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MICAELA KAITLIN

Revolutions that Made the Earth Springer Science & Business Media
For at least a decade the science of climate change has warned us of the dire need for action – particularly by corporations who are the main engines of economic production and consumption. Yet managerial and corporate understanding of climate change and related energy issues remains fragmented and present actions lack the urgency this critical problem deserves. There is a whole new economy – the low-carbon economy – looming on the horizon. But our consumption and production patterns remain in a carbon-locked position. What we are risking is a global carbon crisis and a case of history repeating. Humankind's failure to adequately recognise the onset of and address the effects of the global financial crisis mirrors our similar failures with the carbon crisis. There are many parallels: both are and were predictable and both will have direct implications on humanity on a sweeping, indiscriminate and severe scale. The difference is that we cannot reverse the effects of climate change and fossil fuel scarcity as easily as we can repair the global financial system. It is of paramount importance that we wake up to the risks and begin tackling the issues early enough. To successfully address the risks, business needs to be aware of the consequences that a changing climate and finite carbon resources will have on their business performance. The element carbon – both as a resource and as an emission – is both an economic threat as well as an opportunity for companies. It is a threat for carbon-intense production systems that will need to be changed to avoid further harmful climatic change, and take into account the limited availability of carbon-based fuels. At the same time, new opportunities will emerge for companies who can creatively design and produce goods and services that fit the new emerging carbon-constrained business environment. Many sectors of the economy – for example, renewable energy, energy and resources conservation, waste reduction and management, carbon finance markets – will expand rapidly, as other carbon- and resource-intensive sectors decline. The Global Carbon Crisis succinctly translates important insights from the natural sciences, economics and equity discussions, for the business reader. It reviews important aspects of these discussions and clarifies misunderstandings with respect to climate change and fossil fuel availability and their implications for business. The book provides simple, direct, pragmatic and effective solutions that policy-makers and corporate managers can implement. The aim is to provoke action – thoughtful action – towards developing a low-carbon future for companies on three levels. At the macro level, the authors discuss the importance of tough industrial policies for climate change and propose the idea of an international carbon-equal fund. At the meso level, they elaborate on the role of inter-firm collaborations for establishing low-carbon industries and production systems. At the micro level, they illustrate the virtue of proactive carbon strategies and suggest a corporate carbon management framework. Getting the message of the carbon crisis across to a business audience has proved challenging. This book successfully makes the case that they are intricately connected to one another and practising managers and business students will benefit from viewing the carbon crisis in parallel to the financial meltdown. The book will be essential reading for all businesses grappling with carbon-related issues and for many in academia, including those in management, strategy, finance, corporate social responsibility and sustainable development, globalisation and innovation studies.
Climate Change 2001: Synthesis Report Springer
This comprehensive volume is the first to consider biomass burning as a globalphenomenon and to assess its impact on the atmosphere, on climate, and on the biosphereitself.
Policy Options for Stabilizing Global Climate National Academies Press
The development and analysis of climate policy proposals intertwine with the structure of knowledge and the possibility for changing it. Key questions concern the long-term interaction between policy, technology, infrastructure, and the earth system, but each of these components is deeply uncertain. This dissertation advances the description of knowledge about the climate system, the assessment of economic responses to climatic possibilities, and the development of policy that positions society to achieve long-term climate goals. It offers new paths to describing understanding of complex systems and to modeling optimal management under structural uncertainty. The first chapter formalizes uncertainty about equilibrium climate change. Its hierarchical Bayes framework allows climate models to be incomplete and to share biases, and it shows how prior beliefs about models' completeness and independence interact with models' estimates of feedback strength to determine distributions for temperature change. When models might share biases, the results of additional models might tell us more about models' common structure than about the real-world processes they aim to represent. The most valuable information would then come not from related models but from alternate estimates that should carry a different set of unobservable biases. The possibility that models are wrong in common ways limits the degree to which models' estimates can narrow the probability distribution for feedback strength, which also limits our ability to rule out extreme climatic outcomes. The second chapter empirically estimates a feedback that is especially difficult to model. Climate-carbon feedbacks (or carbon cycle feedbacks) describe the effect of temperature on carbon dioxide (CO_2). If they are positive, then not only does anthropogenic CO_2 cause warming via the greenhouse effect and earth system feedbacks, but this warming itself increases CO_2 and so causes further warming. Previous empirical work estimated a stronger feedback than did coupled climate-carbon cycle models. However, those empirical estimates were probably biased upwards while coupled models' estimates were primarily driven by a few ill-constrained parameters. This chapter attempts to obtain an unbiased estimate of climate-carbon feedback strength by using variations in summer radiation in the Arctic (i.e., variations