3.0 The LBA–Ecology Science Team

3.1 Membership and Responsibilities

The LBA–Ecology Science Team is responsible for:

- Providing the scientific content, direction, and priorities within LBA–Ecology.
- Conducting the scientific research for which each team member was selected.
- Participating in LBA training and education activities.
- Following protocols, including international agreements, cooperative practices, and data sharing policies as well as safety and logistical procedures established by the LBA–Ecology Project Office.

The term of participation on the Science Team will continue as long as the approved activities and the international agreements continue.

The LBA–Ecology Science Team will:

- Be responsible for finalizing study design and research strategy.
- Work with the Project Scientist and Project Office staff to prepare the LBA–Ecology Experiment Plan, refining the preliminary study design and detailing the specific activities to be conducted during the execution of LBA–Ecology and integrating its activities with those of the other LBA modules.
- Contribute to the establishment of a data management, data sharing, and data protocol plan across all of LBA.

Table 3.1 is a list of the investigations and the titles of the proposals. Extended abstracts for each investigation are provided in Appendix A.

3.2 LBA–Ecology Science Team Field Personnel

Appendix B contains a current list of all LBA–Ecology participants and includes their full name, and citizenship. This list will be updated in future version of the Experiment Plan as the composition of the Science Team evolves.

3.3 Science Team Summaries

As discussed earlier, the Science Team has outlined the tasks to be accomplished for each of the science theme research areas. Table 3.2 identifies the main approach that the investigations are taking to execute their tasks. The tasks that are to be accomplished by each investigation team are indicated in Table 3.3. The labeling scheme of the tasks (below) identifies the science theme that the task is associated with.

CD – Carbon Dynamics
LC – Land–Cover Land–Use Change
ND – Nutrient Dynamics and Surface Water Chemistry
TG – Trace Gases

3.4 Science Team Measurement Activities

Table 3.4 is a preliminary table listing the measurement activities of the LBA–Ecology Science Team. This table is organized by the investigation Team in alphabetical order by the first investigator listed on the proposal. This listing represents the most current information communicated to the Project Office; it is subject to change.

Table 3.1 Investigation Title.

ID Number	Investigation Title
LC-01	Agricultural Colonization on the Ecuadorian Amazon: Population, Biophysical, and Geographical Factors Affecting Land Use/Land Cover Change and Landscape Structure
LC-02	Land-Cover/Land-Use Change and Carbon Dynamics in an Expanding Frontier in Western Amazônia: Acre, Brazil
ND-01	Land Cover Conversion in Amazônia, the Role of Environment and Substrate Composition in Modifying Soil Nutrient Cycling and Forest Regeneration
TG-01	Cooperative Regional Transport Modeling of C and N for Amazônia
ND-02	Biogeochemical Cycles in Degraded Lands
ND-03	Linking Soil Biogeochemistry to Surface Water Chemistry in Small Drainage Basins of the Amazon
CD-01	Spatial Integration of Regional Carbon Balance in Amazônia
LC-03	Radar Remote Sensing of Land-Cover and Biomass in the Amazon
CD-02	Carbon and Oxygen Isotope Ratio CO_2 Flux Analyses at the Soil, Canopy, and Landscape Scales
ND-04	Carbon and Nutrient Stocks, Soil Water Dynamics, and Trace Gas Fluxes in Abandoned Pastures and Agroforestry Systems in the Central Amazon
CD-03	Periodic, Transient, and Spatially Inhomogeneous Influences on C Exchange in Amazônia
LC-04	The Effects of Tropical Forest Conversion: Ecological Research in the Large-Scale Biosphere-Atmosphere Experiment in Amazônia (LBA)
LC-11	Mapping the Amazon Basin with JERS-1 Radar Image Data: seasonal change, habitats, and disturbances in the tropical rainforest
LC-12	Using Landsat Data to Develop an Image Based Logistic Regression Model for Predicting Deforestation in the Amazon
ND-06	Nitrogen and Phosphorus Dynamics in Forests and Converted Forest Sites in the Amazon Basin: A Review and Synthesis of Previous Research
CD-04	Measuring the Effects of Logging on the $C0_2$ and Energy Exchange of a Primary Forest in Tapajós National Forest
TG-02	Influence of Amazônia Land-Use Change on Chemical Constituents in the Atmosphere
TG-03	Characterization of Aerosol Optical Properties and Column Water Vapor for LBA-Ecology

Table 3.1. cont.

ID Number	Investigation Title
CD-11	Selective Logging, Fire and Biomass in Amazonia
LC-06	Validation and Evaluation of MODIS Data Products in the Large Scale Biosphere-Atmosphere Experiment in Amazônia (LBA)
TG-07	Soil Biogeochemistry of Carbon, Nutrients, and Trace Gases in the Amazon Region of Brazil: Field and Model Studies of Natural and Managed Conditions
LC-05	Anthropogenic Landscape Changes and the Dynamics of Amazonian Forest Biomass
TG-04	Radon-222 and Stable Carbon Isotope Tracing of Carbon Exchange and Trace Gas Fluxes in Old Growth and Selectively Logged Amazonian Forests
ND-08	Soil Organic Matter Fluxes in Amazonian Forests: Natural Vs Intensively Managed Systems
LC-07	Multi-Scale Analysis of Inundation with Microwave and Optical Remote Sensing in the Amazon Basin: Applications to Biogeochemical Measurements and Modeling
LC-08	Modeling the Biogeochemical System of the Terrestrial Amazon: Issues for Sustainability
LC-09	Human and Physical Dimensions of Land Use/Cover Change in Amazônia: Forest Regeneration and Landscape Structure
CD-05	The Present and Future Effects of Ground Fires on Forest Carbon Stocks, Metabolism, Hydrology, and Economic Value in Amazônia and Cerrado
TG-05	Modeling Terrestrial Ecosystem Processes, Carbon Fluxes, and Trace Gas Emissions for Land Cover/Use Types of the Amazon Basin
CD-06	Carbon and Moisture Fluxes along the LBA Transects: Data Assimilation and Modeling
ND-09	Biogeochemical Dynamics in River Corridors of the Amazon Basin and Their Response to Anthropogenic Change
LC-10	Measurement and Modeling of the Inter-Annual Dynamics of Deforestation and Regrowth in the Brazilian Amazon: Land Use Control on the Annual Net Flux of Carbon
CD-07	High Resolution Carbon Exchange Over Large-Scale Amazônia Based on Modeling and GOES Satellite-Derived Radiation Inputs
TG-08	Trace Gas Fluxes associated with Land-Cover and Land-Use Changes in the Brazilian Amazon
TG-06	Vertical Profiles of Carbon Dioxide and Other Trace Gas Species Over the Amazon Basin Using Small Aircraft

Table 3.1. cont.

