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AN OVERVIEW OF SPATIALLY DISTRIBUTED SURFACE FLUXES OF HEAT AND MOISTURE ACROSS THE SEMI-ARID SAN PEDRO BASIN

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1. INTRODUCTION

Various remote sensing and in situ data have been collected over the Upper San Pedro Basin of southeast Arizona and northeast Sonora, Mexico, as part of the SALSA (Semi-Arid Land-Surface-Atmosphere) program (Goodrich et al. and Arias et al., earlier in this session). A common goal of these measurements is an improved diagnosis of the surface fluxes in semi-arid lands. In this session there are discussions of the broad coverage provided by remote sensing (summary by Moran et al. as well as the presentations of data from specific platforms). This presentation focuses on the potential ability of an atmospheric model to aid in diagnosing the spatial distribution of surface fluxes over the entire basin. The model would ideally assimilate all kinds of remotely sensed data with different error characteristics and various temporal and spatial coverages. As a start in this direction, the RAMS mesoscale atmospheric model (Pielke et al. 1992) was run in a diagnostic mode in near real-time for all of 1997 at a 4 x 4 kilometer grid spacing over the entire San Pedro Basin.

2. MODEL DETAILS

The RAMS model uses a two-component surface scheme based on the multi-component scheme of Avissar and Pielke (1989). The model was initially adapted to the San Pedro region for the purpose of coupling the model with Landsat data (images from 1992 were used). This effort resulted in spatially variable fields of fractional vegetation cover. These fields, provided as inputs to the model, were derived from the satellite vegetation index, and they varied seasonally from image to image, particularly over grassland. For the 1997 simulations no Landsat data were available in near real time, and so the vegetation cover was updated by occasionally setting it to the values for the analogous 1992 season. Analyses and 6-hour forecasts from the operational meso-ETA model were used to generate boundary conditions and nudging tendencies for RAMS. Model output at the grid cells closest to the experimental surface observations was saved every 15 minutes. A preliminary intercomparison of the observations suggests some uncertainty, and it appears that on clear days the model output agreed reasonably well with the data within this range of uncertainty. Some of the observational data from 1996 may underestimate the Bowen ratio (Houser et al., this session). If the 1997 data require adjustment, as appears to be the case for the 1996 Lucky Hills data, the relatively high Bowen ratios output by the model may be valid. On non-clear days the model often misdiagnosed the cloud coverage or location of the clouds, and so on these days it often compared poorly with the observations. Visible satellite data will be used to correct the model's net radiation at the surface (Yucel et al., this conference).

3. DATA ASSIMILATION

A detailed atmospheric model simulation (i.e. large eddy simulation) that incorporates the extreme heterogeneity of the Lewis Springs riparian zone and that, furthermore, assimilates the observed variations in the low-level atmosphere will be quite a challenge. At grid spacings of 1 to 4 kilometers, as currently run, the atmospheric model may be able to diagnose the aggregate effects of increased latent heat flux in the riparian zone, but only if the regional fluxes are valid. Toward this end several alternative surface schemes are being evaluated in RAMS, including a multi-component adaptation of SiB2 (Harlow et al., this conference).

4. ACKNOWLEDGMENT

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5. REFERENCES

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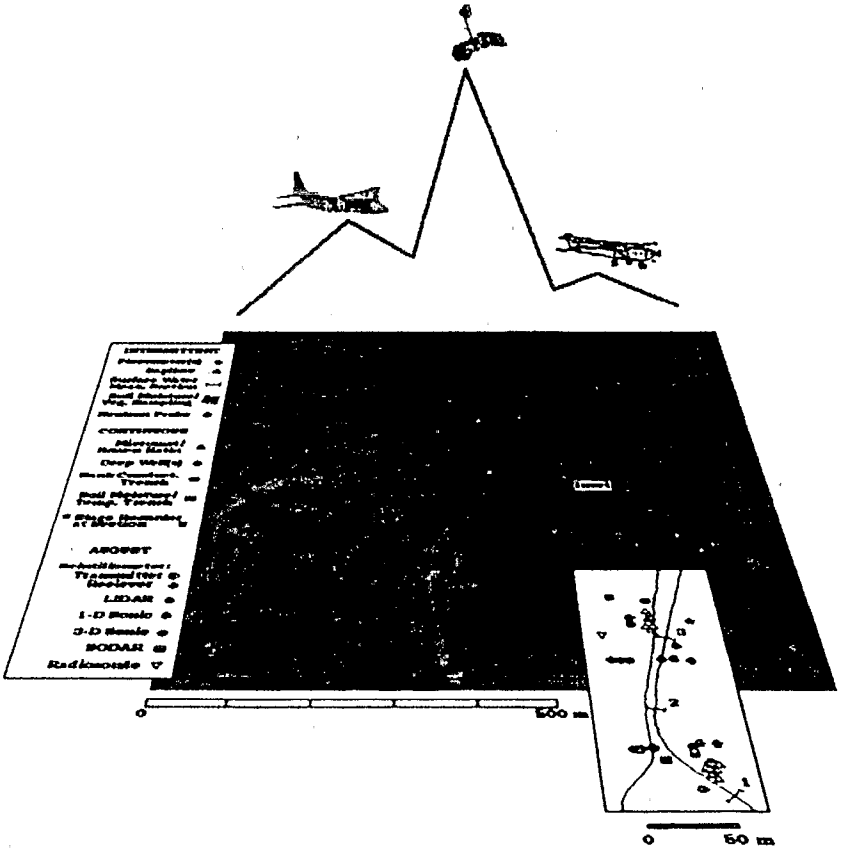

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