XIV. GROUND-BASED OPTICAL REMOTE SENSING MEASUREMENTS

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A. OBJECTIVES

There were two primary objectives to be satisfied with the acquisition of ground-based remotely sensed data in visible, near-infrared (nir) and thermal wavebands:

1) Estimate components of the surface energy balance using ground-based remote-sensing measurements and compare those estimates with the measurements of surface energy fluxes measured at the Bowen ratio and eddy correlation stations;

2) Use ground-based remote sensing measurements as "ground-truth" to check the calibration and atmospheric correction of aircraft and satellite data in the visible, near-infrared and thermal bands.

B. DATA ACQUISITION

1) Yoke-based measurements

General procedure. In order to satisfy these objectives, we attempted to acquire data over as large and uniform an area as possible, usually near the fetch area of each ground-based flux station. This was accomplished by mounting the instruments in a backpack-type apparatus (referred to as a "yoke") which could be efficiently carried over relatively large area of ground surface within a short period of time. Data were acquired over different sites on different days of the experiment. The days of occupation at each site are summarized below. The area traversed at each site was somewhat different, depending on the uniformity of the land surface near the fetch area of the flux station. The area covered in each traverse ranged from approximately 6,000 m^2 - 20,000m^2. Each traverse took approximately 10-15 minutes, depending on the size of the area, and consisted of covering the area in a "forward" and "reverse" direction along a repeatable route. Approximately 10 data points were acquired along each 30 meters of the traverse route. The traverses were done at a given site approximately every hour from the hours of about 9 a.m. to 5 p.m., weather permitting. During special events such as aircraft or satellite overpasses, an attempt was made to center the data acquisition time as close as possible to the overpass time.

Instruments and Observables. The instruments mounted on the yoke consisted of an Exotech 4-band radiometer with interchangeable filters. Except for one data acquisition session in April corresponding to a SPOT overpass, filters corresponding to the first 4 bands of the Thematic Mapper and NS001 (0.45-0.52 μm (blue), 0.53-0.61 μm (green), and 0.62-0.69 μm (red) and 0.78-0.90 μm (nir)) were installed in the radiometer. A separate Everest thermal infrared radiometer (IRT) with a bandpass of approximately 8-13 μm was also mounted on the yoke. The measurements recorded by each of these instruments were logged in a data logger and intermittently downloaded to floppy disks. On some sites on some days, yoke measurements were made frequently over a standard reflectance panel in order to convert surface radiances measured in the visible and nir into reflectance values.

2) Ancillary measurements

Solar irradiance measurements. On some days, instead of collecting simultaneous measurements over a standard reflectance panel with the yoke apparatus, and upward looking Exotech radiometer with the same filter configuration as the yoke instrument was used to acquire frequent measurements of incoming solar irradiance. These data were recorded at 5-10 second intervals for use in computing surface reflectance values from the yoke measurements.

Optical depths. Near the time of C-130 overpasses and satellite overpasses during the April campaign, measurements were made with a GSFC sun photometer, from which a rough estimate of optical depth can be derived.

C. SAMPLE DATA

As an example of the type of data acquired with the yoke, the transect-area average surface temperature for August 21 at Site 14 (pasture) are shown in Figure XV-1. The traverses were done that day near the fetch area of the flux station at this site. The temperatures shown are radiometric surface temperatures which have not been corrected for the effects of surface emissivity or reflected incoming longwave radiation.

D. DATA SUMMARY

Instruments: Exotech 4-band radiometer (3 visible bands and 1 nir band; corresponding to first 4 bands of TM and TMS-NS001)

Observables: Surface reflectance and temperature (area average and frequency distributions)

Where and when:

