Influence of meteorological parameters on air quality

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The physical characterization representative of ambient air particle concentrations is becoming a topic of great interest for urban air quality monitoring and human exposure assessment. Human exposure to particulate matter of less than 2.5 μm in diameter (PM2.5) can result in a variety of adverse health impacts, including reduced lung function and premature mortality. Numerous studies have shown that fine airborne inhalable particulate matter particles (PM2.5) are more dangerous to human health than coarse particles, e.g. PM10. This study investigates meteorological parameter impacts on PM2.5 concentrations in the atmosphere of Rio de Janeiro, Brazil. Samples were collected during 24 h every six days using a high-volume sampler from six sites in the metropolitan area of Rio de Janeiro from January to December 2011. The particles mass was determined by Gravimetry. Meteorological parameters were obtained from automatic stations near the sampling sites. The average PM2.5 concentrations ranged from 9 to 32 μg/m3 for all sites, exceeding the suggested annual limit of WHO (10 μg/m3). The relationship between the effects of temperature, relative humidity, wind speed and direction and particle concentration was examined using a Principal Component Analysis (PCA) for the different sites and seasons. The results for each sampling point and season presented different principal component numbers, varying from 2 to 4, and extremely different relationships with the parameters. This clearly shows that changes in meteorological conditions exert a marked influence on air quality.