in orbital forcing) to identify the effect of temperature on CO_2 in 800 ky ice core records. It finds a range for climate-carbon feedbacks that is closer to coupled models' estimates than to previous empirical work. Since climate-carbon feedbacks are probably positive, temperature change projections tend to underestimate an emission path's consequences if they do not allow the carbon cycle to respond to changing temperatures. The next three chapters assess economic responses to climate change in a policy-optimizing integrated assessment model, in games with long-lived investments into abatement capital, and in a cost-effectiveness model with multiple policy options stretching over long time horizons. The first of these chapters extends a well-known integrated assessment model to include the possibility of abrupt shifts in the climate system. It also changes the model's structure to make the decision-maker aware of uncertainty and of the possibility for learning over time, and it generalizes the welfare evaluation to reflect that uncertainty about temperature change is qualitatively unlike uncertainty about climate thresholds. It finds that tipping points can increase the near-term social cost of carbon by more than 50% when they raise climate sensitivity or make damages more convex. They have less of an effect when they increase the atmospheric lifetime of CO_2 or the quantity of non-CO_2 greenhouse gases. Allowing the policymaker to be differentially averse to consumption fluctuations over time and over risk increases the near-term social cost of carbon by 150%, with tipping point possibilities then increasing it by another 50%. The possibility of tipping points is more important for the social cost of carbon than is the ambiguity attitude the decision-maker uses in evaluating them. The second of these climate economics chapters models the optimal emission tax when firms can adopt low-pollution technology that reduces abatement cost. The regulator anticipates this adoption but must set the tax before firms invest. In many cases, a linear emission tax cannot obtain both socially optimal investment and socially optimal emissions because the regulator either will set it inefficiently high to stimulate investment or will set it at an ex post optimal level that obtains inefficiently low investment. The difficulty is that an emission tax fixes both the incentive to invest and the incentive to abate, but these two goals rarely align perfectly when investment is lumpy. In contrast, tradable permits policies do not suffer this tension because the permit price responds automatically to realized investment. A numerical model then considers the ability of the regulator to select not only the level but also the duration of the tax. It shows that outcomes are still often socially inefficient. Further, the regulator will occasionally use a longer tax to obtain investment when firms expect their investments to lower the tax in the next period, but the cost of not being able to adjust the next period's tax limits the parameter space in which the longer tax is employed. The fifth chapter constructs cost-effective dynamic policy portfolios of abatement, research and development (R & D), and negative emission technology deployment in order to achieve 21st century climate targets. It includes two types of stochastic technological change in a stylized numerical model and allows each type of technology to respond both to public R & D and to abatement policies. It compares worlds where negative emission technologies are and are not available, and it compares a world where the century's cumulative net emissions are constrained with a world in which threshold possibilities lead policy to constrain cumulative net emissions in each year during the century. It finds that R & D options are valuable and exercised but do not substitute for near-term abatement. The type of R & D undertaken depends on long-term emission goals because those determine the magnitude of future abatement. When the cumulative emission constraint is stringent, negative emission technologies substitute for near-term abatement and affect the type of R & D undertaken, but if threshold considerations eliminate the freedom to temporarily overshoot emission targets, negative emission technologies become less valuable. The availability of negative emission technologies provides a valuable option to partially undo previous emissions, but abatement also gains option value from increasing future flexibility to forgo reliance on negative emission technologies if the technology or climate prove problematic in the interim. The concluding chapter directly connects uncertainty about climate change to uncertainty about the cost of achieving CO_2 targets. It shows how beliefs about technology, temperature, and damages interact to affect the cost-effectiveness of climate targets. It finds that the speed with which damages increase at higher temperatures is the most important of these factors. Both 450 parts per million (ppm) and 550 ppm CO_2 targets provide net benefits for quadratic damage functions that reduce annual output by less than the 1-2% estimated for 2.5°C of warming. Cubic damage functions support both CO_2 targets even if 2.5°C of warming only reduces output by 0.2% or less. More convex damage functions also reduce the importance of abatement cost uncertainty. significantly increase the range of damage functions that support these targets and decrease the importance of abatement cost uncertainty. In addition, because extreme feedback outcomes have little effect over the next decades, a thinner-tailed temperature distribution (resulting from optimistic prior beliefs about climate models' independence and biases) supports CO_2 targets under slightly less severe damages than does the thicker-tailed distribution (resulting from skepticism about climate models' independence and biases). Emission reductions hedge against greater societal sensitivity to temperature increases while exposing society to the upside of positive technology surprises. The epistemology of complex systems in an out-of-sample world is a key motif. This dissertation advances knowledge of climate change and understanding of policy design in settings with limited ability to predict future changes or responses. Further work should seek a more unified framework for describing and acting on knowledge of evolving complex systems.
CEPAL Review No.116, August 2015 CRC Press

