Day 1 (Nov. 12th)

Time	Speaker	Title
09:10	A Clappier	The challenge of defining optimal air quality policies at regional and local level
ABSTRACT RIAT+ is a regional integrated assessment tool that supports the policy maker in the selection of optimal emission reduction technologies, to improve air quality at minimum costs, implementing the Pareto boundary concept. RIAT+ has been applied on a French region (Alsace) to select optimal air quality control policies to improve air quality in both a single-pollutant (NO2 or O3 concentrations) and a multi-pollutant (NO2 and O3 concentrations at the same time) framework. The results show how NO2 and O3 optimal air quality control policies are in conflict (for the domain under study) and therefore highlight the importance to correctly prioritize the policy makers objectives when planning air pollution policies at regional scale.		
09:40	M Dasdaren	Development of a 1D canopy module to improve surface parameterizations
ABSTRACT The modeling of meteorological processes is a tedious task with regard to the complexity of processes that are involved. Model resolutions allowing precise description of land surface processes are limited due computer performances. This hence limits the capacity for model to give precise meteorological profiles in the first hundred of meters above the Earth surface, which is crucial to assess meteorological fields in the boundary layer. During the last decades, improved surface parameterization schemes have been developed for meso-scale meteorological models. Providing highly resolved meteorological variables to these parameterizations would require extensive computational resources. We propose here to use a canopy module that can act as an interface between meso-scale models and the parameterization schemes. The canopy module solves a 1-D diffusion equation, while taking into account the presence of obstacles, to calculate a more precise vertical profile for meteorological variables.		
10:00	D Hauglustaine	Urban land surface and emissions
11:00	S Peng	Surface urban heat island across 419 global big cities from satellites observations
ABSTRACT Urban heat island is among the most evident aspects of human impacts on the earth system. Here we assess the diurnal and seasonal variation of surface urban heat island intensity (SUHII) defined as the surface temperature difference between urban area and suburban area measured from the MODIS. Differences in SUHII are analyzed across 419 global big cities, and we assess several potential biophysical and socio-economic driving factors. Our results emphasize the key role of vegetation feedbacks in attenuating SUHII of big cities during the day, in particular during the growing season, further highlighting that increasing urban vegetation cover could be one effective way to mitigate the urban heat island effect.		
11:20	L Li	Modeling climate feedbacks from urbanisation
11:40	G Broquet	Regional and urban flux inversions: focus on the estimates of

		the European CO2 natural fluxes and of the CO2 anthropogenic emissions from Paris
ABSTRACT Regional atmospheric inversions using mesoscale atmospheric transport models have been developed in view to derive robust estimates of natural greenhouse gas fluxes at the continental to local scales. They are now also expected to support the monitoring of anthropogenic emissions at the city scale. We illustrate some of their achievements and critical remaining challenges through the description of some of the regional activities led at LSCE: the estimation of natural CO2 fluxes in Europe at 0.5° / 6-hour resolution and the estimation of the CO2 emissions from the Paris area at 6-hour resolution using ground based networks of CO2 mixing ratio measurements. We also give insights on the study of the potential of future high resolution satellite imagery of CO2 for the monitoring of city emissions.		
14:30	J Wang	Urbanization in China and Ecological Effects: Patterns, Processes, and Models
ABSTRACT China has experienced rapid urbanization since the economic reform beginning in the late 1970s. Urban population in China has increased about 500 million over the past 30 years. At the same time, the total area of built-up land has increased about 4.6 times. Rapid urbanization has caused significant negative impacts on the environment and natural resources. We present the spatial-temporal patterns of urbanization in China over the past 30 years and the processes that drove and were affected by urbanization using DMSP/OLS nightlight intensity data, Landsat TM/ETM+ data, and socioeconomic census data. Then, we focus on three on-going modeling work about urbanization and carbon cycle at regional and landscape scales. First, we work on modeling the synergic effects of urbanization on the productivity of terrestrial ecosystems in China. Second, we study the role of historical land cover change on the regional-scale carbon and GHG dynamics in Pearl River Delta, China. Third, we explore how urban development policies can be directed to help keep the human-dominated urban landscape on the sink side of carbon balance and mitigate climate change.		
14:50	P Ciais	GHG urban emissions & Carbocount-city project
12:10	Discussion	
1) Some thoughts on the table: an urban land surface scheme coupled to LMDZ, either ORCHIDEE or an independent model. One key requirement by the participants is to have multiply vertical boundary layers. One obstacle for a urban PFT in ORCHIDEE is the only one boundary layer shared by different PFT. 2) Funding opportunity by EU (KIT?) 3) Students from Shenzhen Graduate School of PKU could be involved hired/involved in the model development 4) Next discussion could take place in Beijing during spring/winter school Professor Li will organize the smal group (probably a mail list) for evolution of actions 5) Two day visits to Shenzhen after winter school in Beijing		
16:10	Y Huang	Global PM and OC emission inventory
ABSTRACT Global emissions of PM and OC from 77 major sources were estimated for a period		

