N2O losses from Austrian grassland under climate change. - A modelling approach

Cecilie Foldal (1,2), Regine Maier (2), Edwin Haas (3), David Kraus (3), Ralf Kiese (3), Barbara Amon (2,4), Georg Dersch (5), Bettina Schwarzl (6), Gerhard Zethner (6), Michael Anderl (6), Sophie Zechmeister-Boltenstern (2), and Barbara Kitzler (1)

(1) Austrian Research Centre for Forests, Soil ecology, Vienna, Austria, (2) Institute for Soil Science, University of Natural Resources and Life Sciences, Vienna, Austria, (3) Karlsruhe Institute of Technology (KIT), Garmisch-Partenkirchen, Germany, (4) Leibniz Institute for Agricultural Engineering, Potsdam, Germany, (5) Austrian Agency for Health and Food Safety, Vienna, Austria , (6) Environment Agency Austria, Vienna, Austria

The increasing use of nitrogen (N) as fertilizer in agriculture combined with climate change is of major interest in research. Temperature increase and precipitation change will impact crop yields and N losses. Within the "NITROAUSTRIA" project nitrous oxide (N2O) emissions from Austrian grassland soils were simulated using the LandscapeDNDC model and proved to be higher than emissions from croplands. Five different regions and six different soil types which are covering more than 70% of intensively managed grassland area in each region were simulated. The objectives of this study were to predict N2O fluxes from intensively managed grasslands considering the impact of climate change. A baseline scenario (2005 to 2014), 3 temperature and 3 precipitation change scenarios (2031 to 2040) were chosen. The results indicate that lower precipitation decreases NO_3- leaching and increases N availability in soil. Peak N2O emissions are mainly responsible for high annual fluxes and these peaks may increase in future under lower precipitation due to drought-rewetting events triggering gaseous N-losses.