IPCC Report on sources, capture, transport, and storage of CO2, for researchers, policy-makers and engineers.

Characterizing and Responding to Uncertainty in Climate Change World Resources Inst

The Intergovernmental Panel on Climate Change (IPCC) was set up jointly by UNEP and the World Meteorological Organisation in 1988 to provide periodic scientific analysis of the causes, impacts and possible policy response options to climate change issues. This synthesis report is the 4th and final part of the IPCC's third assessment report, and contains information on nine policy-relevant questions regarding the IPCC's 2001 assessment. It is intended to assist governments, individually and collectively, to formulate appropriate adaptation and mitigation responses to the threat of human-induced climate change.

The Emissions Gap Report 2016 Cambridge University Press

These results from the National Research Programme on Climate Change of the Netherlands offer a synthesis of present knowledge in the fields of: source and sinks of greenhouse gases and aerosols; land-atmosphere interactions; the global energy balance; and radiative forcing and climate variability.

Greenhouse Gas Emission Inventories United Nations

In this dissertation, I present three essays that consider the environmental consequences of technological change, from an international perspective. The first two chapters use firm-level production data to estimate the response of CO2 emission intensity to changes in competition in foreign markets. The first chapter estimates this response with respect to foreign demand shocks, i.e., a positive shock to exports. The second chapter exploits a specific liberalization episode to estimate the impact with respect to foreign competition shocks, i.e., a negative shock to exports. Both papers are co-authored with Helene Ollivier. The final chapter analyzes the decision to adopt genetically engineered seeds in different countries around the world, and the attendant impacts on supply and land-use. This last chapter is co-authored with David Zilberman and Steven Sexton and was previously published in Environment and Development Economics. The first chapter investigates the impact of exporting on the CO2 emission intensity of manufacturing firms in India. Recent papers have argued that export market access encourages firms to upgrade technology, which lowers the emission intensity of production; however, data limitations confound previous attempts to separately identify productivity impacts from simultaneous changes in prices and product-mix. We present a model of how these alternative channels could also explain the results documented in the literature. Then, using a highly detailed production dataset of large Indian manufacturing firms that contains information on physical units of inputs and outputs by product, we are able to decompose the overall firm impact into three components -- prices, product-mix, and technology. Export impacts at the firm level are identified from import demand shocks of foreign trading partners. We find that prices systematically bias down estimates of emission intensity in value, that firms adjust emission intensity in quantity through changing output shares across products, but that firms do not lower emission intensity within products over time (technology). The results imply that the productivity benefits from market integration alone are not enough to induce clean technology adoption. The second chapter investigates the ``third-party'' impact of trade liberalization on the environmental performance of firms in countries that lose market share as a result of the liberalization. If competition matters for exporting (as previous research indicates), and exporting matters for emission intensity, then emission intensity reductions in liberalized markets may be offset by emission intensity increases in countries peripheral to the liberalization. To test for this indirect effect, we exploit quasi-natural variation arising from the elimination of quota constraints on textile and apparel exports to the US between 1994 and 2007. Using a detailed panel of production and emission data at the firm-product level, we find that Indian exporters in Prowess lost on average 14% export sales as a result of liberalized trade between the US and India's competitors. This loss of export sales was accompanied by an increase in CO2 intensity of 9%. The results do not appear to be due to fuel-switching, but there is suggestive evidence that capital investments and switching to higher emission intensity varieties may have played a role. Overall, the results support the importance of international competition for production and pollution decisions of firms around the world. The final chapter uses aggregate data to estimate supply, price, land-use, and greenhouse gas impacts of genetically engineered (GE) seed adoption due both to increased yield per hectare (intensive margin) and increased planted area (extensive margin). An adoption model with profitability and risk considerations distinguishes between the two margins, where the intensive margin results from direct ``gene'' impacts and higher complementary input use, and the extensive margin reflects the growing range of lands that become profitable with the GE technology. We identify yield increases from cross-country time series variation in GE adoption share within the main GE crops- cotton, corn, and soybeans. We find that GE increased yields 34% for cotton, 12% for corn and 3% for soybeans. We then estimate quantity of extensive margin lands from year-to-year changes in traditional and GE planted area. If all production on the extensive margin is attributed to GE technology, the supply effect of GE increases from 5% to 12% for corn, 15% to 20% for cotton, and 2% to 40% for soybeans, generating significant downward pressure on prices. Finally, we compute ``saved'' lands and greenhouse gases as the difference between observed hectarage per crop and counterfactual hectarage needed to generate the same output without the yield boost from GE. We find that all together, GE saved 13 million hectares of land from conversion to agriculture in 2010, and averted emissions are equivalent to roughly 1/8 the annual emissions from automobiles in the US.

