface concentrations of secondary pollutants and particle matter.