AvH6-54, 2010
6th Alexander von Humboldt International Conference

Ecological effects of global change

A. Menzel
Center of Life and Food Sciences Weihenstephan, TU München, Germany (menzel@forst.tu-muenchen.de)

Mankind actually puts manifolds loads on our earth including stratospheric ozone depletion, rising freshwater use, changes of land cover and land use. For several of these threats, critical loads and thresholds may be already exceeded, e.g. nitrogen input, climate change and biodiversity loss (Röckström et al. 2009). The working group on Impacts, Adaptation and Vulnerability of the last IPCC report (AR4, 2007) concluded that anthropogenic warming over the last three decades has had a discernible influence on many physical and biological systems, thus global fingerprint of anthropogenic climate change was detectable on all continents and almost all ocean areas (Rosenzweig et al. 2007, 2008). 90% of the significant temperature related changes in 29000 records analysed were consistent with climate warming, e.g. in warming climates earlier spring events, distributional shifts pole wards and to higher altitudes, or community changes with reduced cold adapted species were observed. These impacts, already visible and only related to less than 1°C global warming, allow a limited glance at future changes and pressures on our ecosystems, as the rate of warming may accelerate and will be linked to stronger and more frequent extreme events. Vegetation is an important component of the climate system, part of biogeochemical cycles and the lower boundary of GCMs characterised by certain albedo and roughness. Thus, climate change impacts on vegetation exert feedbacks.

The most striking and challenging problems in analysing climate change impacts on ecosystems are related to cases where one would expect major changes due to warming however there is reduced, limited or no reaction in the observed systems. This feature is known as divergence problem in tree ring research, called resilience in ecosystem dynamics or might be simply a time-lag or environmental monitoring problem.

However, there are various other pressures by global change, e.g. land use change or pollution, leading to major changes in nature, which are not attributable to climate change and are dealt in these climate change impact assessments as ‘confounding factors’. Nevertheless, they have tremendous consequences for biodiversity, food security and human health.