SP 02: Modelling and measurements of land use specific greenhouse gas emissions

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Objective

The main objective is to achieve substantial progress in reducing the high uncertainties associated with the assessment of greenhouse gas emissions from land use change and land use management of the global "hot spot" region of Southern Amazonia. The region-specific calibrated and validated model software will be used to simulate different land management effects to elaborate optimized GHG mitigation options. It will be integrated into the computer based decision support system (DSS) of Carbiocial.

Main hypotheses for this work are:

(1) Mechanistic GHG models (like Candy-GHG; DNDC or DayCent) can be operated more precisely than are results derived from the IPCC approach at the plot scale.

(2) Therefore these models calibration and validation at the intensive investigation plots are more sufficient to create realistic GHG mitigation options

(3) Hot spots and hot moments for N2O emissions offset any pure CO_2 mitigation attempts (C-stock sustainment and C-sequestering), hence mitigation strategies must focus on the elimination of temporal and spatial „hot spots"of GHG emission.

(4) The "buffer zones" between agricultural land and stream systems prove to be efficient in reducing GHG emission as CO_2 equivalents and should be expanded.

(5) Land use change and management changes (e.g. till-> no till) alter soil structure which is an important factor of soil gas exchange and must therefore consider in GHG fluxes modelling.

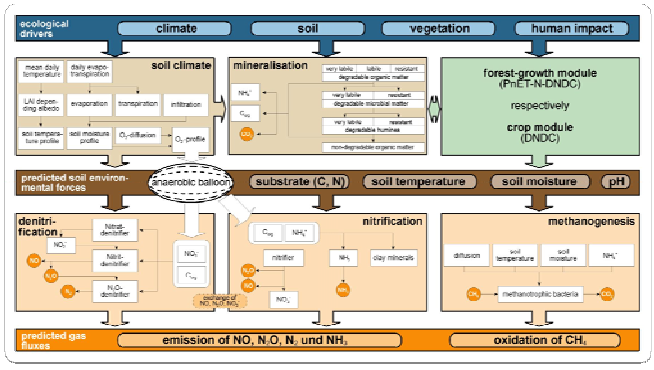

Fig 1: Schematic overview of moduls, ecological drivers and environmental forces in PnET-N-DNDC

Fig 2: Measurement of GHG emission with close chamber at field sites

Methods

The goal will be realized by applying measurement and modelling approaches in close concert. Both GHG modelling and measurements at the plot scale will be done in direct cooperation with our Brazilian partners. The measurements of the direct emissions will be done event-based (land use and climatic events) for all plots with large closed chamber (ground area >0.5 m^2) to minimise the influence of small site soil heterogeneity. Model comparing will be use to analyse the results and to find the optimal model for the most precise GHG predictions in up-scaling for the region of Southern Amazonia.

Workplan

		Year	2011				2012				2013				2014				2015			
		Quarter	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1
D1	Planning and construction of a GHG measuring together with the Brasil Partners																					
D2	Quality check																					
M1	**Knowledge transfer for GHG measurement**																					
D3	Model comparator check																					
D4	Calibration of Candy-GHG for the sites and knowledge transfer																					
D5	Development of a easy to use GHG model with Handbook																					
M2	**First Version of user friendly GHG model for one region**																					
D6	GHG Measurements at the field sites																					
D7	GHG inventory for Nord Mato Grosso and South Para																					
M3	**GHG emission maps**																					
D8	Land use and climate scenarios																					
D9	Additionally GHG Measurements at modelled "hot spots"																					
D10	Development of site-specific mitigation strategies																					
D11	User friendly GHG model for region in South Amazonian																					

Expected Results

(1) Multi-year high quality and detailed GHG-measurements for specific sites

(2) An easy to use GHG-model for policy makers and educated farmers as support for management decision under climate change condition for Southern Amazonia

(3) A mechanistic model based inventory of GHG emission of soils for Southern Amazonia (GHG-maps)

(4) Site specific GHG mitigation strategies

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