Satellite Remote Sensing of Cloud Properties

SALLY MCFARLANE, Pacific Northwest National Laboratory

Clouds play a fundamental role in both the Earth's energy and water cycles. Predicted changes in cloud properties with increases in global mean temperature are one of the largest sources of uncertainty in current climate model predictions of climate change. In order to inform, evaluate, and improve climate models, observations of cloud properties under a wide range of atmospheric conditions are required. Due to their height in the atmosphere, direct sampling of cloud properties (i.e. through aircraft measurements) is difficult, expensive, and impossible to perform routinely on a global scale. However, global information on cloud properties in the atmosphere can be obtained through remote sensing observations, in which energy scattered or emitted by the cloud and atmosphere at various wavelengths is measured by satellite instruments. These measurements are then used to infer cloud properties such as cloud cover, height, phase (water or ice), mass content, and particle size. I will describe the fundamentals of remote sensing measurements of clouds from space, discuss current state of the art satellite instruments, and present some recent results on remote sensing of cirrus (high altitude ice cloud) properties.