from 1960 to 2009. Regression models and a technology split method were used to estimate country and time specific emission factors, resulting in a new estimate of PM and OC emission factor variation among different countries and over time. PM and OC emissions in 2007 were spatially resolved to 0.1° × 0.1° grids based on a newly developed global high-resolution fuel combustion inventory (PKU-FUEL-2007). The global total annual emission of TSP, PM10, PM2.5, and OC in 2007 were 155.7 Tg (118.4-217.0 Tg as IQR), 97.2 Tg (78.2-127.9 Tg), 77.3 Tg (63.3-99.2 Tg) and 10.27 Tg (excluding Wildfire), respectively. South, East, and Southeast Asia were the regions with the highest PM and OC emission densities, contributing more than of 35% of the global total PM emissions and about 61% of global anthropogenic OC emission.

Day 2 (Nov 13th)

Time	Speaker	Title
09:10	B Li	China attribution to global radiative forcing - progress report
ABSTRACT Current status and the main progresses of the RF paper are reported. Firstly, title, objectives, methods, outline and structure of the paper are introduced for discussion and confirmation. Then, results, tables and figures are presented for discussion by all participants. Finally, the main problems are listed for consideration and arrangment in the near future. Although the results of RF paper are interesting and promising, more detailed analysis are needed to make them more impressive and more informative. Also, the mechanism of communication and feedback among participants may by strengthened for more productive collaboration in the future.		
09:30	Discussion	
1) Complete Prof. Li's draft in the end of this year 2) invitation to Thomas for a visit to Beijing 3) Collaboration between bottom-up and top-down approach for N2O and CH4 4) seeking for potential people working on mining the inversion results		
10:00	N Huneeus	Aerosol Forcing : Trying to estimate the contribution from China
ABSTRACT The direct radiative forcing (DRF) of anthropogenic aerosols is estimated using on one hand traditional bottom-up inventories and on the other hand the emission estimates resulting from the assimilation of satellite aerosol optical depth into an aerosol model of intermediate complexity. The DRF is computed for all anthropogenic aerosols (namely black carbon, particulate organic matter and sulphate) and for each one of the species separately. In order to estimate the contribution on the DRF from China three experiments are conducted where all sources are considered, only emissions over China are included and one where emissions over China are omitted. The main results from these experiments using the two inventories will be presented.		
10:20	R Wang	Towards closure of observation and model-based estimates of the direct radiative forcing of black carbon
ABSTRACT Black carbon (BC), or soot, has been highlighted as the second largest contributor to the total anthropogenic radiative forcing (RF), yet its contribution remains uncertain. In particular, model simulations and observation-derived estimates differ significantly by 0.2 to 0.7 Wm^{-2}, due to large discrepancies between modeled and observed atmospheric aerosol absorption. Here we investigate the effects of emission inventory and model resolution on such estimates accounting for uncertainty in emissions. By combining a new inventory and a new atmospheric model with a ~50km grid over Asia, the model simulated aerosol absorption (AAOD) attributable to BC can match the observations. In particular, the bias in AAOD gets reduced from -43% to 5% in East Asia, the region with highest BC loading. In doing so, the observation-based estimate of BC radiative forcing also gets reduced from 3.1 Wm^{-2} to 1.4 Wm^{-2} over East Asia (from 1 to 0.6 Wm^{-2} over the globe) and these new values can be reconciled with model estimates within their errors. The remaining discrepancy is likely due to observational uncertainty and unresolved temporal variation of emissions.		

