NitroEurope

Centre for Ecology & Hydrology

NEU C1-C3 Database

The NitroEurope database overview and available data fields (April 2011)

Email neudata@ceh.ac.uk for help or advice

The NitroEurope Integrated Project (2006 – 2011) aims to gain a better understanding of the nitrogen cycle and its impacts on the European greenhouse gas balance. Over sixty project partners are collecting large volumes of data from sites all over Europe. There are currently around 60 sites throughout Europe. The collected data are at different temporal resolutions, from one-off measurements to 30-minute time-series data. Around 500 parameters (plus attributes) are measured, including soil and plant data, details of cultivation management for natural and manipulated sites, long-term datasets of flux and concentrations of greenhouse gas and pollutants and their precursors, and micrometeorology data. The NitroEurope research community therefore needed a database to provide easy upload and extraction of data for analysis, interpretation and modelling. A bespoke database with a web-based graphical user interface (GUI) in a user-friendly and attractive online environment was produced by the NitroEurope database development team. The software provides a flexible interface between Microsoft Excel workbooks and an Oracle database. The database *Form Manager* enables construction of database forms which reflect the project's Excel data workbook templates. The software locates data according to Excel worksheet and cell references. The database *Uploader* extracts the specified data from completed Excel templates and uploads data directly to the relational database through the web front-end. Data are run through automatic checks on upload and can be checked with an online graphing tool by a human data manager. Data are then validated and made available to the NitroEurope community for downloading. The database *Reporting* tools enable data from different sites and activities to be brought together and datasets can be previewed and graphed before they are downloaded. The database has almost 300 users and currently contains over eight million rows of data. The data will be made available to the wider scientific community two years after the project ends (Spring 2013). The database structure is extremely flexible and has been used for the storage and reporting of other time-series project data at our institute.

Access to data http://nitroeuropedata.ceh.ac.uk

At the moment, all ~300 NitroEurope scientists can access the 15 million rows of data that have been uploaded so far. We are still uploading data and hope to finish this task as soon as possible. In April 2013, the data will be freely available to anyone. We will be implementing a strategy for introducing free access, allowing NitroEurope scientists the option to temporarily with-hold data that they are still working with during the two year transition period.

Meanwhile, non-NitroEurope scientists can visit the database log-in screen, download the user guides (available soon), and request a user-id and password. You will be able to create a report where you will be able to select from the ~500 available data fields. You will also be able to view these data graphically (please see our posters at the Nitrogen Conference, by the "database table")

Data are available by NitroEurope "Activity type"

- Field Measurement (code "C1") time series data
- Field Measurements (code "C1") Methods
- Field Measurements (code "C1") "one-off" type data
- Manipulation field experiments (code "C2")
- Plot-scale Modelling output (site simulations; code "C3")

Data are available by "Ecosystem type"

- Sites are classed as "forest", "grassland", "arable", "wetland" or "shrubland"

Data are available by NitroEurope "field site"

There are ~60 sites, but not all of them contribute data to all activities.

~50 sites are "inferential" (Code "C1L1"), with basic air N concentration measurements at existing CO2 flux sites, for deposition estimates by inferential modelling.
9 sites are "regional" (Code "C1L2"), with basic N and GHG flux monitoring to get annual budgets eg "COTAG" and simple chambers.
13 sites are "super-sites" (Code "C1L3"), measuring N and GHG fluxes and concentrations, meteorological data etc at 30-minute resolution. Super-sites make core measurements and also measure data for special topics. Methods include high-cost micro-meteorologial studies, autochambers with online chemical analyses and process studies.

In addition, there will be experimental details associated advanced analyses of soil and plant N and C pools and processes (code “A1.4”)
There are ~35 manipulated sites making detailed flux measurements at up to 30 minute resolution (code “C2”).

Available data fields
An overview is presented here, and details can be downloaded from the database.