ID Number	Investigation Title
ND-10	An Integrated Use of Experimental Modeling and Remote Sensing Techniques to Study Carbon and Nutrient Dynamics During Tropical Land Use Change
CD-08	Carbon Dynamics in Vegetation and Soils Along the Eastern LBA Transect
CD-09	A Modeling Synthesis of the Impacts of Tropical Forest Conversion on Carbon Fluxes and Storage, and on Nutrient Dynamics in Amazônia
CD-10	Net Ecosystem Exchange of $C0_2$ and H_20 from Primary Tropical Forest in Central Amazônia
ND-07	Impacts of Land Use Change on Nutrient and Carbon Cycles and Trace Gas Exchange in Soils of Savannas of Central Brazil

Table 3.2 LBA–Ecology Investigation Approaches

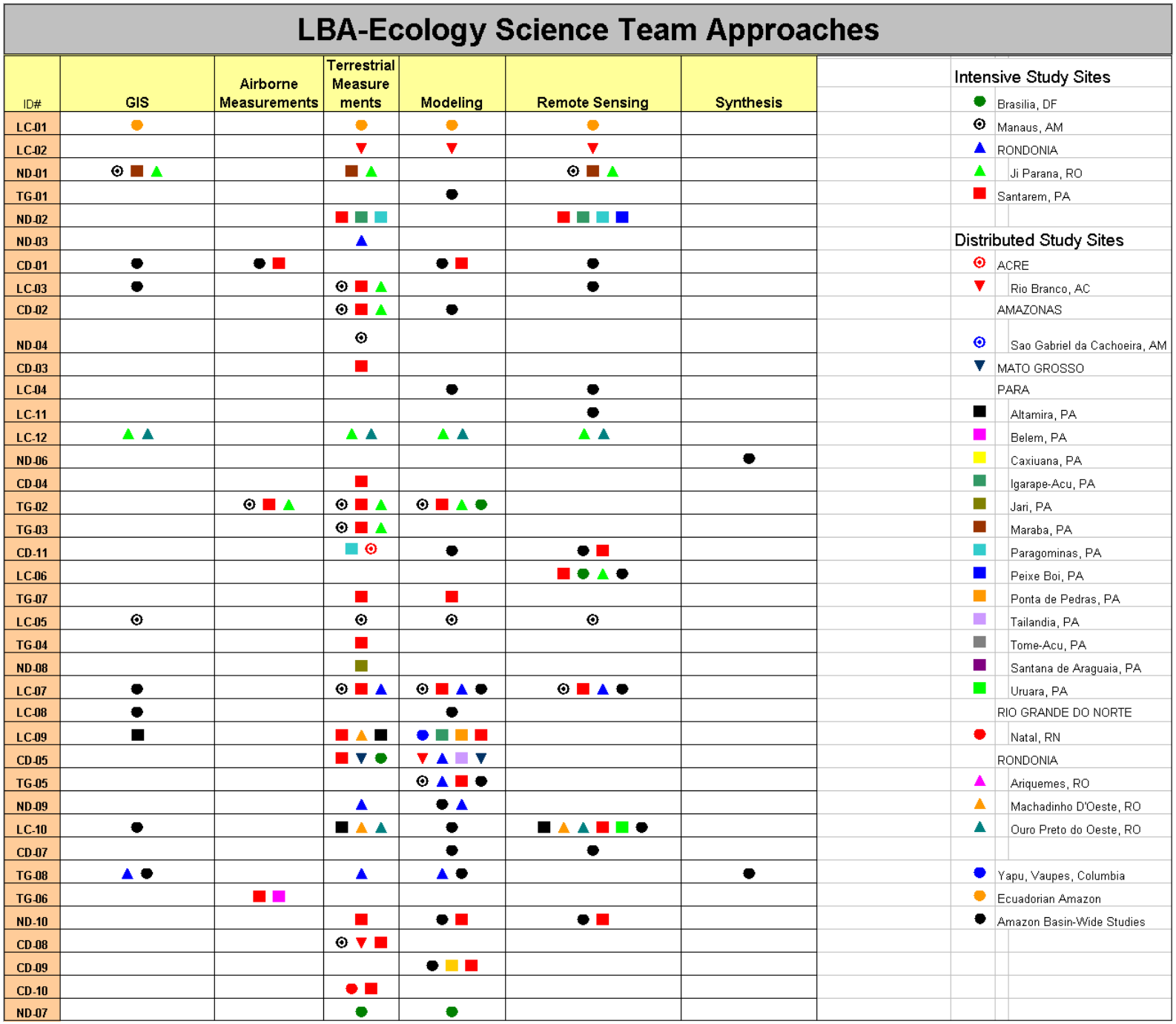

Table 3.3 LBA-Ecology Investigation Tasks.

	Carbon Dynamics Tasks							Land Cover Land Use Change Tasks					Nutrient Dynamics Tasks						Trace Gas Fluxes Tasks		
ID	**1**	**2**	**2a**	**2b**	**2c**	**3**	**4**	**1**	**2**	**2a**	**3**	**4**	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**
LC-01	#					#			#			#									
LC-02	#								#	#		#									
ND-01	#					#			#					#		#					
TG-01																					#
ND-02	#					#			#					#	#	#			#		
ND-03																	#				
CD-01				#			#														
LC-03	#					#		#													
CD-02			#				#														
ND-04				#										#	#						
CD-03			#		#																
LC-04						#	#	#													
LC-11																					
LC-12																					
ND-06													#								

	Carbon Dynamics Tasks							Land Cover Land Use Change Tasks					Nutrient Dynamics Tasks						Trace Gas Fluxes Tasks		
ID	**1**	**2**	**2a**	**2b**	**2c**	**3**	**4**	**1**	**2**	**2a**	**3**	**4**	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**
CD-04			#	#	#																
TG-02			#	#			#									#			#	#	
TG-03										#						#			#		
CD-11	#							#													
LC-06							#	#		#											
TG-07			#	#	#									#	#				#	#	
LC-05	#			#		#			#												
TG-04		#			#														#		
ND-08	#			#										#	#						
LC-07											#										
LC-08						#	#					#									#
LC-09									#			#									
CD-05	#			#						#				#	#						
TG-05							#													#	#
CD-06							#														
ND-09															#		#	#			

	Carbon Dynamics Tasks							Land Cover Land Use Change Tasks					Nutrient Dynamics Tasks						Trace Gas Fluxes Tasks		
ID	**1**	**2**	**2a**	**2b**	**2c**	**3**	**4**	**1**	**2**	**2a**	**3**	**4**	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**
LC-10						#		#	#			#									
CD-07							#														
TG-08	#	#		#		#	#		#					#	#				#	#	#
TG-06							#														#
ND-10	#			#		#	#	#	#					#	#						
CD-08				#																	
CD-09							#														
CD-10			#		#		#														#
ND-07				#										#	#				#	#	

Table 3.4 LBA-Ecology Measurement Activities.

