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Controls over N_2O, NO_x and CO_2 fluxes in a calcareous mountain forest soil

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We measured nitrogen oxides (N_2O and NO), dinitrogen (N_2) and carbon dioxide (CO_2) emissions from a spruce-fir-beech forest soil in the North Tyrolean limestone Alps in Austria. The site received 12.1 kg nitrogen via wet and dry deposition. Fluxes of nitric oxide (NO) were measured by an automatic dynamic chamber system on an hourly basis over a two year period. Daily N_2O emissions were obtained by a semi-automatic gas measuring system. In order to cover spatial variability biweekly manual measurements of N_2O and CO_2 emissions were carried out in addition. For acquiring information on the effects of soil and meteorological conditions and of N-deposition on N-emissions we chose the auto-regression procedure (time-series analysis) as our means of investigation. Hence, we could exclude the data's autocorrelation in the course of the time. We found that soil temperature, soil moisture and wet N-deposition followed by air temperature and precipitation were the most powerful influencing parameters effecting N-emissions. With these variables, up to 89% of observed temporal variations of N-emissions could be explained. During the two-year investigation period between 2.5 and 3.5% of deposited N was reemitted in form of N_2O whereas only 0.2% were emitted as NO. At our mountain forest site the main end-product of microbial activity processes was N_2 and trace gases (N_2O and NO) were only of minor importance.