Field measurements - Inferential sites (Code “C1L1”): “Bulk measurements” of anions, cations and total water soluble N; “DELTA” measurements of gaseous HNO3, HONO, SO2, HCl, NH3, aerosol NO3-, NO2-, SO4-, Cl-, NH4+ and basic cations

Field measurements - Regional and Super sites (Codes “C1L2” and “C1L3”):

Metadata and one-off type data for C1L2: PI details, site details, instrument uncertainty, fetch details, overview of ecosystem age, management, species, crop rotation, land use, grazing, cutting, yield, drainage, grazing, drainage, fertilizer application, soil type, soil and rooting depth, at different soil layers – bulk density, clay, silt, sand, pH, shoot and root C:N.

Metadata and one-off type data for C1L3: PI details, site details, instrument uncertainty, fetch details, overview of Ecosystem age, management, species, crop rotation, land use, grazing, cutting, yield, grazing, drainage, fertilizer details, specific field problems, soil type, soil and rooting depth, at different soil layers -bulk density, clay, silt, sand, pH, moisture field capacity, microbial biomass N, C, mineralisation rate, denitrification rate, nitrification rate, shoot and root C: N ratio, stone fraction, hydraulic conductivity, total organic C and N, PF-curve data, loss on Ignition, organic fertilizer C

Field measurement methods: for all data fields

Field Measurement time series data:

Annual data: canopy height, wood dry biomass, aboveground biomass, leaf litter production, needle C and N, total C and N in litter, crop and inter-crop details, type, cultivar, sowing/planting date, sowing density, harvest yield, grazing and grazing periods, plant species composition areal coverage of plant functional group.

Weekly, monthly or seasonal data: Snow depth, soil NH4 concentration, Soil NO3, [NO3-] in leachate water, start and end time of leaching, tissue C and N, LAI, mean canopy height, aboveground biomass and litter mass, stemflow, standing leaf biomass, leaf litter production, throughfall, thinning, organic fertiliser application method, form, volume, dry matter, available C and N, applied C and N, C and N content, mineral chemical form of NPK, amount of N, K, P applied, animal mean live-weight, type, stocking density, crop yield, biomass residue after cutting, height vegetation before cut, site preparation, herbicides, liming, pesticides, irrigation amount, tillage depth, other events or disturbance, water table, soil moisture.

Soil surface flux (usually 4-a-day): CO2, N2O, CH4, O3, NO2, NO

30-minute flux data: [CO2], [H2O], Atmospheric stability parameter, gap-filled storage-corrected CO2 flux, sensible heat flux, latent heat flux, momentum flux, friction velocity, CO2 storage in canopy air layer, [NO], [NO2], [O3], roughness length, displacement height, evapotranspiration

30-minute meteorology data: Precipitation, global radiation, outgoing shortwave radiation, incoming and outgoing longwave radiation, net radiation, photosynthetic photon flux density diffuse and global, air temperature, pressure, bole temperature, soil temperature profile, soil water content profile, soil heat flux, relative humidity, wind direction, horizontal wind speed, water table depth, canopy wetness, snow depth.

Special topics for C1L3: [N2O],[NH3], NO flux, NO2 flux, N2O flux, NH3 flux, CH4 flux, O3 flux, aerosol [NH4+], aerosol [HNO3], aerosol [NO3-]

Additional fluxes for C1L2: [NO], [NH3], NO flux, NO2 flux, N2O flux, NH3 flux, CH4 flux, O3 flux, aerosol [NH4+], aerosol [HNO3], aerosol [NO3-]

Additional Wet Deposition data for C1L2, C1L3: Bulk precipitation amount, NH4- N, NO3- N, wet-only precipitation amount, NH4- N, NO3- N, throughfall amount, NH4- N, NO3- N, stemflow amount, NH4- N, NO3- N

Suction-cup measurements of leaching for C1L3: Soil water [NH4], [NO3], [N2O], [CH4], soil gas [N2O], [CH4] at different depths