LBA-Ecology Proposed Measurements

"NOT FINAL"

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
LC-01	**Agricultural Colonization on the Ecuadorian Amazon: Population, Biophysical, and Geographical Factors Affecting Land Use/Land Cover Change and Landscape Structure**			
LC	Accessibility Parameters	Ground measurements	GPS captured road networks, average road speed, location of facilities	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC	Biophysical Parameters related to LULCC	Spatial Metrics, Biophysical Modeling Indices	GIS coverage, 1990 and 1998 Survey data	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC	Geo-referenced Community Social Survey	Field survey of 50 community leader groups, GPS ground measurements	To be integrated into land use modeling	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC	Geo-referenced cross-sectional Social Survey	Field surveys of 450 household 1998, GPS ground measurements	To be compared to 1990 data of same households	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC	Geo-referenced Longitudinal socio-economic/demographic database	Comparative Analyses	Field surveys, 1990, Field surveys 1998, GPS ground measurements	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC,CD	GIS Coverage 1:50, 000 (e.g. Digital Elevation Models, slope characteristics, hydrography	Digitizing into GIS environment	1:50,000 topographic base maps	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC,CD	Landscape Ecology (Composition and Structure)	Spatial Metrics, Patch analysis	LC classes, Productivity Measures at the class and landscape level	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC	LC categories related to deforestation, agriculture, extensification	Standard statistical clustering	Satellite Time Series, 1990 and 1998 survey data	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC	LC categories related to secondary plant succession, carbon storage and carbon turnover	Standard statistical clustering	Satellite Time Series, 1990 and 1998 survey data	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC	Longitudinal LULCC Plot level database	Fixed effects, Random effects modeling	1990 and 1998 surveys, GPS ground measurements, GIS derived variables	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC,CD	LULCC Intensity Measurements (Abandonment and Turnover Estimates)	Multivariable Modeling	1990 and 1998 surveys, GPS ground measurements, GIS derived variables	Ecuadorian Amazon (Napo and Sucumbios Provinces)
CD	Measures of Carbon Sequestering	Carbon Sequestering Simulations NDVI, LAI, Literature-based estimates, 1990 1998 Survey data		Ecuadorian Amazon (Napo and Sucumbios Provinces)
CD	Rates and directions of biomass and leaf area	Image Detection Approaches, Normalized Difference Vegetation Index(NDVI), Leaf Area Index (LAI)	Satellite Images and Satellite Time Series	Ecuadorian Amazon (Napo and Sucumbios Provinces)

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
LC-01	**Agricultural Colonization on the Ecuadorian Amazon: Population, Biophysical, and Geographical Factors Affecting Land Use/Land Cover Change and Landscape Structure**			
LC	Rates and directions of LULCC	Channel Scene Integration, Multi-date Composite, Principal Components Analysis and other Image detection approaches	Satellite Time Series	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC	Regional LULCC Parameters	Multivariable Modeling	1990 and 1998 surveys on exact same households, remote sensing data	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC	Satellite Time Series	Illumination corrections, topographic corrections	Landsat MSS, TM, SPOT-MX data 1970-1998	Ecuadorian Amazon (Napo and Sucumbios Provinces)
LC-02	**Land-Cover/Land-Use Change and Carbon Dynamics in an Expanding Frontier in Western Amazônia: Acre, Brazil**			
LC	Biomass, growth, mortality rates	Ground Measurements	Geo-referenced permanent Plots	Rio Branco, AC
LC	Fire frequency and distribution	Remote Sensing	Verify AVHRR	Rio Branco, AC
LC	LUCC with time incorporating socio-economic and policy modifications	Multi-temporal	.	Rio Branco, AC
ND-01	**Land Cover Conversion in Amazônia, the Role of Environment and Substrate Composition in Modifying Soil Nutrient Cycling and Forest Regeneration**			
CD	A horizon. and overall depth, % clay, CEC, SOM	Ground Measurements	Soil Profiles-Soil Core Samples	Ji Paraná, RO Marabá, PA
ND	Leaf mass/area, N, P, cations, Fe and Al	Ground Measurements	Vegetation Samples	
ND	Weathering and Nutrients- Total elements, mineral composition, bulk density, pH, Exch. Cap., cations(exch. and soil solution), P, C, N	Ground Measurements	Selective wet chemical extractions, X-ray diffraction, Sr isotopes- Soil Core Samples	
LC	Pasture vs forest regrowth	Radar, Remote Sensing	SIR-C, JERS, spectral mixing (AVIRIS)	Ji Paraná, RO Manaus, AM Marabá, PA
LC	Terrain attributes	Remote Sensing-Aircraft & Satellite	Digitalized topographic data, aircraft, RS	
LC	Time series	Remote Sensing	Landsat MSS and TM	
TG-01	**Cooperative Regional Transport Modeling of C and N for Amazônia**			
CD, TG	Atmospheric concentrations of CO_2, CO, CH_4, N_2O, and aerosols, isoprene	Model		Amazon Basin
CD, TG	Isoprene profiles and concentrations	Model	PBL 1-d models	Amazon Basin
CD, TG	Perturbations of CH_4 and N_2O	Model	Tracer simulations	Amazon Basin