Economic Issues In Global Climate Change Bentham Science Publishers

Emissions of carbon dioxide from the burning of fossil fuels have ushered in a new epoch where human activities will largely determine the evolution of Earth's climate. Because carbon dioxide in the atmosphere is long lived, it can effectively lock the Earth and future generations into a range of impacts, some of which could become very severe. Emissions reductions decisions made today matter in determining impacts experienced not just over the next few decades, but in the coming centuries and millennia. According to Climate Stabilization Targets: Emissions, Concentrations, and Impacts Over Decades to Millennia, important policy decisions can be informed by recent advances in climate science that quantify the relationships between increases in carbon dioxide and global warming, related climate changes, and resulting impacts, such as changes in streamflow, wildfires, crop productivity, extreme hot summers, and sea level rise. One way to inform these choices is to consider the projected climate changes and impacts that would occur if greenhouse gases in the atmosphere were stabilized at a particular concentration level. The book quantifies the outcomes of different stabilization targets for greenhouse gas concentrations using analyses and information drawn from the scientific literature. Although it does not recommend or justify any particular stabilization target, it does provide important scientific insights about the relationships among emissions, greenhouse gas concentrations, temperatures, and impacts. Climate Stabilization Targets emphasizes the importance of 21st century choices regarding long-term climate stabilization. It is a useful resource for scientists, educators and policy makers, among others.

Inventory of U.S. Greenhouse Gas Emissions and Sinks Springer Science & Business Media

The Department for Energy and Climate Change's (DECC) official CO2 figures - that count territorial emissions from power stations and transport, etc, within UK borders - show nearly 20% reduction between 1990-2009. But research commissioned for the Department for the Environment Food and Rural Affairs reveals that CO2 emissions were 20% higher in 2009 if consumption based emissions - from imported goods - are included. The fall in territorial emissions was not mainly the consequence of the Government's climate policy. Rather it was the result of the shift in manufacturing industries away from the UK and the switch from coal to gas-fired electricity generation that began in the early 1990s. Since 1990 carbon dioxide emissions from imports have almost doubled (from 166 million tonnes (Mt) CO2 to 331 Mt CO2 in 2009). If the UK wishes to encourage emissions reductions in countries that manufacture and export goods to the UK, the MPs say the Government should recognise the growth in the UK's consumption-based emissions. Acknowledging that UK consumption is driving up territorial emissions in other countries could increase the UK's leverage over those emissions and help to secure a binding global agreement on carbon cuts. There is sufficiently robust data available to develop new policy options and identify carbon-intensive behaviours that are overlooked by concentrating on territorial emissions alone. Ministers should explore the options for incorporating consumption-based emissions data in to the policy making process and setting emissions targets on a consumption-basis at the national level.

