Storybook of Lectures

General skills (coordination: Lenka Fehrenbach)

KN1: Communication techniques (2h)

Lecturer: Dr. Annie Cottier Bucher, Jasmin Fallahi

Join us for a session on the inspiring and interesting topic of intercultural learning and communication. The class is aimed at supporting you in developing your intercultural learning skills, and encourages you to be critical about your views on the culture and society of your host and your home country. We will discuss your expectations for the summer school, learn about complex terms such as culture and interculturality, and reflect on how you can benefit most of your two weeks with fellow students from all over the world at the University of Bern.

Physical climate system (coordinators: Christoph Raible and Jörg Franke)

KN2: IPCC Working Group I - current state of knowledge (1.5 h)

Lecturer: Prof. Thomas Stocker

The lecture presents the important results of the latest assessment reports of the Intergovernmental Panel on Climate Change published in 2013. These reports support the United Nations Framework Convention on Climate Change, which is the main international treaty on climate change. The report of Working Group I assesses the current physical understanding of the climate system and the potential future change. The students will learn about what climate scenarios are and how under certain scenarios the climate will evolve in future. Thus, the educational objectives are to obtain an overview of the current understanding of climate and its potential future change. Additionally, insights of the process on how the report was generated and which role IPCC Panel composed of representatives appointed by governments have will be presented. Finally, the current status of the new IPCC process started in 2015 will be discussed.

References

Intergovernmental Panel on Climate Change (2012), Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, 542pp, Cambridge Univ. Press, Cambridge, U. K., and New York. [available at http://www.scopus.com/inward/record.url?eid=2-s2.0-84928051547&partnerID=tZOtx3y1.]

IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535pp, doi:10.1017/CBO9781107415324. [available at http://www.ipcc.ch/report/ar5/wg1/]

KN3: Basics on statistical and numerical Climate modelling (1.5 h)

Lecturer: Prof. Christoph Raible

The findings on the potential future evolution of the climate assessed in the latest IPCC reports are based climate model simulations. Thus, it is essential to obtain a basic understanding of the functioning of models, but also on their limitations – the mayor goal of this lecture. An overview of different methods to simulate climate and its variability will be presented. In principle there are two possibilities: statistical modelling or numerical modelling. Both modelling strategies will be illustrated, though the focus is on numerical modelling. Statistical modelling will cover two fields of application: (i) stochastic climate models, which are used to describe climate variability and (ii) statistical models which are used to forecast weather and states of modes of variability. For the latter, the most important mode of variability of the climate system – El Niño Southern Oscillation (ENSO) will serve as an example. Thereby standard techniques like regression will be presented. Numerical modeling will focus on the governing physical equations and how these equations are discretized with numerical methods. For the latter simple differential equations will be

discretized in order to understand the basic concept. Further, state-of-the-art complex climate models will be introduced and how these models can be used will be discussed. In particular limitations of climate models (sources of uncertainties in their formulations), but also advantages (wrt observations) are presented.

References

Hasselmann, K., 1976: Stochastic climate models Part I. Theory, Tellus, 28, 473–485. doi: 10.1111/j.2153-3490.1976.tb00696.x

Stocker, T.F., 2016: Introduction to climate modelling, lecture note, 148 pp. [available at xxx.]

Wilks D.S., 2005, Statistical Methods in the Atmospheric Sciences, Volume 100, International Geophysics Series, 2nd Edition, 648pp.

KN4: Basics on statistical methods to verify predictions (1h)

Lecturer: Dr. Jörg Franke

Models have limitations as they are simplifications of reality. Thus, it is essential to assess their quality by (i) analyze the variability represented in a model and (ii) evaluate the model's ability to predict a future state. To do so, observations are inevitable prerequisite. Still, also observations have limitations and, thus, a brief overview will be given first. It is also important that observations are completely independent from the forecast because often observations are already used to fit parameters of model (e.g. regression coefficients). The concepts of cross-validation and leave-one-out validation are discussed. These two methods are used to avoid so-called "overfitting", which would make us believe that the model forecast is better than is actually is.

The second part of the lecture will introduce statistical methods to verify predictions on, e.g., the weather time scale or longer times scales up to several seasons; the latter being important for the most important mode of climate variability ENSO. Forecasts are preferably accurate, unbiased and sharp. The main focus in this lecture are basic measures like correlation, bias or root mean squared error. However, not all meteorological measures are metric and Gaussian, e.g. precipitation. Concepts are introduced how to deal with discrete or binary data (e.g. precipitation vs no precipitation). Additionally, forecast accuracy is often checked with so-called "skill scores". These are a relative measure that compare for instance how much better a forecast is compared to the climatology, the assumption that the climate state will be simply average. Especially if multiple forecasts are available, more advanced measures are commonly used. Therefore, concepts of like rank histograms, error-spread ratios are introduced.

References

Jolliffe I. J., D. B. Stephenson, 2011: Forecast Verification: A Practitioner's Guide in Atmospheric Science, 2nd Edition, 292pp.

Wilks D. S., 2005, Statistical Methods in the Atmospheric Sciences, Volume 100, International Geophysics Series, 2nd Edition, 648pp.

Climate Governance (coordinator: Manfred Elsig)

KN5: Theories of Climate Governance

Lecturer (Manfred Elsig)

The lecture focuses on the role of international cooperation in climate governance. It presents major advancements in theorizing about international cooperation drawn from the main theories of international relations (realism, liberalism and social constructivism) and discusses selected research programs that are relevant in the study of the governance of global commons, and in particular climate.