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
ND-02	**Biogeochemical Cycles in Degraded Lands**			
CD	AGB accumulation	Ground Measurements		Igarapé-Açu, PA Paragominas, PA Peixe Boi, PA Rio Branco, AC Santarém, PA
CD, ND	Soil Fauna Diversity and Activity	Ground Measurements		
CD	Soil Respiration	Chambers/Enclosures	CO_2 Analyzer (Portable LiCor) or accelerator MS	
CD, ND	Soil Stocks of Carbon and Nutrients-net N min, net nitrification, Total N, P & C, Total or exchangeable cations, pH, exchangeable acidity, ^{14}C in organic fraction, P fractionation, Net Mineralization, Total Stocks, Litterfall	Ground Measurements	50 x50 cm frame, Double Cylinder soil corer- Soil Core Samples	
LC LC LC	Chronosequences of Secondary Forests	Chronosequences		Igarapé-Açu, PA Paragominas, PA Peixe Boi, PA
LC	LUCC classification of Young Capoeira Landscapes, NDVI (vegetation Index), and optical properties	Remote Sensing-Aircraft & Satellite	Video	Santarém, PA
ND	N_2O, NO, CH_4, CO_2 (soil respiration), rainfall, Soil lysimeter	Chambers/Enclosures	GC, CO_2 Analyzer	Rio Branco, AC
ND	Nutrient Manipulation Experiment-	Species composition, biomass by species, nutrient concentrations in foliage, Net N mineralization, Net Nitrification, P fractionation, soil exchangeable cations, NO_3 leaching, soil trace gas emissions (CO_2, CH_4, N_2O, NO), root nodules, rhizosphere assays		Igarapé-Açu, PA
ND				Paragominas, PA
CD	Plant Species Composition	Field Observation/Field Surveys		Santarém, PA
TG	Soil Emissions of N_2O and NO	Chambers/Enclosures	Gas Chromatograph	Santarém, PA
ND	Solution Fluxes- Rainwater, throughfall, soil solutions	Ground Measurements	Lysimeters- Surface Water samples	Igarapé-Açu, PA
ND				Paragominas, PA
ND				Peixe Boi, PA
ND				Santarém, PA
ND-03	**Linking Soil Biogeochemistry to Surface Water Chemistry in Small Drainage Basins of the Amazon**			
ND	Characterization of Stream Biochemistry- pH, conductivity, NO_{3-}, NH_{4+}, P, DON, DOP, K+, Na+, Ca, Mg, Al, Fe, Si, Sr, Cl and SO_4, tot. susp. Solids (C,N,P), chlor. ad^{13}C of POC and DOC	Surface water samples	Auto samplers, temperature/conductivity sensors	Fazenda Nova Vida, RO
ND	Land Use Effects on Stream Biochemistry	Nutrient concentration, organic matter source	Paired catchment comparisons	Fazenda Nova Vida, RO
ND	Nutrient Limitation to Stream Algae	Nutrient Diffusing bioassays	Ceramic Disks fused to plastic vials	Fazenda Nova Vida, RO

WHO		WHAT			WHERE
		Measurements	Strategy	Tool / Method	Site Area
CD-01		**Spatial Integration of Regional Carbon Balance in Amazônia**			
	CD	Convection Boundary Layer Budgets of ^{13}C	Aircraft flask samples	Lab Analysis- NOAA/CMDL	Santarém, PA
	CD	Convection Boundary Layer Budgets of CO_2	Continuous aircraft sampling	Infrared Gas Analyzer	Santarém, PA
	CD	Hierarchical models addressing different scales	Model	SiB2, CASA	Santarém, PA
	CD	Mesoscale estimates of Carbon Balance	Model- stand Level	SiB2, RAMS	Santarém, PA
	CD	Prediction of CO_2 and $^{13}CO_2$ vertical profiles basin wide	Model	SiB2, RAMS	Amazon Basin
LC-03		**Radar Remote Sensing of Land-Cover and Biomass in the Amazon**			
CD		Above Ground Biomass- Estimation - 100-meter resolution	Remote Sensing- Satellite	JERS-SAR, ERS SAR, RADARSAT	Amazon Basin
CD		Above Ground Biomass- Estimation - 30-meter resolution	Remote Sensing- Satellite	SIR-C data - Digital thematic maps	Brasília, DF Ji-Paraná, RO Manaus, AM Rio Branco, AC Santarém, PA São Gabriel da Cachoeira, AM
CD		Biotic Carbon Pool - Estimation - 30-meter resolution	Remote Sensing- Satellite	SIR-C data - Digital thematic maps	
LC		Field biometry measurements- Stem diameters, height, branching pattern, leaf size, shape and density	3		
LC		Land Cover Classification- 30-meter resolution	Remote Sensing- Satellite	SIR-C data - Digital thematic maps	
CD		Biotic Carbon Pool - Estimation - 100-meter resolution	Remote Sensing- Satellite	JERS-SAR, ERS SAR, RADARSAT	Amazon Basin
LC		Land Cover Classification- 100-meter resolution	Remote Sensing- Satellite	JERS-SAR, ERS SAR, RADARSAT	Amazon Basin
CD-02		**Carbon and Oxygen Isotope Ratio CO2 Flux Analyses at the Soil, Canopy, and Landscape Scales**			
CD		Aboveground Carbon Stocks - Carbon Isotopes in Height related Profile	Dominant Tree leaves and Understory leaves Samples	Mass Spectrometer at SIRFER at Univ. of Utah and CENA, Brazil	Ji-Paraná, RO Manaus, AM Santarém, PA
CD		Below Ground Carbon Stocks- Carbon Isotopes in depth Related Profiles	Soil Organic Matter Samples	Mass Spectrometer at SIRFER at Univ. of Utah and CENA, Brazil	
CD		Carbon Flux - Oxygen isotopes of atmospheric water vapor	Aircraft Air Sample	Mass Spectrometer in CENA, Brazil	

