Preliminary ARESE Results from the ARM Enhanced Shortwave Experiment: Radiative Fluxes Measured in Clear and Cloudy Skies

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Sets of broadband radiometers and narrowband radiometers onboard two aircraft flying in a stacked formation measured the radiative fluxes in clear and cloudy skies in Oklahoma as part of the 1995 Atmospheric Radiation Measurement Program (ARM) Enhanced Shortwave Experiment (ARESE). Coordination between the two aircraft was such that the up and down fluxes at the two altitudes were measured simultaneously over the same location along the flight track. The data are combined to yield net fluxes and column absorptions for the column of atmosphere between the aircraft, typically the region from 1 km above the ground up to 13 km.

Figure 1 shows a portion of the fluxes measured in the clear sky on October 17, 1995. These data were collected near the end of the flight when the two aircraft flew at the same altitude in close formation in order to intercompare the radiometers. "Total down" refers to the downwelling solar flux, from 0.3 to 4.0 microns wavelength, measured by the uplooking total solar broadband radiometer. The "fractional" broadband measures from 0.7 to 2.7 microns. Another pair of these radiometers is mounted downlooking, yielding the upwelling flux measurements. The two aircraft are represented by symbols of squares and circles.

Figure 2 shows the net fluxes from each aircraft measured in the "total" and "fractional" bandpasses for October 30, 1995. This was a day with a solid overcast, so the Twin Otter flying at 0.8 km was always beneath the clouds while the Egrett at 13.4 km was always above the clouds.

Figure 3 shows the differences that result when the net fluxes at 0.8 km are subtracted from those at 13.4 km, giving a measure of the energy absorbed in the column for these two bandpasses.

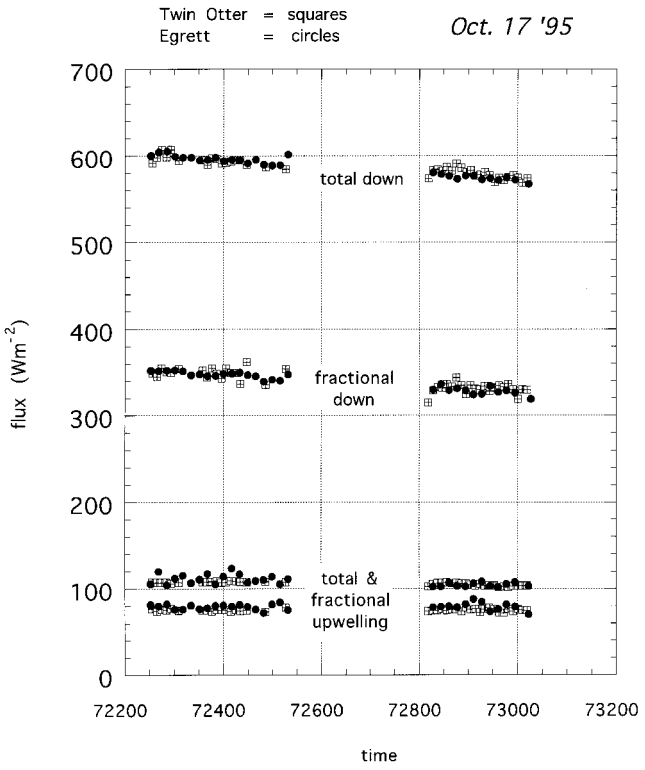

Figure 1. Flux measurements during clear sky on October 17, 1995.

Future work will concentrate on analysis of the entire set of data from this experiment. The volume of the dataset is considerable, encompassing 12 flights made in skies ranging from clear to very cloudy. It should help address one of the primary questions posed by ARESE by providing direct measurements of the absorption of solar radiation in clear and cloudy skies.

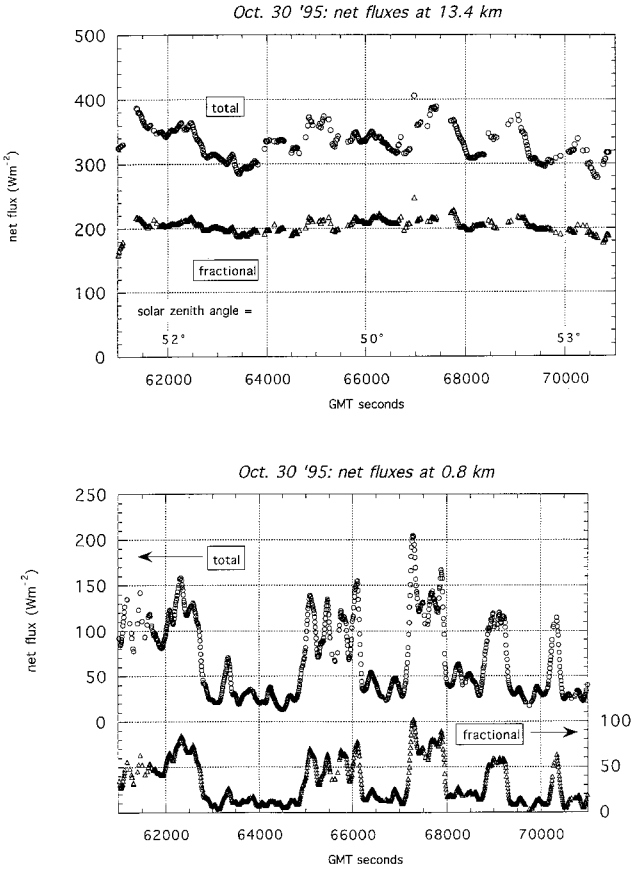

Figure 2. Net fluxes from each aircraft for October 30, 1995.

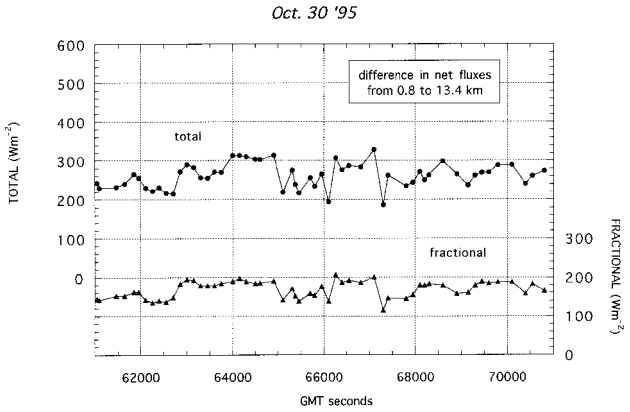

Figure 3. Difference in net fluxes from 0.8 to 13.4 km.