Figure Captions

Figure 1. Back-trajectory analysis ending at the ship's location (10 m altitude) at 1200 GMT for each day (shown by a diamond) of the meridional transect. The crosses on each map mark the ship's position at 1200 GMT for all days during the cruise. Each map is labelled with the date, latitude, and longitude of the final point of the analysis and the length of the back trajectory in days.

Figure 2. Optical depth of the Teflon construction material of the walls of the Weiss equilibrator used to measure the seawater concentrations of reduced sulfur gases during AMT-7.

Figure 3. (a) Insolation from radiometer measurements (thick line) and a theoretical calculation (thin line), (b) Daily integrated insolation from radiometer measurements (thick line) and the theoretical calculation (thin line), (c) Total heat flux (sum of longwave, sensible, and latent components). (d) Cloud cover. (e) Absolute value of wind speed (solid line: underway recorder; diamonds: bridge observations); (f) Total column ozone from the TOMS satellite.

Figure 4. Upper ocean temperature and salinity structure: (a) underway sea surface temperature (solid line), uppermost temperatures from XBT (asterisks) and CTD (squares); (b) temperature profiles from XBT and CTD (the time of the profile is given by the intersection of the uppermost point with the time axis); (c) uppermost salinity from CTD; (d) salinity profiles from CTD (the time of the profile is given by the intersection of the uppermost point with the time axis).

Figure 5. Annual time series of 8–day average SeaWiFS chlorophyll *a* concentration for each pixel along the AMT-7 transect. White patches denote gaps in the satellite record due to clouds or periods large aerosol optical depth (for the case of North Africa).

Figure 6. (a) Chlorophyll *a* concentration using a Turner fluorometer for discrete measure-

ments from the ship's uncontaminated seawater supply (triangles; in situ data measured using Turner fluorometer and from SeaWiFS satellite (diamonds); and (b) Beam attenuation coefficient at 660 nm from uppermost rosette bottle (diamonds) and diffuse attenuation coefficient at 650 nm from *Jerlov* [1976] (solid line); (c) Inverse of diffuse attenuation coefficient for PAR for 0–200 m and inverse of diffuse attenuation coefficient for 475 nm from *Jerlov* [1976] (solid line).

Figure 7. Summary of discrete optical measurements from AMT-7 cruise: (a) gelbstoff fluorescence signal (excitation at 254 nm; emission at 440 nm); (b) tryptophan fluorescence signal (excitation at 270 nm; emission at 320 nm); (c) absorption coefficient at 300 nm; and (d) slope of the graph of base 10 logarithm of the absorption coefficient versus wavelength.

Figure 8. Scatter diagram of SeaWiFS chlorophyll *a* concentration versus $a_g(300nm)$ where the seawater sample is filtered and the baseline correction has been applied.

Figure 9. Measurements of trace gases made during the AMT-7 cruise: (a) COS mixing ratio in ambient air from the foremast of the ship (diamonds are measurements; crosses are daily averages with the standard deviation indicated); (b) sea surface COS concentration; and (c) sea surface CS_2 concentration (diamonds: AMT7 data; triangles: Pacific meridional transect cruise [*Xie and Moore*, 1999]; crosses: northeast Atlantic Ocean [*Xie and Moore*, 1999]; squares: United States eastern seaboard [*Kim and Andreae*, 1992]). The dotted lines denote the detection limits.

Figure 10. Histograms of distribution of (a) COS seawater concentration, (b) CH_3SH seawater concentration, (c) DMS seawater concentration, (d) CS_2 seawater concentration, and (e) COS atmospheric mixing ratio.

Figure 11. Measurements of trace gases made during the AMT-7 cruise: (a) sea surface CH_3SH concentration (low mixing ratios on Julian day 296 were recorded during a wind

storm); (b) sea surface DMS concentration (diamonds: AMT-7 measurements; vertical crosses: measurements from the database of *Kettle et al.* [1999] from September and October taken within 300 km of any AMT-7 measurement; solid line: data from the smoothed first guess field of sea surface DMS concentration for September (after Plate 4 of *Kettle et al.* [1999]); dotted line: data from the data-assimilated field of sea surface DMS concentration for September (after Plate 5 of *Kettle et al.* [1999]); dashed line: data from the smoothed first guess field of sea surface DMS concentration for October (after Plate 4 of *Kettle et al.* [1999]); dot-dashed line: data from the data-assimilated field of sea surface DMS concentration for October (after Plate 5 of *Kettle et al.* [1999])). The dotted lines denote the detection limits.

Figure 12. Ratio of sea-air flux of DMS to CH_3SH.

Figure 13. Sea-air fluxes for (a) COS, (b) CH_3SH, (c) DMS, and (d) CS_2.

Figure 14. Histograms of frequency distribution of flux of (a) COS, (b) CH_3SH, (c) DMS, and (d) CS_2.