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
CD-02	**Carbon and Oxygen Isotope Ratio CO2 Flux Analyses at the Soil, Canopy, and Landscape Scales**			
CD	Carbon Fluxes - Carbon Isotope Ratio of Ecosystem Respiration	Chambers/Enclosures	Mass Spectrometer at SIRFER at Univ. of Utah	Ji-Paraná, RO Manaus, AM Santarém, PA
CD	Carbon Fluxes - Carbon isotope ratio of soil respiration	Aqueous Samples	Mass Spectrometer at SIRFER at Univ. of Utah	
CD	Carbon Fluxes - Oxygen Isotope Ratio of Ecosystem Respiration	Chambers/Enclosures	Mass Spectrometer at SIRFER at Univ. of Utah	
CD	Carbon Fluxes - Oxygen Isotope Ratio of Soil Respiration	Chambers/Enclosures - Air sampling	Mass Spectrometer at Univ. of Utah	
CD	Carbon Fluxes - Oxygen isotopes of leaf water in height related profiles	Dominant Tree leaves and Understory leaves Samples	Mass Spectrometer at CENA, Brazil	
CD	Carbon Fluxes - Oxygen isotopes of soil water In depth related profiles	Soil Samples	Mass Spectrometer at CENA, Brazil	
CD	Carbon Fluxes - Oxygen isotopes ratio of precipitation	Precipitation Sampling	Mass Spectrometer at CENA, Brazil	
CD	Carbon Fluxes - Soil Respiration Rate (when isotopes are sampled)	Field Measurement	Chambers/Enclosures	
CD	Carbon Fluxes - Leaf -level Photosynthesis of canopy leaves	Field Measurement	Canopy access tower	Santarém, PA
ND-04	**Carbon and Nutrient Stocks, Soil Water Dynamics, and Trace Gas Fluxes in Abandoned Pastures and Agroforestry Systems in the Central Amazon**			
ND	Decomposition and Nutrient Release Patterns - Microclimate, litter quality, soil nutrient status	Ground Measurements	Soil Samples	Manaus, AM
ND	Nutrient Stocks and Cycling- Soil Moisture, Surface Temperature, soil fauna populations, Chemical characteristics of litter	Ground Measurements		Manaus, AM
CD	Total System Carbon- Woody biomass, understory herbaceous biomass, Litterfall, Surface litter, roots, fine root dynamics, Soil	Ground Measurements		Manaus, AM
CD-03	**Periodic, Transient, and Spatially Inhomogeneous Influences on C Exchange in Amazônia**			
CD	Auto Weather Station- T, q, Precipitation gradients from River	Short towers	Campbell Weather Stations	Santarém, PA
CD	Boundary Layer Studies - Cloud fraction and Cloud Base	Ground Measurements	Vaisala Ceilometer	Santarém, PA
CD	Boundary Layer Studies - Cloud type and Cloud Fraction- sky images	Ground Measurements	ASRC custom sky camera (digital camera)	Santarém, PA
CD	Boundary Layer Studies - Wind speed and direction	Platform	Remtech portable SODAR (acoustic radar)	Santarém, PA
CD	Radiation Observations- K, L, PAR, (up, down)	Boom / Platform	Yankee rotating shadow-band radiometer	Santarém, PA
CD	Sub-canopy Studies- [CO_2], Heat, H_2O, Momentum, eddy flux	Tower, Sub-canopy balloon platform	T, q, [CO_2]	Santarém, PA

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
LC-04	**The Effects of Tropical Forest Conversion: Ecological Research in the Large-Scale Biosphere-Atmosphere Experiment in Amazônia (LBA)**			
LC, CD	Land Cover Change Effects on Carbon sources and sinks	Model	IBIS Dynamic Biosphere Model	Amazon Basin
LC	Land Cover Change- historical perspective	Remote Sensing	Landsat MSS and TM, AVHRR, National Inventory Data	Amazon Basin
CD	Model Validation [Data includes: streamflow, tower flux, Isotope samples($^{13}C/^{12}C$, $^{18}O/^{16}O$), Landsat, AVHRR, MODIS	Model		Amazon Basin
LC, CD	Net carbon exchange response to land use change	Model		Amazon Basin
LC-11	**Mapping of the Amazon Basin with JER-1 Radar Image data: seasonal change, habitats, and disturbances in the tropical rainforest**			
LC	Inundation Map		JERS-1 SAR	Amazon Basin
LC	Amazon mosaic	2 low resolution mosaics - high, low flood conditions		Amazon Basin
LC	Land Cover Classification - Simple vegetation classification map		JERS-1, Radarsat	Amazon Basin
LC	Field Surveys-Validation and Calibration, Video and Photographic coverage	Ground Measurement	Field survey	TBD
LC	Field Surveys-Validation and Calibration, Video and Photographic coverage	Airborne Measurements	Field survey	TBD
LC-12	**Using Landsat Data to Develop an Image Based Logistic Regression Model for Predicting Deforestation in the Amazon**			
LC	Field Survey- Validation and Calibration	Ground Measurement	Field survey	Ji Paraná, RO Ouro Preto do Oeste, RO
LC	Land Use Changes	GIS	Landsat imagery and ancillary data	
LC	Deforestation for colonization	Model	Landsat-based logistic Regression Model	
ND-06	**Nitrogen and Phosphorus Dynamics in Forests and Converted Forest Sites in the Amazon Basin: A Review and Synthesis of Previous Research**			
ND	Nitrogen and Phosphorus	Review and synthesis		Amazon Basin

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
CD-04	**Measuring the Effects of Logging on the $C0_2$ and Energy Exchange of a Primary Forest in Tapajós National Forest**			
CD	Air temp	Tower	Thermocouples	Santarém, PA
CD	CO_2, H_2O - Flux and profile	Tower	Eddy covariance - LI6262	Santarém, PA
CD	Forest floor PPFD	Ground Measurements	GaAsP photodiodes	Santarém, PA
CD	Net radiation	Tower	REBS Q*7	Santarém, PA
CD	PPFD	Tower	LI190SB	Santarém, PA
CD	Rainfall	Tower	Tipping bucket	Santarém, PA
CD	Respiration survey - stem, soil, slash	Chambers/Enclosures	LI-6200	Santarém, PA
CD	Sap flow	Ground Measurements	Granier type, 30 trees	Santarém, PA
CD	Soil and biomass temperature	Ground Measurements	Thermocouples	Santarém, PA
CD	Soil heat flux	Ground Measurements	REBS HFT3	Santarém, PA
CD	Continuous soil respiration	Chambers/Enclosures	~10 automated closed-type chambers	Santarém, PA
CD	Soil water	Ground Measurements	TDR	Santarém, PA
CD	Solar radiation	Tower	Epply pyranometer	Santarém, PA
CD-04	**Measuring the Effects of Logging on the $C0_2$ and Energy Exchange of a Primary Forest in Tapajós National Forest**			
CD	Throughfall	3	Tipping buckets with gutters	Santarém, PA
CD	Wind speed and direction	Tower	Cup anemometer and vane	Santarém, PA
CD	Wood increment	3	Dendrometers on 100 trees	Santarém, PA
TG-02	**Influence of Amazônia Land-Use Change on Chemical Constituents in the Atmosphere**			
CD, TG	Aerosol composition (org acids, nitrate, sulfate, cations, anions	Cartridge Air Samples on Balloon	Ion chromography	Brasília, DF Ji-Paraná, RO Manaus, AM Santarém, PA
CD, TG	Aerosols size distribution	Balloon	Cartridge Air Samples	
CD, TG	CO, VOC, NO_x, isoprene, monoterpene, methanol, oxygenated VOC	Tower	REA, bag/cartridge	
CD, TG	Isoprene profiles and concentrations	Tower	Eddy correlation, fast isoprene analyzer	
CD, TG	Vertical Profiles - CO_2, CO, O_3, NO_x, VOC	Balloon Platform	Mixed layer gradient, mass balance	
LC, TG	Impact - global	Model	3-D + MOZART	Global
LC, TG	Impact of LUCC on TG fluxes (regional)	Model	3-D transport	Amazon Basin

