The VEMAP Integrated Database for Modelling United States Ecosystem/Vegetation Sensitivity to Climate Change

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The VEMAP integrated database for modelling United States ecosystem/vegetation sensitivity to climate change

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Abstract. For the Vegetation/Ecosystem Modelling and Analysis Project (VEMAP), we developed a model database of climate, soils and vegetation that was compatible with the requirements of three ecosystem physiology models and three vegetation life-form distribution models. A key constraint was temporal, spatial and physical consistency among data layers to provide these daily or monthly time step models with suitable common inputs for the purpose of model inter-comparison. The database is on a 0.5° latitude/longitude grid for the conterminous United States. The set has both daily and monthly representations of the same long-term climate. Daily temperature and precipitation were stochastically simulated with WGEN and daily solar radiation and humidity empirically estimated with CLIMSIM. We used orographically adjusted precipitation, surface temperature and surface wind-speed monthly means to maintain consistency among these fields and with vegetation distribution. Vegetation classes were based on physiognomic and physiological properties that influence biogeochemical dynamics. Soils data include characteristics of the 1–3 dominant soils per cell to account for subgrid variability.

Key words. Climate, soils, integrated database, spatial interpolation, ecosystem physiological modelling, vegetation life-form distribution modelling, United States.

INTRODUCTION

Continental and global simulations of ecosystem physiology and vegetation distribution and their sensitivity to climate and CO_2 change have recently been evaluated in a number of modelling studies (e.g. Melillo *et al.*, 1993; Mouseral, Tchebakova & Leemans, 1993; Neilson, 1993; Ojima *et al.*, 1993; Running & Nemani, 1991). Comparison of these results is restricted by the use of different driving variable and boundary-condition datasets and different scenarios of altered forcing. In addition, with few exceptions (cf. Pastor & Post, 1988), studies have not evaluated the joint response of ecosystem nutrient cycling and biome redistribution to altered forcing across large domains.

The Vegetation/Ecosystem Modelling and Analysis Project (VEMAP) is a multi-institutional, international effort whose goal is to evaluate the sensitivity of terrestrial ecosystem and vegetation processes to altered climate forcing and elevated atmospheric CO_2. The project's objectives are (1) inter-comparison of the climate and CO_2 sensitivity of three ecosystem physiology models (plant production and soil biogeochemical process models) and three vegetation life-form distribution models (biome distribution models) and (2) the one-way linkage of vegetation distri-

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