

SOURCES OF HIGH SULFATE CONCENTRATIONS IN THE EASTERN MEDITERRANEAN ATMOSPHERE

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Since the Eastern Mediterranean region is downwind from strong emission regions in Europe, chemical composition of Eastern Mediterranean aerosol is expected to be impacted by atmospheric transport of anthropogenic material from these source areas. Studies performed in the Eastern Mediterranean atmosphere have clearly demonstrated an anthropogenic component that is almost always associated with air mass trajectories from N and NW wind sectors. Although most of the pollution markers measured in the region, such as metals and ions with well known man made sources, have indicated a high, but not unusually high anthropogenic component in Eastern Mediterranean aerosol, sulfate was an exception. Sulfate concentrations measured in the region were one of the highest measured in whole Europe. Similar high concentrations measured in different sites separated by hundreds of kilometers indicated that this is a regional phenomenon. In this study data for SO₄²⁻ and other ions, generated by analysis 1500 aerosol samples collected at a station on the Mediterranean coast of Turkey between 1992 and 2000, were used to determine the source regions responsible for observed high SO₄²⁻ concentrations in the region. The median value of the SO₄²⁻ concentration was 6.9 µg m⁻³, which is comparable to values reported in other sites in the region and in the Black Sea atmosphere. Concentrations of SO₄²⁻ showed a well-defined seasonal cycle with summer time concentrations is approximately a factor-of-two higher than concentrations measured during winter season. This was attributed to enhanced photochemistry in summer and more extensive wet scavenging during winter periods. Comparison of measured concentrations with those measured in the EMEP network demonstrated that, well-documented decrease in SO₄²⁻ concentrations after late 80's in EUROPE was not observed in the Eastern Mediterranean. Comparison of SO₄²⁻/NO₃⁻ ratio has indicated a sulfate rich aerosol which was typical throughout Europe before 1990, but now typical for former Eastern Block countries and Balkan countries. Trajectory statistics applied to data set showed that Certain regions in Bulgaria and Romania, western parts of Turkey, particularly Istanbul and surrounding highly industrialized region, industrial area around the city of İzmir and Greater Athens area in Greece are the main source regions for observed high SO₄²⁻ concentrations in the Eastern Mediterranean region.