10:40	F Zhou	N_2O emissions in China from 1978 to 2008

ABSTRACT Nitrous oxide (N_2O) emissions from China have received increasing attention because of its importance on global climate forcing. A new and high-resolution N_2O emission inventory (PKU-N2O-CHINA) has been developed with the following improvements: (i) All of anthropogenic and natural emission sources were considered excluding LULUCF in IPCC category; (ii) the emission factors (EFs) and the associate parameters were updated to reflect country-specific conditions and spatial heterogeneity; (iii) a 1x1 km gridded map was produced for 2008 based on county-level activity data; (iv) temporal trends were derived for total and each emission source from 1978 to 2008; (v) uncertainties associated with the inventory were quantified. It was estimated that 1762 Gg of N_2O were emitted in China in 2008, which is lower or slightly lower than that previously reported. Manure management systems (29%) was the largest contributor, following by synthetic fertilizers (20.5%), indirect emission from atmospheric N deposition (10.4%), public electricity and heat production (7.9%), and organic fertilizers (6.9%). By using county-level data directly and regional EFs and parameters, spatial bias in previously national or province-level disaggregation was reduced by 120.7%, resulting mainly from uneven intensities of fertilizer and energy uses within nation or provinces. Total and per-capita emissions increased monotonically and steadily since 1978, while agricultural N_2O emissions per cereal productivity rapidly fell down after 2003 because of nutrient management implemented and high-yield crop varieties promoted. N_2O emissions in China would be effectively reduced if improving nutrient or energy use efficiencies as well as shifting human dietary choice with lower per capita calorific intake.

11:00	S Peng	Bottom-up anthropogenic methane emission inventories in China from 1980 to 2010

ABSTRACT Using IPCC Guidelines (IPCC, 2006) Tier 1/2 methods, anthropogenic methane emissions over China from 1980 to 2010 were estimated by bottom-up inventories. The total anthropogenic methane emissions were estimated from 9 sectors: livestock (including enteric fermentation and manure management), rice, biomass burning (including inside and outside), fugitive from coal mining and oil, gas production and transmission, fuel combustion, landfills, domestic swedge and industrial waste water. During the past three decades, the total anthropogenic CH_4 emissions in China increase from 21.7±3.7 Tg CH_4 yr^{-1} in 1980 to 45.5±5.6 Tg CH_4 yr^{-1} by bottom-up inventory, which is about ~10% of global CH_4 net emission. The yearly anthropogenic CH_4 emission maps for each sector from 1980 to 2010 at spatial resolution of half-degree were also produced by bottom-up inventories.

11:20	P Bousquet	Thirty years of methane sources and sinks : from global to regional emissions

ABSTRACT Methane is the second anthropogenic greenhouse gas after carbon dioxide. Atmospheric methane has contributed about 20% of the climate forcing by long-lived greenhouse gases since pre-industrial times. It also influences the oxidizing capacity of the atmosphere and the production of tropospheric ozone, through its reaction with OH radicals. With a rather short lifetime of 9-10 years in the atmosphere, methane is an interesting target for climate change mitigation. Direct measurements of atmospheric methane began in 1978, reached global coverage

after 1983, and now include a large variety of observations: in-situ samples collected regularly at the surface or with aircrafts, continuous measurements at the surface or in the low troposphere with tall towers, remotely-sensed atmospheric columns retrieved from the surface or from space since 2003. Although sources and sinks of methane are identified, large uncertainties remain in their spatio-temporal quantification. Here, we present a synthesis of methane emissions and sinks during the past thirty years, from global to regional scales, using an integrated approach to combine: atmospheric measurements, chemistry-transport models, ecosystem models, emission inventories, and climate-chemistry models. Decadal budgets suggest a possible overestimation of total natural emissions by ecosystem models and data-driven approaches. As remaining uncertainties on emission trends do not allow definitive conclusions, emission scenarios are proposed to explain inter-annual variability of atmospheric methane since 1985, with a focus on the past 10 years.

11:40	X Lin	5 years of trace gas observations over the Indian subcontinent: a study based on surface flask measurements

ABSTRACT With the rapid population growth and economic development, the emissions of greenhouse gases (GHGs) over the Indian subcontinent have sharply increased during the current decade. However, evaluation of regional fluxes of GHGs and characterization of their spatial and temporal variations remain uncertain due to the sparse atmospheric surface observation network. Three new atmospheric stations were recently established in India as part of the cooperation between C-MMACS and LSCE, France - at Hanle (HLE), Pondicherry (PON), and Port Blair (PBL) - to monitor various long-lived trace gases and regionally constrain their fluxes between the biosphere and the atmosphere. Here we present temporal variations of multiple trace gases (CO_2, CH_4, N_2O, SF_6, CO, H_2) flask measurements at HLE, PON, and PBL during the period 2007–2011. For each species at each station, the mean seasonal cycle is analyzed, and related to seasonal variations in terrestrial ecosystem fluxes, anthropogenic emissions, and monsoon circulation, including convection. Back-trajectories analyses of the three stations during the sampling period show the dominant air flow patterns in different seasons. The covariance between different species pairs is also examined to identify the dominant sources of synoptic variability over the region. The measurements of multiple long-lived trace gases at the three stations have the potential to improve the atmospheric transport model and constrain the inversions of fluxes over the Indian subcontinent. The network of ground stations needs further extension to different parts of this region for better understanding of the carbon cycle.