Additional concentration and flux data for C1L3: [N (NO3-+NH4+)], Nr flux, total bulk N, total wet N, total throughfall N, total stemflow N, Soil [NH4], [NO3] at further depths, total soil [N] at different depths

Additional special topics for C1L3: [HNO3], [HNO3+NO3-], [NH3]+[NH4+], [NH4NO3]

Heights and depths of measurements

Manipulated site measurements (code "C2")

Treatment details

Site and PI details

Methods for measurements

Vegetation and fertilizer data: Sowing, density, Height of vegetation before and after each cut (grasslands), N, P, K applied at mineral fertiliser event, dry matter fertiliser applied at each fertiliser event, total N and C content of organic fertiliser, available N (ammonium and nitrate) and C content of organic fertiliser, estimated N and C applied to surface from organic fertiliser for each application, depth of tillage, amount of water applied during irrigation, typical LAI during grazing (grassland).

Crop management: Rotation length, ecosystem age, planting, thinning and harvest history, fertiliser application (rate, incorporation depth), chemical form of mineral N, P and K, form and application method of organic fertiliser applied at each fertiliser event, pesticides and herbicides details, irrigation, liming, grazing (duration, animal species, animal density), cutting dates (grasslands), drainage, tillage, Other events (date and description of main events, e.g. fire, flood etc.)

Site details: Latitude, Longitude, Elevation, Slope, depth of field drains, mean and maximum rooting depth

Soil details: Soil type (FAO soil classification), litter type

Vegetation details: vegetation age, canopy / vegetation height, DBH and stems ha-1 (forest), Wood, shoot, root and leaf dry biomass, LAI, max vegetation height, C to N ratio of wood biomass (forest), shoot biomass (arable, grassland, shrubland, wetland), root biomass, leaf biomass, leaf [N]

Biomass C and N: Biomass C and N total yield, grain yield, straw yield, in residues left after harvest, maximum potential total C and N yield.

Litter data: Litter mass and layer depth, total organic C and N in litter, annual litter production C and N

Soil details: ***t***otal number of soil layers, excluding the litter layer, ***s***oil layer number, bulk density, soil clay, sand, silt, stone fraction, hydraulic conductivity, porosity, moisture content at field capacity, at wilting point, available water, total organic C and N, pH.

*Soil pF:*soil water content at corresponding pF, pF at corresponding soil water content

Soil Nitrogen: Soil [NO3-], [NH4+], total [N]

Soil biomass: Microbial biomass C and N g-1 dry soil

Nitrogen cycle processes: Net N mineralization, nitrification and denitrification

Soil water measurements: Soil water [NO_3] and [NH_4], Soil water [DOC], [DON]

NO3 leaching: seepage Water, soil NO_3- leaching

Atmospheric N deposition: wet, dry and total atmospheric N deposition

N-fixation: Nitrogen fixation

Meteorological parameters: Air temperature (mean, min, max), global Radiation, PPFD Precipitation, snow depth, throughfall (forest), groundwater table depth, RH, horizontal wind speed, atmospheric [CO_2] and [NH_3]

Soil water and temperature time series: Soil water content and temperature

Ecosystem flux and associated data: ecosystem N_2O-N, NO-N, NO_2-N, NH_3-N, CH_4-N flux, soil CO_2-C dark respiration, net ecosystem CO_2-C exchange, soil temperature, air temperature, PPFD, soil water measured during flux measurement, evapotranspiration

Micrometeorological parameters: reflected or short wave outgoing, long wave incoming, long wave outgoing, net radiation, PAR incoming radiation, outgoing radiation, global radiation, air pressure, canopy radiative temperature, soil heat flux, wind direction, **w**ater vapour concentration, sensible heat flux, latent heat flux, momentum, friction velocity, CO_2 storage in canopy air layer, heat storage in canopy air layer