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Analysis of ground level ozone for various Measurement sites in Ireland

Om Tripathi (1), Gerard Jennings (1), Colin O'Dowd (1), S. Leinert (2), E. Moran (3), S. O'Doherty (4), and T. Spain (1)

(1) Environmental Change Institute, National University of Ireland, Galway, Ireland (tripathi_o_p@yahoo.com), (2) Environmental Protection Agency, Dublin, Ireland, (3) Met-Éireann, Dublin, Ireland, (4) Physical and Theoretical Chemistry, University of Bristol, U.K.

Several years of data from various stations and sources are analyzed to investigate the surface ozone concentration, long term trends, and seasonal changes in and around Ireland. These stations are representative of different regimes of – urban, suburban, major city, major town, rural, and marine sites – ground level ozone chemistry. Hourly ozone data is used to calculate daily mean concentration and time series of monthly mean ozone concentration. Time series statistical analysis is performed on the monthly mean data using seasonal and trend decomposition procedures. Ozone concentration in the Irish region is found to have a decreasing trend at all sites except at the coastal sites of Mace Head and Valentia. Data from the most polluted Dublin city site has shown exceptionally strong negative trends. The negative trend is noticed when the data span is considered from around the year 2000 to 2007. Mace Head has shown a positive trend of about 0.16 ppb per annum over the period 1988-2007. For detailed analysis, back trajectories are calculated to investigate the impact of air-mass origin on the behavior of a seasonal component and trends – particularly at the Mace Head site. Cluster analysis for back trajectories are performed for the stations having a long record of data – Mace Head and Lough Navar – to assess the wind sector contribution to the ozone level and trend. For Mace Head, the northern and western clean air sectors have shown a similar positive trend (0.17 ppb per year for the Northern sector and 0.18 ppb per year for the Western sector). The seasonal pattern in ozone for the polluted Eastern sector is found to be lagging behind the cleaner non-eastern sectors. Partial analysis for the clean Western sector shows different ozone trends during different time periods with a decrease in trend since 1988. The minimum trend is found for the period 2001 to 2007.