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# 1 Long-term changes in wet nitrogen and sulfur deposition in Nanjing

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## 16 Abstract:

17 The concentration and deposition of acid from precipitation in Nanjing in the  
18 Yangtze River Delta are presented, and their long-term trends are detected based on  
19 ground measurements. The wet  $\text{SO}_4^{2-}$  deposition was  $18.1 \text{ kg S ha}^{-1} \text{ yr}^{-1}$  from  
20 2015-2016, which is much lower than the average across China; and the  $\text{NO}_3^-$   
21 deposition was  $8.5 \text{ kg N ha}^{-1} \text{ yr}^{-1}$ , which is higher than the national average. Both  
22  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$  depositions were relatively high in spring, summer, and autumn, with  
23 the lowest occurring in winter. From 1990 to 2016, the averages of  $\text{SO}_4^{2-}$  deposition  
24 during each Five-year Plan gradually decreased from the 8<sup>th</sup> (1991-1995) to 12<sup>th</sup>  
25 Five-year Plan (2011-2015), although the annual value did not show a significant  
26 decreasing trend due to large variations. Both the annual value and averages of  $\text{NO}_3^-$   
27 deposition during each Five-year Plan showed significant increasing trends from 1990  
28 to 2016. The  $\text{SO}_4^{2-}$  deposition during the 12<sup>th</sup> Five-year Plan decreased by 26.5%  
29 while the  $\text{NO}_3^-$  deposition increased by 182.9% relative to that of the 8<sup>th</sup> Five-year  
30 Plan. These results confirmed that  $\text{NO}_3^-$  deposition is still high in the Yangtze River  
31 Delta.

32 **Key words:** wet acid deposition, long-term trend, ground measurement, Nanjing

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## 34 1 Introduction

35 China has become one of the global hotspots of acid deposition due to the  
36 increased energy consumption in recent years (Vet et al., 2014). To control acid  
37 pollution and improve air quality, the Chinese government has enacted a series of  
38 policies to decrease the acid deposition precursors  $\text{SO}_2$  and  $\text{NO}_x$  since the mid-1990s  
39 (Hao et al., 2000). Before the 12<sup>th</sup> Five-year Plan (2011-2015), only  $\text{SO}_2$  emissions  
40 were controlled, and the joint control on  $\text{SO}_2$  and  $\text{NO}_x$  emissions began with the 12<sup>th</sup>

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