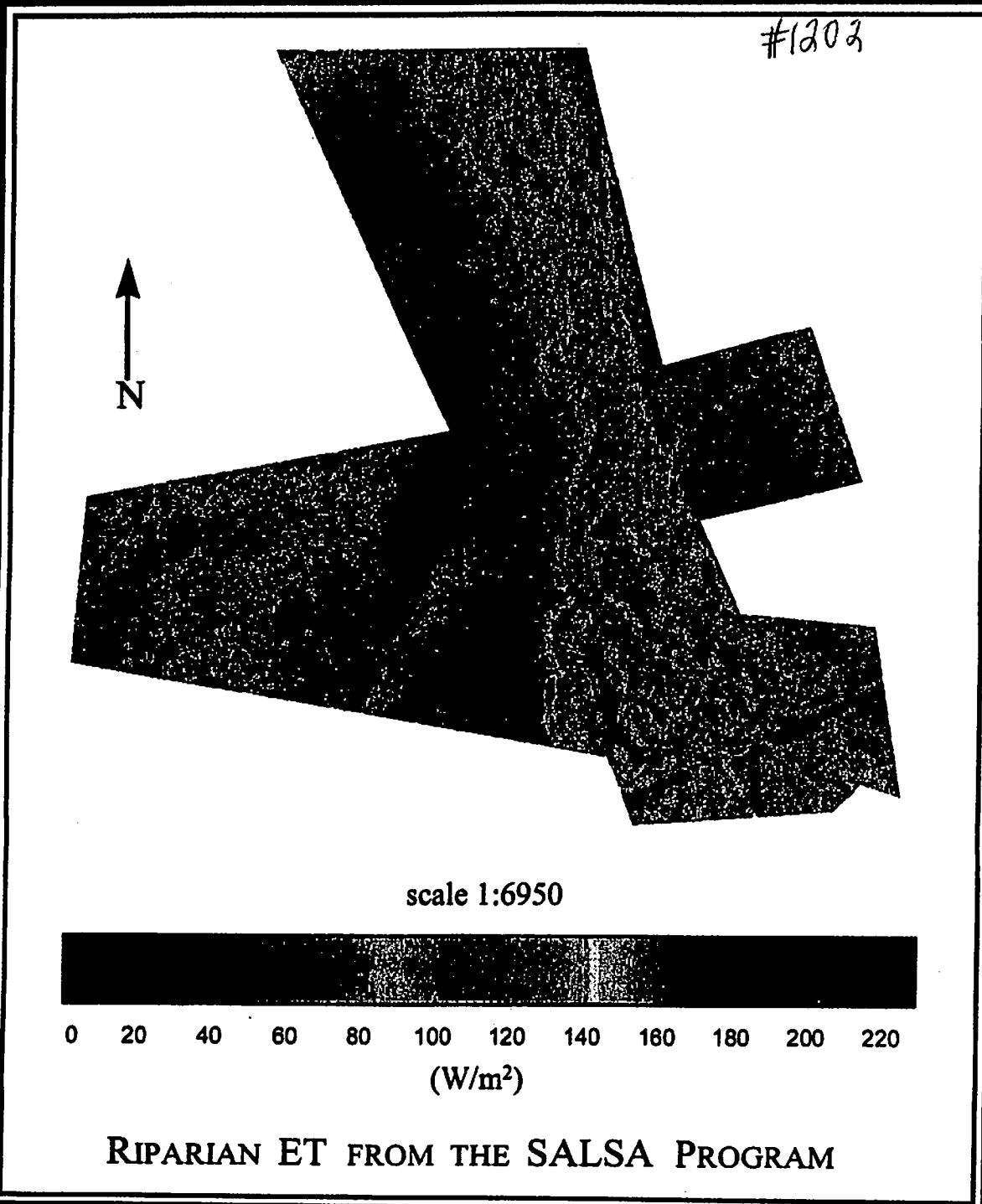




SPECIAL SYMPOSIUM ON HYDROLOGY

11-16 JANUARY 1998

PHOENIX, ARIZONA



RIPARIAN ET FROM THE SALSA PROGRAM

AMERICAN METEOROLOGICAL SOCIETY

INTEGRATED OBSERVATIONS OF SEMI-ARID LAND-SURFACE-ATMOSPHERE INTERACTIONS: POSTER SESSION OVERVIEW

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1. INTRODUCTION

Semi-arid regions cover almost one-fifth of the world's land surface and are significant sources of food, fiber, habitat, and open space. They are important components of the global land-surface-atmosphere system, interacting with other components to influence global circulation patterns while simultaneously being affected by those patterns. Because of the complex and interdependent nature of global systems, global change research requires an integrated approach to observing land-surface-atmosphere interactions. The benefit of this approach is demonstrated in the many oral and poster presentations given as part of this Symposium. The purpose of this paper is to briefly highlight some of the major research themes occurring in the poster presentations in order to direct readers to posters and authors of particular interest

