



Determination of sources affecting chemical composition of rain water at the Eastern Mediterranean using positive matrix factorization.

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Fair amount of data is now accumulated on the chemical composition of atmospheric aerosol at the Eastern Mediterranean. Information on the chemical composition of precipitation; however, is not as abundant. In this study sources affecting chemical composition of rain water at the Eastern Mediterranean basin is investigated using multivariate statistics applied to approximately 400, daily, wet-only rain samples collected at a rural station on the Mediterranean coast of Turkey, between December 1991 and July 2000. Considering the low annual rainfall in the region, number of rain water samples used in this study is substantial. Collected samples are analyzed for Na^+ , Cl , Al , Fe , Ca^{2+} , K^+ , Mg^{2+} , H^+ , SO_4^{2-} , NO_3^- , NH_4^+ , Cd , Cu , Pb , Ni , Cr , Zn . Sources responsible for the observed concentrations of measured species were investigated using positive matrix factorization (PMF). After trials with 3 – 8 factor solutions, 5 factor solution was found to be the optimal solution. Factors are identified based on factor profiles, variances of species explained, temporal variation in factor scores (G-matrix) and backtrajectories corresponding to highest factor scores. The five factors identified included, Free acidity, local crustal, sea salt, and two anthropogenic components. One of the anthropogenic factors is associated with long range transport and the other one are more regional in nature. The potential source contribution function is calculated using factor scores resolved in PMF. Uncertainties in calculated PSCF values are checked using nonparametric bootstrapping. The main source regions for long range transport component is found to be Balkan Countries, Ukraine and central parts of Russia.