EDITORIAL

The First ISCCP Regional Experiment Intensive Field Observations II

I recall the time clearly when Rudy Preisendorfer and I discussed some of the differences and similarities between hydrological and atmospheric optics. Our conversation at one point focused on one of the significant issues of hydrological optics, namely how to deduce the optical properties of the biological scatterers of sunlight in water. Modeling these optical properties is not clear-cut and so the hydrological optics community has developed ways of deriving this information from in situ measurements obtained by instruments lowered from ships. In situ measurements in the atmosphere, I argued, are more difficult to make. In our conversation I suggested to Rudy that the optical properties of water clouds are perhaps better understood than their hydrological counterparts. Cirrus clouds, we both agreed, suffered from the worst of both worlds. They are neither readily accessible for direct observation nor are their optical properties well represented by present theory. From this perspective alone, cirrus clouds present a real challenge.

These complications together with the prevalence of these clouds, are reasons why cirrus clouds beg further study. Cirrus clouds are cold and high and act as radiative heaters of the upper troposphere. The solar reflective properties of these clouds are also significant and perplexing. Cirrus clouds produce radiative influences that are different from lower lying clouds or deep penetrating convective clouds. They challenge our faulty understanding of the water balance of the upper troposphere where relatively small perturbations in water vapor lead to significant perturbations in ice mass and radiative responses.

The combination of these factors and effects, their relative inaccessibility, their impact on radiative transfer through optical property effects not yet well understood, together with how these clouds evolve and how the large scale environment controls this evolution, broadly represent the underlying motivations for the First ISCCP Regional Experiment (FIRE) second field experiment. This experiment was conducted in November through December 1991 out of Coffeyville, Kansas—a place not quickly forgotten by those forced to endure it throughout the six week long field campaign. The research based on data gathered during this experiment is described in the papers of this special issue.

The flavor of the research described in the papers of this issue clearly reflects on the topics Preisendorfer and I discussed some years back. The uncertain nature of the cloud optical properties reappears as a theme in a number of papers through the need to characterize the microphysics of the clouds to the radiative transfer in these clouds. The inaccessibility of the clouds is highlighted by limited direct aircraft data, the widespread use of these data, and the growing use of surface remote sensors. In a sense, FIRE II was as much about how to observe cirrus clouds as it was an enquiry into the physics of these clouds. In all, our understanding of these midlatitude cirrus, their microphysical properties, their radiative effects, and the larger scale influences on their evolution has been improved through the activities of FIRE. Tropical cirrus awaits.

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of the
FIRE IFO II Special Issue