12:00	Y Yin	Fire emission inversions: CO

ABSTRACT With the rapid population growth and economic development, the emissions of greenhouse gases (GHGs) over the Indian subcontinent have sharply increased during the current decade. However, evaluation of regional fluxes of GHGs and characterization of their spatial and temporal variations remain uncertain due to the sparse atmospheric surface observation network. Three new atmospheric stations were recently established in India as part of the cooperation between C-MMACS and LSCE, France - at Hanle (HLE), Pondicherry (PON), and Port Blair (PBL) - to monitor various long-lived trace gases and regionally constrain their fluxes between the biosphere and the atmosphere. Here we present temporal variations of multiple trace gases (CO_2, CH_4, N_2O, SF_6, CO, H_2) flask measurements at HLE, PON, and PBL during the period 2007–2011.

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12:20	Y Wang	Global fossil fuel data assimilation framework (FFDAS) and an experiment of error estimation

ABSTRACT The increase of atmospheric CO_2 concentration from Industrial Era is primarily caused by the anthropogenic emissions. In traditional inversion system, fossil fuel CO_2 emission is assumed perfectly known, which will mistakenly report errors from anthropogenic fluxes into natural fluxes. Currently, many atmospheric inversions focus on natural fluxes at global scale and anthropogenic fluxes at local scale, but few attempts on fossil fuel CO_2 at global scale has been made. My PhD study aims at establishing a global Fossil fuel data assimilation (FFDAS) with the application of $^{14}CO_2$ and CO observation data. The first task is to establish the performance of a ^{14}C network and the most cost-effective sampling strategy to quantify emissions. Under the framework of an analytical inversion, I am working on the estimation of error sources and their amplitude.

14:30	P Peylin	Overall development of ORCHIDEE
14:50	S Luyssaert	DOFOCO Branch of ORCHIDEE
15:10	J Chang	Improving the representation of grassland systems in ORCHIDEE

ABSTRACT ORCHIDEE-GM is newly developed by integrating the management module from PaSim, a grassland model developed for site applications, into ORCHIDEE. It is capable to simulate dynamics of biometric variables and C fluxes of managed grassland, considering mowing and grazing. Compared to data from statistics (Eurostat or FAOstat), ORCHIDEE-GM can well reproduces the spatial distribution of yields and livestock density, however, tends to overestimate them. Long-term evolution and interannual variability of grassland yields induced by elevated CO_2 and/or climate change are able to be captured by the model. With the ability to accounting for carbon (C) export/input, ORCHIDEE-GM simulates a net C sink of 22.5 gC m^{-2} $year^{-1}$ and a net greenhouse gases (GHGs) sink of 82.2 gCO_2-C equiv. m^{-2} $year^{-1}$ over European grasslands in recent 2 decades. The European-scale reduction of livestock numbers in recent 20 years has enhanced C sequestration (stored in soil) by 273 TgC and reduced GHGs emission by 477 $TgCO_2$-C equiv., in which Eastern Europe plays a major role.

15:50	X Wu	Improvement of crop processes in ORCHIDEE

ABSTRACT We integrated some key processes from STICS into ORCHIDEE to improve both

phenological, biophysical and biogeochemical processes. These processes include: Vegetative growth (phenology, growth stages); Carbon allocation and grain filling processes. Multi-sites comparison shows that our model has good ability to simulate the phenological, biophysical and biogeochemical processes for major crops even using a generic scheme.		
16:10	H Liu	Holocene vegetation dynamics and climate feedback
ABSTRACT We reconstructed regional vegetation cover changes based on 15 high quality lake sediment profiles selected from 55 published sites in North China, along with their modern remote sensing vegetation index. Our results showed that vegetation cover in North China increased slightly before its maximum at 6.5 cal ka BP and has since declined significantly. The vegetation decline since 6.5 cal ka BP has likely induced a regional albedo change and aerosol increase. Further comparison with paleoclimate and paleovegetation dynamics in South China reproduced the regional cooling effect of vegetation cover decline in North China modelled in previous work. By comparing vegetation map of 6.0 ka BP and modern time, it is found that forests have retreated for hundreds of kilometers in the northern edge of the boreal zone, the Mediterranean region and central North America. We are linking these vegetation cover declines to climate cooling since the Holocene megathermal.		
16:30	Discussion	
1) organizing development of ORCHIDEE crop with a target to establish a unified crop model applicable to the globe 2) population and land use history of China to see historical influence of land use with DOFOCO branch with forest management. 3) ORCHIDEE-DEV meeting		

