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Impact of agricultural ammonia emissions on particulate ma

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Particulate matter (PM10) concentrations commonly exceed the health standards in large parts of Europe. Significant fractions of PM10 are of secondary origin, such as sulfate, nitrate, ammonium and organic compounds. Cost-effective measures to reduce secondary aerosol depend on the knowledge of the complex relationships between PM10 and the emissions of gaseous precursors like ammonia and nitrogen oxides. More than 90% of the total ammonia emissions in Switzerland are caused by agriculture. Several studies have shown that technical and operational measures in livestock farming could reduce these emissions by 30-50%. We investigate if such a reduction in ammonia emissions will result in a noticeable change of PM10 levels based on observations of the Swiss national air pollution monitoring network. An inorganic aerosol thermodynamic equilibrium model is applied to study the partitioning of NH_3/NH_4^+ and HNO_3 /NO_3^- between the gas and aerosol phase given the measured concentrations of total ammonium (NH_3 + NH_4^+) and total nitrate (HNO_3 + NO_3^-). The sensitivity of inorganic aerosol mass to changes in ammonia concentrations from this process based analysis is compared to an analogous analysis with a Neural Network, which represents a contrasting model approach not including any knowledge about the involved processes. The results indicate that secondary aerosol formation in Switzerland is only moderately dependent on the availability of ammonia. While the two analyses agree qualitatively well, some differing answers were obtained for the cold season and are discussed.