Buying Greenhouse Insurance Springer Science & Business Media

International concern for the continued growth of greenhouse gas emissions, and the potentially damaging consequences of resultant global climate change, led to the signing of the United Nations Framework Convention on Climate Change by 155 nations at the Earth Summit in June 1992. The Convention came into force on 21 March 1994, three months after receiving its 50th ratification. All Parties to the Convention are required to compile, periodically update, and publish national inventories of anthropogenic greenhouse gas emissions and sinks using comparable methodologies. In support of this process, the US Country Studies Program (US CSP) is providing financial and technical assistance to 56 developing and transition countries for conducting national inventories. This book presents the results of preliminary national inventories prepared by countries participating in the US CSP that are ready to share their interim findings. In some cases, inventories were prepared with support from other organizations. Preliminary inventories of twenty countries in Africa, Asia, Central and Eastern Europe and the Newly Independent States, and Latin America are presented, as well as regional and global syntheses of the national results. The regional and global syntheses also discuss results of eleven other preliminary national inventories that have been published elsewhere with the assistance of other programs. Results are discussed in the context of national and regional socioeconomic characteristics, and the regional and global syntheses compare national inventory estimates to other published estimates that are based largely on international databases. Papers also discuss inventory development issues, such as data collection and emission factor determination, and problems associated with applying the IPCC inventory methodologies. The preliminary inventory results reported here represent significant progress towards meeting country commitments under the Framework Convention, and provide useful information for refining international greenhouse gas emission databases and improving inventory methodologies. As the first book to compile national greenhouse gas emission estimates prepared by national experts in developing countries and countries with economies in transition, this will be an invaluable resource to scientists, policymakers, and development specialists in national, regional and global anthropogenic sources and sinks of greenhouse gases.

Uncertainties in Greenhouse Gas Inventories MIT Press

This book grows out of a 2001 workshop on "Emission of Chemical Species and Aerosols into the Atmosphere." The contents deal with inventories of emissions related to anthropogenic emissions or biomass burning; emissions from vegetation and soils; emissions of mineral and sea-salt aerosols; and emissions of sulphur compounds from the oceans. Concluding chapters show how atmospheric observations have been used to improve our knowledge of emissions.

The Climate System Univ of California Press

"Mercury deposition and contamination is widespread and well documented, and it continues to be a public-health concern for certain sectors of the global human population in both developed and developing countries. This edited volume focuses on integrating the diverse sciences involved in the process of mercury cycling in the environment--from the atmosphere, through terrestrial and aquatic food webs, and human populations--to develop a comprehensive perspective on this important environmental pollutant. Using a systems-level approach, this book provides recommendations on mercury remediation, risk communication, education, and monitoring. In response to a growing need for understanding the cycling of this ubiquitous pollutant, the science of mercury has grown rapidly, expanding into several interdisciplinary fields and encompassing such disparate academic and scientific disciplines as biogeochemistry, economics, sociology, public health, decision sciences, physics, global change, and mathematics. Only recently have scientists really begun to establish more holistic approaches to studying mercury pollution, giving rise to investigations that have furthered the integration of a multi-tiered approach, especially by using chemistry, biology, and human health sciences collectively. The study of mercury pollution has produced a variety of contributions to domestic and international policies related to the management of mercury in the environment"--

Methane Emissions from Major Rice Ecosystems in Asia MIT Press

Verifying Greenhouse Gas EmissionsNational Academies Press

Global Climate Change and Greenhouse Emissions OUP Oxford

Understanding, quantifying, and tracking atmospheric methane and emissions is essential for addressing concerns and informing decisions that affect the climate, economy, and human health and safety. Atmospheric methane is a potent greenhouse gas (GHG) that contributes to global warming. While carbon dioxide is by far the dominant cause of the rise in global average temperatures, methane also plays a significant role because it absorbs more energy per unit mass than carbon dioxide does, giving it a disproportionately large effect on global radiative forcing. In addition to contributing to climate change, methane also affects human health as a precursor to ozone pollution in the lower atmosphere. Improving Characterization of Anthropogenic Methane Emissions in the United States summarizes the current state of understanding of methane emissions sources and the measurement approaches and evaluates opportunities for methodological and inventory development improvements. This report will inform future research agendas of various U.S. agencies, including NOAA, the EPA, the DOE, NASA, the U.S. Department of Agriculture (USDA), and the National Science Foundation (NSF).

Countdown to Kyoto, Parts I-III Springer Science & Business Media

The Earth that sustains us today was born out of a few remarkable, near-catastrophic revolutions,

started by biological innovations and marked by global environmental consequences. The revolutions have certain features in common, such as an increase in complexity, energy utilization, and information processing by life. This book describes these revolutions, showing the fundamental interdependence of the evolution of life and its non-living environment. We would not exist unless these upheavals had led eventually to 'successful' outcomes - meaning that after each one, at length, a new stable world emerged. The current planet-reshaping activities of our species may be the start of another great Earth system revolution, but there is no guarantee that this one will be successful. The book explains what a successful transition through it might look like, if we are wise enough to steer such a course. This book places humanity in context as part of the Earth system, using a new scientific synthesis to illustrate our debt to the deep past and our potential for the future.

