

INTERNAL REPORT 105

SEASONAL AND DIURNAL PATTERNS OF CO₂ UPTAKE BY EUROPEAN SPRUCE: A JOINT GERMAN-AMERICAN IBP PROPOSAL

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German IBP gas exchange studies on 70-year-old spruce are near completion and part of the data base is being made available to provide parameter estimation of Reed's recently developed photosynthetic model. To our knowledge these data represent the most complete and accurate set of such measurements available. (Dr. Koch's detailed report in German is on file in the Oregon IBP office.)

The gas exchange measurements were made with 6 temperature and humidity controlled Siemens cuvettes. These cuvettes were positioned at 5 different heights within the crown of the spruce tree and used to compare the response of different ages of foliage situated at different exposures. More than 400 consecutive days of data have been processed and edited from punch-tape to computer listing.

The gas exchange measurements include CO₂ net uptake, dark respiration and transpiration determined on intact twigs as well as cut branches. Ambient CO₂, temperature, absolute humidity, and light were continuously recorded and compared with the environment inside each aspirated cuvette. In most cases, temperature, humidity, and light within the cuvettes closely tracked ambient conditions.

Detailed dimensional analyses were conducted on some 2,500 separate twigs in order to accurately predict the amount of tissue and surface area in different parts of the crown.

Energy budget studies were conducted by Dr. Baumgartner's meteorological group in the same stand at the same time, so temperature, radiation, wind, and humidity profiles are also available. Because of difficulties in processing the original data, accurate computer listings were not available until now.

Dr. Reed has requested data representing exchange processes over a range of environmental conditions. He will compare 1- and 2-year-old needles growing at five different levels in the crown. From these data he will predict CO₂ exchange as a function of light, temperature, leaf resistance, and ambient CO₂ concentration on dates not previously selected for parameter estimation.

We hope to finish most of the research before July 1, within the period of the NSF grant extension. Further details concerning the publications of this joint effort and the possibility of Dr. Koch helping our Biome more directly in 1974 will be discussed when Dr. Waring visits Germany this summer.

Color photographs of the German IBP site with a description of the program recently appeared in American Forest (Kerner and Koch 1972).