WHO		WHAT			WHERE
		Measurements	Strategy	Tool / Method	Site Area
TG-03		**Characterization of Aerosol Optical Properties and Column Water Vapor for LBA-Ecology**			
TG		Aerosol (spatial variation)	3	Handheld sun photometers	Brasília, DF Ji-Paraná, RO Manaus, AM Santarém, PA São Gabriel da Cachoeira, AM
CD		Aerosol optical thickness and precipitable H2O	3	Cimel sun/sky spectral radiometer- direct sun and sky radiance measures	
TG		Aerosol size distribution and phase functions	3	Sky radiance almucantar	
TG		Data for RS and climate models- aerosol absorption	3	Broadband radiometer	
TG		Diffuse flux	3	Yankee MFRSR	
TG		Light for vegetation production-irradiance data	3	Broadband radiometer	
TG		Spectral irradiance	3	Optronics spectroradiometer	
TG		Surface sampling - particulates (P,S,K) dry dep	3		
CD-11		**Selective Logging, Fire, and Biomass in Amazonia**			
CD		Rates of wood removal, mortality, rates of forest growth (Aboveground Biomass)	Ground Measurements		Paragominas, PA Acre TBD - State of Pará
LC, CD		Rates, areal extent, and spatial distribution of logging and fire	Remote Sensing	Landsat and Radar	Amazon Basin
LC, CD		Distribution of Sawmills - how readily can selective logging be monitored remotely?	Remote Sensing	Landsat TM	Santarém, PA Amazon Basin
CD		Releases and accumulations of carbon resulting from logging and fire	Model	Cohort model that tracks the area, age, and biomass of lands subjected to disturbances	Sites TBD Amazon Basin
LC-06		**Validation and Evaluation of MODIS Data Products in the Large Scale Biosphere-Atmosphere Experiment in Amazônia (LBA)**			
LC		Albedo, BRDF - 1km	MODLAND	MODIS, MISR	Amazon Basin
CD		Atmospheric correction, Surface Reflectance datasets - bands (1-7) 250m (1-2) and 500m (3-7)	Remote Sensing	MODIS	Amazon Basin
LC		Fire - distribution, frequency, timing	Remote Sensing	MODIS	Amazon Basin
CD		LAI, fPAR	Remote Sensing	MODIS	Amazon Basin
CD		Land surface temp. - day/night 5km	Remote Sensing	MODIS	Amazon Basin
LC		Radiometric and biophysical measurements	Ground Measurements	Site Validation surveys	Santarém, PA
LC					Brasília, DF
LC		LUCC - 1km	Remote Sensing	MODIS	Amazon Basin
CD		Net PS and NPP	Remote Sensing	BIOME-BGC, MODIS	Amazon Basin
CD			Model		Amazon Basin

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
TG-07	**Soil Biogeochemistry of Carbon, Nutrients, and Trace Gases in the Amazon Region of Brazil: Field and Model Studies of Natural and Managed Conditions**			
TG	CO_2, N_2O, NO, CH_4	Chambers/Enclosures	Manual and automated enclosures	Santarém, PA
ND	Fertilizer- Root cores	Ground Measurements	Root Cores	Santarém, PA
TG	Link productivity and N-gas emissions	Model	DNDC	Santarém, PA
CD	Litter fall, fine root biomass, productivity, decomposition	Ground Measurements		Santarém, PA
TG	N_2O, CH_4	Tower	Profiles	Santarém, PA
ND	Nutrient stocks and cycling in litter and roots	Ground Measurements		Santarém, PA
LC-05	**Anthropogenic Landscape Changes and the Dynamics of Amazonian Forest Biomass**			
CD	Above-Ground Biomass	Ground Measurements	Permanent Plots	Manaus, AM
CD	Aboveground Biomass accumulation- impact of species composition, history of land use, and age	Ground Measurements	Species-specific allometric equations	Manaus, AM
CD	Biomass, growth, mortality rates	Ground Measurements	Allometric Equations	Manaus, AM
CD	Biometry-Species-specific	Ground Measurements	Destructive Sampling	Manaus, AM
LC	Landscape Analysis	Remote Sensing	Landsat MSS	Manaus, AM
CD	Liana density and Biomass	Ground Measurements	Permanent Plots	Manaus, AM
LC	Model Development/Validation	Model	Landscape features and biomass dynamics	Manaus, AM
CD	Phytodemography Surveys	Ground Measurements	66 permanent plots	Manaus, AM
LC	Vegetation Classification- structure, demography, land cover classes, physiological state of leaves	Remote Sensing	Landsat MSS	Manaus, AM
ND-08	**Soil Organic Matter Fluxes in Amazonian Forests: Natural Vs Intensively Managed Systems**			
CD, ND	Bulk density - 2 depths	Ground Measurements	Ped Method	Jari, PA
ND	Extractable P, K, Al, Mg, Ca, pH, CEC	Ground Measurements		Jari, PA
CD	Labile/stable C ratio	Ground Measurements	Sonication, sieving, densiometric separations	Jari, PA
CD	Litter decomposition + stem (2.5-10cm)	Ground Measurements	Bags	Jari, PA
CD	Litter quality (C,N,P, Lignin, cellulose)	Ground Measurements		Jari, PA
CD	Litterfall - foliar, stem, reproduction	Ground Measurements	Traps	Jari, PA
CD	Root biomass	Ground Measurements	Coring	Jari, PA
CD	Total soil C and N	Ground Measurements		Jari, PA
CD	Woody debris	Ground Measurements	Ground Survey	Jari, PA

