生态学报 2006 26 (2006(08)): 2602～2607 ISSN: 1004-616x CN: 44-1063/R

研究论文

九龙江流域大气氮干沉降

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收稿日期 2005-6-30 修回日期 2005-11-24 网络版发布日期: 2006-8-25

摘要 对九龙江流域10个站位的大气氮干沉降量进行为期1a的连续观测。利用专用降尘缸湿法收集大气沉降氮，在获取各月氮组分浓度和相应水样体积后，求得各月氮沉降速率，再将各月数值相加得到全年的大气氮干沉降量。结果表明，九龙江流域大气氮干沉降表现出一定的时空差异性，总氮沉降量为3.41～7.63 kg N/(hm^2•a)，铵氮为1.02～3.00 kg N/(hm^2•a)，硝氮为0.76～1.76 kg N/(hm^2•a)。干沉降中氮的3种主要形态铵氮、硝氮与有机氮分别占总沉降量的31%、24%和45%。中游漳州地区的大气氮干沉降总量较大。上游龙岩地区与中游漳州地区具有较高的铵氮沉降量，硝态氮在上下游间无明显变化，而有机氮沉降量在中下游地区较高。在时间尺度上，大气氮干沉降呈现出夏秋两季比春冬两季略高的总体趋势，季节性差异显著($p<0.05$)。大气氮干沉降时空差异主要与氮排放量和气象条件有关。

关键词 氮；大气干沉降；九龙江流域

分类号 S718

Dry deposition of atmospheric nitrogen to Jiulong River watershed in southeast China

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Abstract In this study, bulk samplers that use a water surface to collect dry deposition were used in ten sites throughout the Jiulong River watershed, an agriculture-dominated watershed located in southeastern China with a drainage area of 1.41×104 km^2. Bulk samples were collected monthly. On the day after collection, aliquots of water samples containing dry depositions were taken to the laboratory where different nitrogen species were measured followed by filtration through 0.45 μm Nucleopore membranes. Based on the sum of monthly data, the annual dry atmospheric deposition flux of nitrogen species was quantified. Annual mean atmospheric deposition of dissolved total nitrogen, ammonium nitrogen, and nitrate nitrogen to the Jiulong River watershed in 2004 ranged 3.417.63, 1.023.00, 0.761.76 kg N/(hm^2•a), respectively. Average atmospheric deposition flux of nitrogen species are 1.52 kg N/(hm^2•a) for ammonium nitrogen and 1.16 kg N/(hm^2•a) for nitrate nitrogen. Dissolved organic nitrogen, defined as the difference between dissolved total nitrogen and the sum of ammonium and nitrate nitrogen, was calculated as 1.023.45 kg N/(hm^2•a) with a mean of 2.19 kg N/(hm^2•a). The dry deposition of ammonium nitrogen, nitrate nitrogen and organic nitrogen formed 31%, 24% and 45% of the total flux for the whole watershed, respectively. In dry deposition the spatial pattern of nitrogen species was ostensibly linked to local pollution sources. For example, higher dry deposition flux of ammonium nitrogen was found in the up-stream and mid-stream region due to the intensive agricultural activities there with higher ammonia volatilization. The dry atmospheric nitrogen deposition in summer and autumn has a greater flux than that in spring and winter at most investigated sites. The spatio-temporal variation of atmospheric nitrogen deposition indicated that higher ammonia volatilization from fertilizer application in the growing season, and livestock productions during summer together provide the larger nitrogen s

ource. Atmospheric deposition is delivered by wet, dry and cloud deposition processes, and thes
e processes are controlled by a wide range of landscape features, including canopy type and struc
ture, topographic exposure, elevation and slope orientation. As a result, there can be a very hig
h degree of spatial variability within a watershed, so further research is needed on both dry and w
et deposition of atmospheric nitrogen with more representative sites in order to achieve a compre
hensive understanding of nitrogen cycling and nitrogen balance at the watershed level.

Key words atmospheric nitrogen _ dry deposition _ Jiulong River watershed

DOI

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