

Laboratory of Plant and Atmospheric Environment

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Plants uptake carbon dioxide, produce organic matter, and evolve oxygen through photosynthetic activity utilizing solar radiation. These abilities allow trees to support the lives of oxygen-consuming organisms; however, declines in forested areas have been observed worldwide since the 1970s (Photo. 1).



Photo. 1. Declining spruce forests in Germany (left) and birch forests in Japan (right).

Since ambient levels of air pollutants, such as tropospheric ozone, the main component of photochemical oxidants, have adverse effects on plant life, they are believed to be one of the most important factors relating to forest decline. Furthermore, many studies have demonstrated that exposure to ozone results in significant reductions in growth and yield of agricultural crops. Asian countries have recently experienced problems regarding transboundary air pollution, which can include tropospheric ozone, and its effects on vegetation are an area of serious concern. In order to protect not only forests, but also commercial crops, our lab conducts experiments regarding the effects of air pollutants on both trees and agricultural crops.

To elucidate the effects of air pollutants on trees and agricultural crops, we analyze plants grown in open-top chambers (OTCs) that allow for exposure to air pollutants. We use two types of OTCs: one type has ambient air introduced directly, while the other is supplied with charcoal-filtered (clean) air. By comparing the dry mass, yield and physiological parameters of plants from each respective OTC type, we can determine how air pollutants adversely affect plant growth and physiological functions.



Photo. 2. Experiments in our laboratory.