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Perspective

Remote Sensing of the Atmosphere Using the Lidar Technique

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DESCRIPTION

The worldwide economic and technological activities are rapidly changing resulting in the rapid and potentially stressful changes in our global environment. Increasing atmospheric greenhouse gases and aerosols may significantly alter our climate, agriculture, forestry and other land-use practices, industrial activities, waste disposal and transportation have altered the terrestrial and coastal ocean ecosystem, thus affecting, for example, biological productivity, water resources and the chemistry of the global atmosphere. These fundamental changes, evident also in the decline of stratospheric ozone and in acid precipitation, transcend the traditional boundaries of scientific disciplines and have potential impacts that reach beyond the domains of individual nations.

Advances in measurement technology, particularly satlliteborne remote sensing, allow global monitoring of the environment. New generations of computers have increased our capability to synthesize data sets and to develop increasingly comprehensive numerical models. These tools, coupled with our growing understanding of the components of the Earth system. The atmosphere, oceans, soil and solid earth and biota and the physical, chemical and biological processes that link them, permit, for the first time, an integrated and interdisciplinary approach to Earth system studies. For the understanding of the climate and its variability it is essential to study the significant interactions of the biological, chemical and physical processes that govern changes in the earth system that are most susceptible to human perturbation. Records of the past global environment and modelling future global trends provide the basis for guiding and testing our understanding of climate and its predictability.

There are broadly, two ways to study the earth's atmosphere direct methods and remote sensing methods. The former involves sampling of the medium in the immediate vicinity of the instrument, using some direct effect on the variable in question in order to measure it. These methods give good temporal resolution, but they are limited to one sampling point, thus it is tedious to obtain spatial distribution. To acquire above ground, profile or integrated height information, the instruments are required to be mounted on a suitable platform such as an aircraft, balloon or rocket. This further complicates the process of relating the measured properties to that of the actuals in the atmosphere. Most of these problems may be avoided by applying remote sensing methods which permit sensing of the atmosphere in a more natural way. The remote sensing techniques use the fundamental fact that the interaction of transmitting wave energy with the medium through which they propagate depends upon the properties of the medium and in a known way.

CONCLUSION

Moreover, the remote sensors offer the major intrinsic advantage that they do not perturb the medium being sampled whereas the direct measuring instruments necessarily do so. While remote sensing methods do present their own interpretation problems, a number of remote sensing techniques have already been demonstrated with apparently good success. Much of the contribution to the studies of atmospheric constituents has come from optical remote sensing methods. The field of optical remote sensing of the atmosphere was greatly advanced by the laser which may be thought of an active remote sensor since it can intensively illuminate coherently the target region in contrast to a passive optical sensor which detects ambient light or thermal emission from the target.

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