

Rate of atmospheric bulk N deposition in natural and agricultural areas in the Southern Ukraine

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Abstract

Atmospheric N aerosols has strong impacts on climate (IPCC, 2007), while its deposition may effect on ecosystem functioning. It is known that N deposition can be considered as an important nutrient source for natural ecosystems, particularly in N-load regions (Geßler et al., 2000; Butterbach-Bahl et al., 2004; Sparks, 2009). Moreover recently the significance of organic N deposition and its large contribution to total N deposition has been revealed (Cornell, 2003, 2011; Medinets and Medinets, 2012). The aim of this study is to assess and compare the rates of atmospheric bulk N deposition onto surface in natural and agricultural areas in the Southern Ukraine region in 2011-2013. Samples have been collected monthly/fortnightly in three sites: agricultural (PTR), garden (DN1) and natural (DN2). TN, water soluble TN and DIN (NO₂-, NO₃-, NH₄+) have been determined in each sample. Average annual deposition rate for 3 years has been estimated as 11.4 kg N ha⁻¹ for PTR, 9.8 kg N ha⁻¹ for DN1 and 7.7 kg N ha⁻¹ for DN2. We have found that PTR site regularly obtained more deposited TN (by 37%) and DIN (by 40%) than relatively clean DN2 site. It has been demonstrated that inter-annual fluctuations for DIN varied significantly less (ca. 8-13%) than those for TN (ca. 26-36%) and for WSTN (ca. 20-33%). Interestingly that in all three sites the contribution of DIN in TN deposition varied in the same ranges from 39% (PTR) to 35% (DN1 and DN2). It can mean that tropospheric transformations of N pollutants with formation of organic and mineral aerosols and gases appear to be similar with constant ratio (±5%) for sites, located in the same region, regardless of different local N-load. Thus we conclude that significance of organic N contribution in N deposition onto both terrestrial and aquatic surfaces is crucial and further investigations as well as long-term monitoring are timely and urgently needed.