Geophysical Research Abstracts, Vol. 8, 02080, 2006
SRef-ID: 1607-7962/gra/EGU06-A-02080

Air-soil exchange of carbonyl sulfide in tropical forests in China

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The exchange fluxes of carbonyl sulfide (COS) between the atmosphere and forest soils were investigated using a static chamber in Dinghushan Biosphere Reserve (DBR) in tropical China from July, 2004 through March, 2005. The three typical subtropical forests studied, including monsoon evergreen broad-leaf forest (BF), pine and broad-leaf mixed forest (MF) and pine forest (PF), represent forests with different succession stages in the region. COS exchange rates were also compared between the plots with litter-fall remained (plot L) and those with litter-fall removed (plot S) in each forest. Results showed that these forest soils all acted as sinks for COS. The exchange rates ranged between -1.22 and -11.82 pmol m^{-2} s^{-1}, with the mean exchange rates of -3.90, -4.77 and -3.65 pmol m^{-2} s^{-1} in the BF, MF and PF, respectively. COS fluxes in the MF were significantly higher than those in the BF or the PF ($p<0.05$). Also COS fluxes at the plots L were significantly higher than those at plots S in the MF, but not in the BF and the PF. The mean COS fluxes were -3.29, -3.15 and -2.99 pmol m^{-2} s^{-1} at plots S, and -4.25, -6.38 and -3.90 pmol m^{-2} s^{-1} at the plots L in BF, MF and PF, respectively. The mean COS fluxes were significantly higher in March (-6.06 pmol $m^{-2}s^{-1}$) than those in July (-3.60 pmol m^{-2} s^{-1}), August (-3.82 pmol m^{-2} s^{-1}), September (-3.45 pmol m^{-2} s^{-1}) and October (-3.54 pmol m^{-2} s^{-1}). The dependence of COS fluxes on the initial COS concentrations were detected in BF and PF, with higher soil uptake rates recorded at higher initial COS concentrations. Considering soil temperature or the soil water contents as a single factor, no correlation between the COS fluxes and them was observed in all the three forests, but soil COS fluxes were influenced coherently by them. The variation of COS fluxes between the plots L and the plots S, as well as among the three forests, might be related to

the amount of soil microorganisms, especially soil bacteria. The relationship between the COS uptake rates and soil respiration rates also indicated that microbial activity affected the uptake of COS by soils.