Day 3 (Nov. 14th)

Time	Speaker	Title
09:10	P Ciais	Aerosols effects on the carbon cycle
09:40	X Wang	Evaluation of Trendy models, seasonal cycle and interannual variations
10:00	P Cadule	Coupled carbon climate simulations at IPSL
10:20	L Bopp	CMIP5 output and ocean carbon climate
11:00	T Wang	Snow modelling
11:20	C Yue	Modeling the role of fires in global terrestrial carbon balance in relation to fire pyromes

ABSTRACT Carbon dioxide emissions from natural and anthropogenic fires contribute to the atmospheric CO2 buildup and further to global warming. Thus to simulate the response of terrestrial carbon cycle to future climate change, fires must be included in the earth system models. Following the integration of the SPITFIRE module into the global vegetation model ORCHIDEE, the role of fire in global terrestrial carbon balance is examined. We conduct two simulations with fire being switched ON (fireON) and OFF (fireOFF) to investigate the difference in terrestrial carbon balance. The simulated global net biome production (NBP) correlates well with the residual terrestrial carbon sink. The NBP difference between fireOFF and fireON simulations is generally small, indicating that fuels which are not burned by fires in the fireOFF simulation are respired in form of heterotrophic respiration. However, a smaller carbon sink efficiency (NBP/NPP) by the fireON simulation compared with the fireOFF one does happen for years with extreme fire carbon emissions (due to extreme fires), when the emissions from fires could not be fully compensated by the heterotrophic respiration. By further relating this fire reduced sink efficiency to the different fire pyromes, we find that, compared with the rare and infrequent fires, a higher fraction of NPP is emitted as fire carbon emissions for more frequent fires, which result in a greater reduction in the sink efficiency (NBP/NPP).

11:40	S Peng	Permafrost and wetland CH4 emissions in ORCHIDEE

ABSTRACT The permafrost degradation under the context of climate warming is one of the most interesting questions in climate change science, because (1) permafrost contains the largest organic carbon reservoir in the terrestrial system, which may contribute a powerful greenhouse gas such as CO_2 and CH_4 positive feedbacks on climate; and (2) permafrost stability have important impacts on social-economics of permafrost domain. Here, the progress of permafrost and wetland CH4 emissions modules incorporated into 11-layer soil diffusion scheme was introduced. Then, we show a part of results of high-latitude version of ORCHIDEE for the current international projects RCN and PAGE21. Finally, the future plan of ORCHIDEE development including thermokarst module was also discussed in this presentation.

12:00	D Zhu	Last Glacial Maximum Permafrost Carbon Pools and Fluxes

ABSTRACT Atmospheric CO2 concentration rose by nearly 100 ppm during late Pleistocene glacial–interglacial transitions. To make clear the sources of this carbon requires better knowledge of carbon reservoirs during glacial periods. It was estimated that the terrestrial biosphere contained 330 PgC less carbon in the Last Glacial Maximum compared with pre-industrial time, yet with a large area of low-productivity but carbon-rich biomes. During LGM, an inert carbon pool of more than 2000 Pg C has been inferred, which exceeds carbon stored in permafrost today by more than 700 Pg C. This large terrestrial inert pool partly disappeared during the climate warming to the Holocene, and may have contributed to the deglacial rise in atmospheric CO2. During the three-year PhD study, I will use and further develop the process-based ecosystem model ORCHIDEE, by improving DGVM, introducing soil accumulation rates and introducing interactions with steppe-tundra mammals, in order to simulate the extent and distribution of LGM permafrost carbon pools and dynamics. The model results will be evaluated using new paleo-environmental reconstructions.

14:00	Discussion	

1) PKU-LSCE agreement extension. Thinking about the possibly to include IPSL. First draft will be completed by P Ciais.

2) Date of winter school: 10 Mar - 14 Mar, and possible Shenzhen visit of 13 Mar - 14 Mar

3) Winter school arrangement.
Advance in the format:
a. mini-project organized by professors and post-doc (leading a three people group), student presentations of the project output
b. project content to be delivered in late November
c. the scale of students is expected to be about 30

Email on the arrangement and timeline will be sent by Cecilia.