Image: An Integrated Model to Assess the Greenhouse Effect Springer Science & Business Media

Rice production is affected by changing climate conditions and has the dual role of contributing to global warming through emissions of the greenhouse gas methane. Climate change has been recognized as a major threat to the global environment. Because of insufficient field data, rice-growing countries face a problem when trying to comply with the United Nations Framework Convention on Climate Change stipulations to compile a national inventory of emissions and to explore mitigation options. Given the expected doubling in rice production in Asia, the need to evaluate the interaction between climate change and rice production is critical to forming a sound basis for future directions of technology developments by policy makers, agriculturists, environmentalists, rice producers, and rice consumers. The present book comprises two sections. The first part documents a comprehensive overview of the results achieved from an interregional research effort to quantify methane emission from major rice ecosystems and to identify efficient mitigation options. This research report broadens understanding of the contribution of rice cultivation to methane emissions and clarifies that emissions are relatively low, except in specific rice ecosystems, and that these high emissions could be ameliorated without sacrificing yield. The second section shows results from other projects that investigated the role of rice cultivators in field and laboratory approaches. The findings represent inputs for future modeling approaches in the role of rice cultivators. The expanded database generated by other projects is reflected in modeling efforts.

Improving Characterization of Anthropogenic Methane Emissions in the United States CRC Press

This book is based on the 2014 Special Issue 124(3) of Climatic Change. It brings together 16 key papers presented at, or produced, subsequent to the 2010 (3rd) International Workshop on Uncertainty in Greenhouse Gas (GHG) Inventories. The Workshop was jointly organized by the Lviv Polytechnic National University, Ukraine; the Systems Research Institute of the Polish Academy of Sciences; and the International Institute for Applied Systems Analysis, Austria. This book has been written to enhance understanding of the uncertainty encountered in estimating greenhouse gas (GHG) emissions and in dealing with the challenges resulting from those estimates. Such challenges include, but are not limited to i) monitoring emissions; ii) adhering to emission commitments; iii) securing the proper functioning of emission trading markets; and iv) meeting low-carbon or low-GHG futures in the long term. The approaches to addressing uncertainty discussed by all authors attempt to improve national inventories, not only for their own sake but also from a wider, systems analytical perspective that seeks to strengthen their usefulness under a compliance and/or global monitoring and reporting framework. These approaches show the challenges and benefits of including inventory uncertainty in policy analysis and where advances are being made.

Global Climate Change and Agricultural Production CRC Press

Cepal Review is the leading journal for the study of economic and social development issues in Latin America and the Caribbean. Edited by the Economic Commission for Latin America, each issue focuses on economic trends, industrialization, income distribution, technological development and monetary systems, as well as the implementation of reforms and transfer of technology. Written in English and Spanish (Revista De La Cepal), each tri-annual issue brings you approximately 12 studies and essays undertaken by authoritative experts or gathered from conference proceedings.

Consumption-based emissions reporting Springer Science & Business Media

Nitrous oxide gas is a long-lived relatively active greenhouse gas (GHG) with an atmospheric lifetime of approximately 120 years, and heat trapping effects about 310 times more powerful than carbon dioxide per molecule basis. It contributes about 6% of observed global warming. Nitrous oxide is not only a potent GHG, but it also plays a significant role in the depletion of stratospheric ozone. This book describes the anthropogenic sources of N2O with major emphasis on agricultural activities. It summarizes an overview of global cycling of N and the role of nitrous oxide on global warming and ozone depletion, and then focus on major source, soil borne nitrous oxide emissions. The spatial-temporal variation of soil nitrous oxide fluxes and underlying biogeochemical processes are described, as well as approaches to quantify fluxes of N2O from soils. Mitigation strategies to reduce the emissions, especially from agricultural soils, and fertilizer nitrogen sources are described in detail in the latter part of the book.

Carbon Dioxide Capture and Storage Springer Science & Business Media

Atmospheric Chemistry has been a rapidly growing field with a recent focus on the major aspects of global environmental change, including stratospheric ozone depletion, UV-B change, and global warming. This book describes recent developments in our understanding of the global aspects of the chemistry in the main parts of the atmosphere, troposphere, and stratosphere, as obtained from field observations, laboratory investigations, and modeling studies. Although this chemistry is largely driven by reactions between gas phase species, recent progress made in the understanding of chemical reactions occuring in clouds and on the surface of aerosols is also reported.