References

Grieco Joseph et al. 2015. "The Environment and International Relations". In Introduction to International Relations, edited by J. Grieco, J. Ikenberry and M. Mastanduno, London: Palgrave, 388-415.

KN6: Linking Trade Policy and Climate Policy

Lecturer: Joseph Francois

We have witnessed two related processes in recent decades that have greatly transformed the world economy. These changes pose challenges in the inter-linkages between global and local economic activity and the environment. One is the geographic disintegration and delocation of production with the emergence of international production networks. The other is changes in the institutional architecture governing related trade and investment flows since the early 1990s. In this lecture we provide an overview of global trade linkages, their relationship to carbon management, and the sometimes-conflicting interactions between trade policy objectives and environmental ones. Students will be introduced to the concept of global carbon accounting, wherein we trace for example the carbon emitted in various stages of production -- for example steel, rubber, and plastics that feed into production of an automobile. This will include the concept of assigning carbon to where it is consumed rather than produced. We will also examine the balance between environmental and economic (trade) policy within the WTO system. This includes tariffs against imports of solar panels, and the economics underpinning the application of international trade rules (and consistency with those rules) when implementing environmental policies. An example here is border tax adjustment in carbon pricing regimes, and the legitimacy of clean air as a trade policy objective.

References

Baldwin, R. E. (2011), 'Integration of the North American Economy and New-paradigm Globalization', in A. Sydor (ed.), Global Value Chains: Impacts and Implications (Ottawa: Government of Canada), 43–76.

Baldwin, R. E. (2014), 'Trade and Industrialisation After Globalisation's Second Unbundling: How Building and Joining a Supply Chain Are Different and Why It Matters', in R. C. Feenstra and A. M. Taylor (eds.), Globalization in an Age of Crisis: Multilateral Economic Cooperation in the Twenty- first Century (Chicago, IL: University of Chicago Press/NBER) 165–212.

Dür, A., Baccini, L., & Elsig, M. (2014). The design of international trade agreements: Introducing a new dataset. The Review of International Organizations, 9(3), 353-375.
Hillman, Jennifer. 2013. Changing Climate for Carbon Taxes: Who's Afraid of the WTO? Climate and Energy Paper Series. Washington, DC: German Marshall Fund of the United States. Hillman is a former member of the WTO Appellate Body.
Horn, Henrik and Petros C. Mavroidis. 2011. "To B(TA) or not to B(TA)? On the Legality and Desirability of Border Tax Adjustments from a Trade Perspective." *The World Economy* 34 (11): 1911–37.
Pauwelyn, Joost. 2012. Carbon Leakage Measures and Border Tax Adjustments under WTO Law. In Research Handbook on Environment, Health, and the WTO, ed. Denise Prévost and Geert Van Calster (Cheltenham, UK: Edward Elgar), 448-506.

KN7: International trade law and climate governance

Lecturer: Peter Van den Bossche

The lecture addresses the question whether the rules of international trade law affect national climate change policies. The lecture focuses primarily on the basic rules of non-discrimination, market access and subsidies and how these rules either promote or undermine the efforts by States to address climate change.

References

Peter Van den Bossche and Denise Prévost, *Essentials of WTO Law* (Cambridge University Press, 2016), 13-112.

Climate Economics (coordinator: Ralph Winkler)

KN8: Climate Policy as a Global Public Goods Game (1.5 h)

Lecturer: Ralph Winkler

One of the main economic problems associated with mitigating anthropogenic climate change is the "public good" property of greenhouse gas emissions reductions: Each country's efforts to control emissions will benefit all countries in a non-exclusive and non-rival manner. In this lecture, we set up a simple model of countries' mitigation costs and benefits. This model allows us (i) to understand the Prisoners' Dilemma aspect of greenhouse gas emissions reductions and (ii) to analyze the limits of ambition in international climate agreements that emerge from UNFCCC-style international negotiations.

References:
Wagner, U. J. (2001): The design of international environmental agreements: Economic theory and political economy. Journal of Economic Surveys 15: 377–411.

KN9: On the design of International Environmental Agreements (1h)

Lecturer: Ralph Winkler

Starting from the pessimistic predictions of economic theory about the formation of ambitious international climate agreements, we explore to what extend game theory may guide us in designing better rules for international environmental negotiations. We also discuss the limitations of game theoretical predictions due to the limited observability of players' preferences.

References:
Wagner, U. J. (2001): The design of international environmental agreements: Economic theory and political economy. Journal of Economic Surveys 15: 377–411.

KN10: Using Quasi-Experiments for Environmental Policy Evaluation (1.5h)

Lecturer: Eric Strobl

Cost benefit analysis of climate change impacts crucially require the valuation of environmental goods. However, many environmental are not sold directly on the market and hence do not have explicit prices. One way that environmental economists try nevertheless to quantify the value of these is thru stated preference methods, most notably contingent valuation and choice experiment methods. These involve surveys that ask respondents to value hypothetical scenarios involving the environmental good in question. In this lecture this approach will be outlined and its pros and cons discussed, and what this mean for environmental policy making.

References:
Carson, Richard T. (2012): Contingent valuation: A practical alternative when prices aren't available. Journal of Economic Perspectives 26: 27-42.