Date	Site	Surface Type	Weather/data quality/comments
Apr 6	11 12	Alfalfa/Wheat mix Corn (mostly bare at time)	Good - not adjacent to flux station however; C-130 flights
Apr 7	11 12	Alfalfa/Wheat mix Corn (mostly bare at time)	Good - not adjacent to flux station however; C130 flights
Apr 8	14	Pasture	Good - adjacent to flux station - No C130 data
Apr 9-11			No data due to inclement weather
Apr 12	11	Alfalfa/Wheat mix Corn (mostly bare)	Good - not adjacent to flux station however TM overpass mostly clear
Aug 18	Sonde Site	Pasture	Stormy and very cloudy Clearing just at TM overpass Conditions good thereafter Flux station and radiosondes adjacent - 2 yokes simult. At same site to get large target for TM overpass
Aug 19	32 (Yoke1)	Winter wheat (Bare soil at time)	Overcast at first; Clearing in PM Flux station adjacent
	34 (Yoke2)	Pasture	(Same)
Aug 21	14	Pasture	Good; flux station adjacent Both yokes at same site
Aug 22	32	Winter wheat (Bare soil at time)	Good
Aug 23	34	Pasture	Good - flux station and lysimeter adjacent

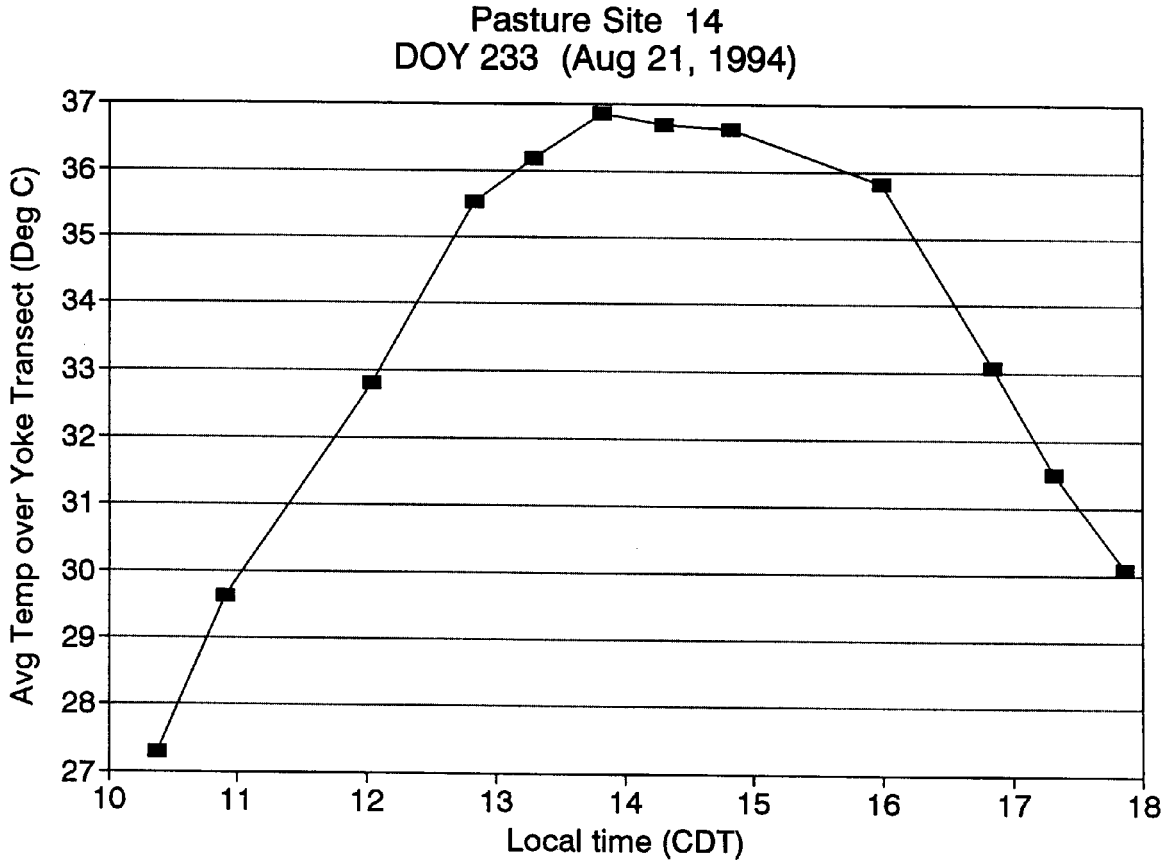

Figure XV-1. Radiometric surface temperature averaged over the yoke traverse area near the flux station at Site 14 for August 21, 1994..