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
LC-07	**Multi-Scale Analysis of Inundation with Microwave and Optical Remote Sensing in the Amazon Basin: Applications to Biogeochemical Measurements and Modeling**			
LC	Water Levels	Ground Measurements	Pressure Transducers	Manaus, AM Rondônia Santarém, PA
LC	Vegetation surveys	Ground Measurements		
LC	Inundation (25 km)	Remote Sensing	SMMR, SSMI	
LC	Inundation and vegetation (20 m to 1000m)	Remote Sensing	JERS (LHH), Radarsat (CHH), ERS-2 (CVV), Landsat, AVHRR, EOS	Amazon Basin
LC	Inundation (25 km)	Remote Sensing	SMMR, SSMI	Amazon Basin
LC-08	**Modeling the Biogeochemical System of the Terrestrial Amazon: Issues for Sustainability**			
LC, CD, ND, TG	Analysis of Natural Ecological Systems (NPP, Respiration, Nutrient Availability, trace Gas fluxes)	Model	TEM/WBM	Amazon Basin
ND	Carbon and Nutrient Biogeochemistry	Model	DNDC	Amazon Basin
LC	Evaluation of suitability & availability of land for crops and pasture	Model		Amazon Basin
LC	Land Cover Change (Human-induced) and Ecosystem distribution and condition (disturbance gradients induced by human activity)	Model	GEOMOD	Amazon Basin
LC	Land Use and Climate Change	GIS	AVHRR, MODIS, EOS-AM-1	Amazon Basin
LC, CD	NDVI	Remote Sensing	MISR, AM-1	Amazon Basin
LC-09	**Human and Physical Dimensions of Land Use/Cover Change in Amazônia: Forest Regeneration and Landscape Structure**			
LC	Deforestation Rate - Effects of Architecture of Property	Ground Measurement	Field survey	Machadinho D'Oeste, RO
LC	GIS Data base	GIS	Landsat, radiometry, biometry, hyperspectral data	Altamira, PA
LC	Spectral Library- includes field data collected previously(soil, species, DBH, stem height, total height, AGB, BGB, Soil density)	Model	Landsat, radiometry, radar, hyperspectral data	Altamira, PA
LC				Igarapé-Açu, PA
LC				Ponta de Pedras, PA
LC				Santarém, PA
LC				Tomé-Açu, PA
LC				Yapu, VAUPES, Columbia

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
LC-09	**Human and Physical Dimensions of Land Use/Cover Change in Amazônia: Forest Regeneration and Landscape Structure**			
LC	Vegetation structure, demography, soils maps, land cover classes	Field Measurements	Field Measurements	Altamira, PA
LC				Machadinho D'Oeste, RO
LC				Santarém, PA
CD-05	**The Present and Future Effects of Ground Fires on Forest Carbon Stocks, Metabolism, Hydrology, and Economic Value in Amazônia and Cerrado**			
CD	Above-ground Biomass	Ground Measurements		Brasília, DF Caxiuaná, PA Paragominas, PA Rio Branco, AC Santarém, PA
CD	Evapotranspiration and Drainage	Ground Measurements		
CD	Litterfall - foliar, stem (fine and coarse)	Ground Measurements		
CD	Root biomass	Ground Measurements		
LC, CD	Burned area vs. Carbon Stock	Model		Rio Branco, AC
LC, CD				Santana de Araguaia, PA
LC, CD				Santarém, PA
LC	Fire frequency and distribution	Ground Measurements	Property Surveys	Mato Grosso
LC				Rio Branco, AC
LC				Rondônia
LC				Tailândia, PA
TG-05	**Modeling Terrestrial Ecosystem Processes, Carbon Fluxes, and Trace Gas Emissions for Land Cover/Use Types of the Amazon Basin**			
CD	Evapotranspiration	Model	CASA	Amazon Basin Manaus, AM Rondônia Santarém, PA
CD	NPP	Model	CASA	
CD	Plant Biomass	Model	CASA	
CD	Plant VOC flux	Model	CASA	
CD, TG, ND	Soil C and N (total and labile)	Model	CASA	
ND	Soil moisture	Model	CASA	
ND	Soil N min rates	Model	CASA	
TG	Soil N2O, NO flux	Model	CASA	
CD, TG, ND	Soil texture and pH classes (1-8 km)	GIS	Geostatistical routines	

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
CD-06	**Carbon and Moisture Fluxes along the LBA Transects: Data Assimilation and Modeling**			
CD	Regional extrapolation using multispectral images	Model	EOS-IDS regional hydroloy/biogeochemical cycling model	Amazon Basin
ND-09	**Biogeochemical Dynamics in River Corridors of the Amazon Basin and Their Response to Anthropogenic Change**			
TG	CH4, N2O, and CO2	Chambers/Enclosures		Rondônia
CD	CO2, H2O in water	Ground Measurements	Surface water samples	Rondônia
SW	Hydrologic parameters, ground water and stream chemistry	Ground Measurements	Surface water samples	Rondônia
ND	In-Channel production and mineralization, dissolved gases (O2, Co2, N2O, CH4 and 18O2)	Ground Measurements	Sediment Samples	Rondônia
TG	Sources N2O- d15N and d18O	Ground measurements	Surface water samples	Rondônia
TG	Transformation NO to NO3- d15N	Ground measurements	Surface water samples	Rondônia
LC-10	**Measurement and Modeling of the Inter-Annual Dynamics of Deforestation and Regrowth in the Brazilian Amazon: Land Use Control on the Annual Net Flux of Carbon**			
LC	Field Survey- Validation and Calibration	Ground Measurement	Field survey	Altamira, PA Ariquemes, RO Ouro Preto do Oeste, RO Santarém, PA Uruará, PA
LC	Field surveys - Key informant surveys	Ground Measurements	field case studies of decisions of farmers and managers	
LC	Time series- Land cover change transition dynamics	Model	Landsat	
CD, LC	Inter-annual variability in deforestation and abandonment rates	Remote Sensing	Landsat	Amazon Basin
CD, LC				Ariquemes, RO
CD, LC				Ouro Preto do Oeste, RO
CD, LC				Santarém, PA
CD, LC				Uruará, PA
CD-07	**High Resolution Carbon Exchange Over Large-Scale Amazônia Based on Modeling and GOES Satellite-Derived Radiation Inputs**			
CD	Canopy and soil T (SRB, PAR, Trs, Tc and Ts)	Remote Sensing- Satellite	GOES-8 (radiometric skin T)	Amazon Basin
CD	Predict surface flux of CO_2	Model	Biosphere model with mesoscale meteorology	Amazon Basin

