Martin Jung, Katerina Zemanova

Carbon cycle and global vulnerability

Speaker: **Wolfgang Lucht**

Summary

(1) Charles Keeling showed since the 1960s that Atmospheric Greenhouse Gases increase
(2) The increase of atmospheric CO2 depends on latitude
(3) the seasonal variability of atmospheric CO2 decreases towards the south pole that points towards the influence of the terrestrial biosphere on the northern hemisphere
(4) The increase of atmospheric CO2 (ca. 3 Gt/yr) is only ca. half of the anthropogenic emissions (CA. 6Gt/yr)
(5) Main part of CO2 uptake: land (1,4 Gt/yr) and oceans (1,7 Gt/yr). If considered no deforestation the land uptake would be double.
(6) Atmospheric CO2 concentration changed during the Earth history: ice age concentration of CO2 was lower (natural range of glacial-interglacial cycles is 180 – 280 ppm). Atmospheric CO2 concentration increased during anthropocene (up to ca 350 ppm).
(7) Such increase of CO2 concentration as the human caused have never occured before. Not only CO2 contributed to greenhouse effect, there is a significant increase of Nox, CH4 and S.
(8) Scenarios: need of complex approach (biosphere reaction): evident cause (CO2 concentration increase) and consequence (temperature increase).

Terrestrial Carbon Cycle and Global Vegetation and Biosphere
(1) modeling the terrestrial biosphere involves considering processes operating across a broad range of scales from molecules to the global geographical distribution of plant functional types
(2) major contributions to the field originate form Colin Prentice
(3) global dynamic vegetation models (DGVMs such as LPJ) are characterized by a close coupling of calculating water and carbon budgets, mainly as a function of climate, soil and CO2
(4) as DGVMs become more sophisticated more and more relevant processes are included such as permafrost distribution and fire regimes
model results suggest that there is large spatial and temporal variability in the distribution of carbon flux processes
(5) coupled climate – biosphere simulations suggest that the biosphere will continue to act as a net carbon sink until the middle of the 21 century and then become a source
(6) the human factor especially in terms of land use must be considered to be a first order influence on the global carbon cycle