



The unexpected effect of SO₂ and NO₂ emission reductions over China: strong and rapid increase of atmospheric ammonia levels

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Air pollution, reaching hazardous levels in many Chinese cities has been a major concern in China over the past decades. New policies have been applied to regulate anthropogenic pollutant emissions, leading to changes in atmospheric composition and in particulate matter (PM) production. Increasing levels of atmospheric ammonia columns have been observed by satellite during the last years, in particular IASI observations reveal an increase of these columns by 15% and 65% from 2011 to 2013 and 2015, respectively, over Eastern China. For this period, it appears that ammonia emissions have remained almost identical. In our study, we have performed model simulations (with CHIMERE 3D CTM) for 2011, 2013 and 2015 in order to understand the origin of this rapid and substantial increase, and in particular to quantify the link between ammonia and the inorganic components of particles: NH₄⁺(p) / SO₄²⁻(p) / NO₃⁻(p). Interannual change of meteorology can be excluded as a reason for ammonia increase: year 2015 meteorology leads to enhanced sulphate production over Eastern China, which increases the ammonium production and decreases the ammonia content which is contrary to satellite observations. Reductions in SO₂ and NO_x emission between 2011 and 2015 of respectively -38 and -21%, as constrained from satellite based OMI instrument observations, lead to decreased inorganic matter (by 14% for NH₄⁺(p) + SO₄²⁻(p) + NO₃⁻(p)). This in turn leads to increased gaseous NH₃(g) tropospheric columns, by as much as 24% and 49% (filtering model data following IASI data availability) from 2011 to 2013 and 2015 respectively, and thus can explain most of the observed increase.