AEROSOL NITRATE AND NON-SEA-SALT SULFATE OVER THE EASTERN MEDITERRANEAN

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INTRODUCTION

Among the biogenic sources of sulfate aerosols, reduced sulfur gases such as DMS constitute and control a significant fraction of the atmospheric nss-sulfate budget (Charlson *et al.*, 1987, e.g.). Certain species of phytoplankton; particularly the dinoflagellate *Phaeocystis pouchetii* and the coccolithophore *Emiliana huxleyi* are known to be important producers of dimethylsulfide (DMS) (Matrai and Keller, 1993, e.g.). Biogenic sulfur, created mainly by seasonal phytoplanktonic activity, could be particularly rich sources in certain regions and dominate the atmospheric sulfur cycle.

Daily samples of aerosol collected at Erdemli, Turkey (36°33'54"N, 34°15'18"E) during October 1991-December 1992 were analyzed by ion chromatography (IC) to determine Cl^-, NO_3^- and $SO_4^=$ concentrations. Elemental compositions of these samples together with air mass trajectory analyses have emphasized the influence of crustal material compared to anthropogenic emissions (Kubilay and Saydam, 1995). The relatively low concentrations of anthropogenic trace elements observed in Erdemli, compared with the western Mediterranean (Bergametti *et al.*, 1989), suggests dominance of marine biogenic DMS contribution to nss-sulfate by phytoplankton blooms.

RESULTS AND DISCUSSION

Aerosol sulfate and nitrate decrease in winter due to scavenging by precipitation. The maximum nss-sulfate occured in June 1992 (21.8±8.5 $\mu g/m^3$) and July 1992 (19.8±6.5 $\mu g/m^3$), whereas nitrate reached 7.7±4.0 $\mu g/m^3$ in April 1992, compared to their means in Table 1.

The episodic transport events are best characterized by case studies, as given for 27-28-29-30 July 1992 below; Air mass back trajectories arriving at 900 hPa level on 27 and 28 July originated from the Black Sea (Fig. 1a,b), where an intense basin-wide coccolithophore (*E. huxleyi*) bloom was observed (Vladimirov *et al.*, 1997) at about the same time, producing the minimum Secchi disk visibility depth of 6.2m. observed since 1923. We consistently measured unusually high nss-sulfate concentrations in aerosols crossing over or originating from the Black Sea in the 25 June-3 August 1992 period.

Table 1. Aerosol nss-sulfate and nitrate concentrations ($\mu g/m^3$) in Erdemli

Sampling date	nss-sulfate (6.57±6.54)	nitrate (2.74±2.73)
27 July 1992	29.29	9.34
28 July 1992	31.44	8.99
29 July 1992	4.24	8.29
30 July 1992	21.79	6.06

The arithmetic means of the entire data set are given in parentheses.

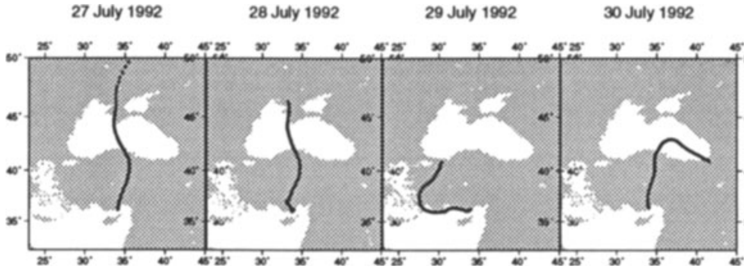

Figure 1. 3-D back trajectories associated with air masses arriving at 900 hPa level (a) 27 July 1992; (b) 28 July 1992; (c) 29 July 1992; (d) 30 July 1992.

Air flows within the boundary layer on 27 and 28 July (Fig. 1a,b) showed similar patterns with maximum nss-sulfate concentrations. On 29 June, the flow at 900 hPa level changed in direction swept the western and south-western coasts of Turkey (see Fig. 1c), resulting in rapid decrease in sulfate concentration. Steady nitrate concentrations in the same period, which are significantly higher than the overall mean (2.74 ($\mu g/m^3$), suggest anthropogenic contributions from land. The rapid decrease on 29 July in contrast to the nitrate suggests a dropout in the biogenic contribution to nss-sulfate level on 29 July, as a result of the temporary diversion from the Black Sea source (see Fig. 1c), which was restored once again when the flow changed direction towards the eastern Black Sea on 30 July 1992 (see Fig. 1d). This increase can be attributed to the anomalous *E. huxleyi* bloom reported by Vladimirov *et al.*, (1997) in the Black Sea.

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