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
TG-08	**Trace Gas Fluxes Associated with Land-Cover and Land-Use Changes in the Brazilian Amazon Basin**			
ND	C,N and P Stocks and C and N Cycling rates	Soil Samples	Lab Analysis	Fazenda Nova Vida, RO
TG	N_2O, NO and CO_2 flux between soil and atmosphere	Chambers/Enclosures		Fazenda Nova Vida, RO
ND	Plot-level Manipulation Experiment- Soil moisture and fertilizer (N,P) to examine controls on trace gas fluxes in a forest site and pastures cleared in 1987 and 1972		LiCor or GC	Fazenda Nova Vida, RO
LC	Gas Flux Estimations	GIS	Soils, Climate, and ecosystem state and cattle statistics	Amazon Basin Rondônia
CD,ND,TG	C and N Stocks and N_2O, NO CH_4 and CO_2 fluxes	Model	MBL/TCM and DNDC	Amazon Basin Rondônia
TG-06	**Vertical Profiles of Carbon Dioxide and Other Trace Gas Species Over the Amazon Basin Using Small Aircraft**			
CD, TG	CO_2, CO, CH_4, N_2O, H_2 and SF_6 and $^{13}C/^{12}C$, $^{18}O/^{16}O$ in CO_2	Flask Samples	Lab Analysis	Belém, PA
CD, TG				Santarém, PA
ND-10	**An Integrated Use of Experimental, Modeling and Remote Sensing Techniques to Study Carbon and Nutrient Dynamics During Tropical Land Use Change**			
ND	Soil P , N-P-cation Mineralization,	Soil Samples	Hedley-Style fractionations, Ion resin bags and lab incubations	Santarém, PA
ND	Foliar C,N,P, base cation content	Foliar samples	Elemental Analysis	Santarém, PA
CD	Effectiveness of $^{13}CO_2$ as a tracer of regional fluxes following deforestation	Model	Mass Spectrometry	Global
ND	N, P, and cation sorption/desorption isotherms	Soil Samples	Atomic absorption/colormetric analysis	Santarém, PA
LC	Seasonal Trends of Greenness and Energy absorption	Remote Sensing	AVHRR spectral unmixing	Santarém, PA
LC	Surface Reflectance, aerosol and Water vapor contamination	Remote Sensing	Field Spectroscopy	Santarém, PA
ND	Regionalization of Pasture biogeochemical information	Remote Sensing	Landsat TM with RT model	Santarém, PA
CD	Biomass and NPP	Model	Radiative Transfer (RT) and Biogeochemical modeling	Santarém, PA
CD-08	**Carbon Dynamics in Vegetation and Soils Along the Eastern LBA Transect**			
CD	Age demographics	Ground Measurements, Model	^{14}C isotope by AMS	Manaus, AM Rio Branco, AC Santarém, PA
CD	C uptake rates - extend records of tree growth back beyond permanent plots	Ground Measurements, Model	^{14}C isotope by AMS	
CD	SOM and soil CO_2	Chambers/Enclosures	^{14}C isotope by AMS	
CD	Production and decomposition of dead wood	Ground Measurements, Model	Surveys, wood density	Manaus, AM
CD				Santarém, PA

WHO	WHAT			WHERE
	Measurements	Strategy	Tool / Method	Site Area
CD-09	**A Modeling Synthesis of the Impacts of Tropical Forest Conversion on Carbon Fluxes and Storage, and on Nutrient Dynamics in Amazônia**			
CD	Canopy carbon and water flux estimates (Diurnal and seasonal dynamics)	Model	SPA: Soil-Plant-Atmosphere model, validated on tower data	Caxiuaná, PA Santarém, PA
ND	Nutrient cycling	Model	MBL-GEM - biogeochemical modeling	
CD	Decadal Carbon Dynamics	Model	MBL-GEM - biogeochemical modeling	
CD	Daily gross primary productivity and evapotranspiration	Model	ACM - Aggregated Canopy Model	Amazon Basin
CD	Decadal Carbon Dynamics	Model	MBL-GEM - biogeochemical modeling	Amazon Basin
CD-10	**Net Ecosystem Exchange of C02 and H20 from Primary Tropical Forest in Central Amazônia**			
CD	Ambient CO Concentration	Tower	Gas Chromatograph	Natal, RN
CD			Infrared Absorption	Santarém, PA
CD	Ambient CO_2 Concentration	Tower	Infrared Gas Analyzer	Natal, RN
CD	Net Ecosystem Exchange of CO_2 (CO_2 Flux)	Tower	Infrared Gas Analyzer- High Speed (Eddy Correlation)	Santarém, PA
CD	Net radiation (Radiant Heat Flux)	Tower	Net Radiation Sensor	Santarém, PA
CD	Photosynthetically Active Radiation- above and below canopy	Tower	PAR Sensor	Santarém, PA
CD	Sensible Heat Flux and Momentum	Tower	Sonic Anemometer	Santarém, PA
CD	Soil Temperature (2 cm, 20cm, 50cm)	Tower	Thermistors	Santarém, PA
CD	Temperature Profiles (within and above canopy)	Tower	Thermistors	Santarém, PA
CD	Vertical Profiles - CO_2, H_20 (within and above canopy)	Tower	Infrared Gas Analyzer- Slow	Santarém, PA
CD	Water Vapor Flux	Tower	Infrared Gas Analyzer- High Speed (Eddy Correlation)	Santarém, PA
CD	Wind speed and direction	Tower	Sonic anemometer	Santarém, PA
ND-07	**Impacts of Land Use Change on Nutrient and Carbon Cycles and Trace Gas Exchange in Soils of Savannas of Central Brazil**			
CD	C sources - C^3/C^4	Ground Measurements	Isotopes	Brasília, DF
TG	CO_2, CO, NO	Chambers/Enclosures		Brasília, DF
CD	Microbial biomass and community structure	Ground Measurements	Amount and composition of biomarker compounds - PLFA, ergosterol	Brasília, DF
CD, ND	Soil C and N	Ground Measurements		Brasília, DF
ND	Soil T, moisture, nutrients, diffusivity, surface UV irradiance	Ground Measurements		Brasília, DF
CD	SOM and litter - size and fractionation	Ground Measurements	Isotopes	Brasília, DF
AUX	Surface UV Irradiance	Remote Sensing	Filters/Controlled field experiments	Brasília, DF