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Vegetation and climate – an introduction

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Within the series of 42 IAVS-Symposia, the interactions between "vegetation and climate" have been discussed twice: At the 1975-Congress in Rinteln/Germany this was the only topic. And for the 1999 symposium in Bilbao/Spain it was chosen as the main subject by the organizers (a survey of all the topics in Bilbao is given in the following article by Loidi). At both meetings, the majority of contributions focussed on meso-scalic climate and vegetation patterns. Another frequent topic of discussions is provided by phenological phenomena. Micrometeorological effects on plants – the modifications of the microclimate by the plant cover and adaptations of plants to extreme climatic conditions – were significant in the 70s, when ecosystematic approaches and ecophysiological methods arose. Those aspects where not in the centre of interest in Bilbao, but other questions emerged: How will the plant cover react to human induced climatic changes? And can we model those responses and make realistic predictions?

This issue presents a cross-section of the various perspectives from which the interrelations between the bio- and the atmosphere can be discussed. The sequence of papers was arranged according to three aspects: A) Climatic changes and their effect on vegetation, B) Phenological phenomena, and C) Climatic gradients and vegetation pattern at medium to small spatial scales.

A realistic prognosis of plant migrations under changing climatic conditions must take into consideration the results of palaeoclimatology and vegetation history. Therefore, the first section starts with the opening lecture-paper of Pott, who outlines the long-term climate and vegetation dynamics in Central and Southern Europe and offers a synthesis about *Fagus sylvatica*-refugia during the last glaciation and its migrations since. Besides the general and well known trends in postglacial vegetation changes, the detailed analysis makes clear that forest development in the holocene depended very much on local conditions and that the answers of taxa to climatic changes were very individualistic. Quite an individualistic response is also assumed by Box & Choi, who estimate on the basis of climatic envelope models the vulnerability of a west-mediterranean evergreen oak-community under global warming. At a very fine spatial scale and based upon a broad spectrum of vegetation and environmental parameters, Guisan & Theurillat model scenarios of plant community and species richness pattern for a small catchment in the subalpine-alpine ecotone of the Swiss Alps under changing climatic conditions.

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The next three papers are regional case studies about vegetation dynamics under climatic shifts. KOVÁCS-LÁNG et al. use the "space-for-time-substitution-concept" to predict possible changes in Hungarian semi-arid grassland under increasing aridity. WALTHER records the recent invasion of allochthonous evergreen laurophyllous shrubs into the Insubrian deciduous forests for recent decades, correlated with less extreme winter temperatures, MESHINEV et al. observe the rising up of the *Pinus peuce*-timberline in the Central Balkan Mountains which might be the result of elevated winter temperatures in the 70s.

Apart from unidimensional trends in paleoclimate and vegetation history, the periodicity of climate and its biotic effect are of interest to vegetation scientists. The phenological strategy of keystone species from the alpine timberline in the Valaisian Alps is studied by a Swiss team (THEURILLAT & SCHLÜSSEL, SCHLÜSSEL et al.) to achieve a better understanding of the present-day distribution of the species and to assess the possible impact of climatic change. In general, the phenophases there are correlated with the sum of mean daily air temperatures, but each species shows a different strategy as regards the required number of degree-days. With the example of European beech forests, DIERSCHKE demonstrates the value of long-term phenological observations as an instrument for bioclimatological monitoring. A new multivariate analysis of symphenological relevés is presented by FISCHER on the basis of a data set taken in hay meadows. A significant relationship between the time of the year and a new phenological index can be shown.

The vegetation changes in the four above-mentioned papers have a rhythmic character and all studies come from the temperate climate zone. A contrast is the contribution of BLOCK & RICHTER, who record and document the dynamic of a semi-desert vegetation after a stochastic rainfall event in one of the most sensitive areas of the world with respect to inter-annual rain anomalies, in the Sechura Desert in Northern Peru.

The majority of contributions deals with vegetation-climate related patterns on different spatial scales. In a global context, RICHTER highlights some effects of the variables "mass elevation" and "airstream position" for the gamma-diversity in high mountain ecosystems. BECKER & JÜRGENS show that a decreasing precipitations and increasing rainfall variability are the decisive differentiating factors for the vegetation zonation along a long-distance transect in NW Namibia. Edaphic and topographic factors as well as land-use by semi-nomads have a strong influence there, too. The Central Namib Desert serves as a model for vegetation-climate-patterns without any human disturbances in the studies of HACHFELD & JÜRGENS. From a synthesis of the halophytic vegetation along the Arabian coast (DEIL) it becomes evident, that this often as "azonal" labelled vegetation type exhibits very distinct regional patterns, related to temperature and rainfall periodicity. The phenomenon "isoclimate and convergence in vegetation (synmorphology)" is demonstrated by NAKAMURA et al. in a comparison of laurel forests on the Island of Tenerife and in Central Japan. SCHICKHOFF uses the forest vegetation in Karakorum as an indicator of where and how

far the Indian monsoonal humidity influx crosses the main Himalayan Range. GODEFROID & TANGHE examine the influence of quite small macroclimatic gradients on the floristic composition of roadside grassland in Belgium. The number of frost days is the most explanatory factor there.

PHYTOCOENOLOGIA, as one of the publication organs of IAVS, requested of all participants of the Bilbao-meeting, who contributed to the topic "vegetation and climate" with a plenary lecture, an oral contribution or a poster, that they submit their papers. The papers had to fit into the general profile of the journal. 31 manuscripts were submitted, 20 contributions have been finally accepted (two papers will be included in forthcoming issues). Thanks to the discipline of the authors, to the support and fast treatment of the manuscripts by the reviewers and, last but not least, to the commitment of the editorial office of the publisher (Mrs. DOROTHEE SEITZ), the proceedings have been finished one year after the meeting.

We hope that this first special feature of the journal will be a good start for further thematic volumes and that it will attract the attention of our readers.

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