2. RESEARCH THEMES

For the purposes of this paper, poster presentations have been categorized according to 1) principal hydrometeorological process, 2) research approach, 3) principal measurement technique, 4) vegetation type, and 5) program or institutional affiliation. A summary of poster themes is presented in Table 1. A brief discussion of the themes is presented below. Note that all references cited here appear as poster presentations or papers within these Symposium Proceedings. Consequently, only the authors' names and presentation titles are provided.

2.1 Hydrometeorological Process

Surface fluxes (energy and water), evapotranspiration (ET), and plant transpiration are the principal hydrometeorological processes

addressed in the poster presentations (e.g., Chehbouni et al. a & b, and Schaeffer and Williams). They represent interrelated components of the overall energy and water balance, and are differentiated here simply to indicate research emphasis. Subsidiary research on water source, stream-aquifer interactions, soil moisture, and plant growth was typically conducted to support these energy and water balance studies (e.g., Snyder et al., MacNish et al., Moran et al., and Nouvellon et al.). Most of these studies are part of larger global change research programs in the USA and Mexico. Notable exceptions are the work of Venencio and Garcia on droughts in Argentina, and the results presented by Gay a & b and others on the long-term ET inventory program in Arizona.

2.2 Research Approach

Research approach was categorized as either hydrometeorological or ecophysiological. Most investigators took a hydrometeorological approach to the research (e.g., Prueger et al., Whitaker et al.), that is, the emphasis was on the physical characteristics of the land-surface-atmosphere system rather than the ecological or biological characteristics. However, where the fundamental research question was ecological in nature rather than physical, an ecophysiological approach was used. This was the case for the water source research of Snyder et al., the sap flux research of Schaeffer and Williams, and the modeling work of Bégué et al. and Nouvellon et al.

2.3 Measurement Technique

For field experiments, researchers used a variety of standard atmospheric, hydrologic, and soil sensors and measuring devices to make direct measurements of hydrometeorological variables (e.g., MacNish et al., Scott et al.).

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Table 1. Summary of poster presentation themes, session on Integrated Observations of Semi-Arid Land-Surface-Atmosphere Interactions.

| Authors* | Hydrometeorological Process | Research Approach | Measurement Technique | Vegetation Type | Program Affiliation |
|------------------------|-----------------------------|-------------------|-----------------------|--------------------|---------------------|
| Bégué et al. | surface fluxes | ecophysio. | modeling | grassland | SALSA |
| Chehbouni et al. (a) | surface fluxes | hydromet. | remote sensing | grass/shrub steppe | SALSA |
| Chehbouni et al. (b) | surface fluxes | hydromet. | remote sensing | grass/shrub steppe | SALSA |
| Eichinger et al. | surface fluxes | hydromet. | remote sensing | riparian | SALSA |
| Gay (a) | ET | hydromet. | direct | irrigated crop | AZET |
| Gay (b) | ET | hydromet. | direct | riparian/orchard | AZET |
| Goff and Goodrich | ET | hydromet. | direct | riparian | SALSA |
| Goodrich et al. | ET | hydromet. | various | riparian | SALSA |
| Harlow et al. | surface fluxes | hydromet. | modeling | mixed | SALSA |
| Honaman et al. | ET, PET | hydromet. | direct | irrig. crop/shrub | AZET |
| Hymer et al. | soil moisture | hydromet. | direct | shrub steppe | SALSA |
| Konrad et al. | ET | hydromet. | modeling | irrigated crop | AZET |
| LeMone et al. | surface fluxes | hydromet. | direct | mixed | CASES-97 |
| Lhomme et al. | transpiration | hydromet. | modeling | grass/shrub steppe | SALSA |
| MacNish et al. | stream-aquifer | hydromet. | direct | riparian | SALSA |
| Moran et al. | soil moisture | hydromet. | remote sensing | grass/shrub steppe | SALSA |
| Nouvellon et al. | plant growth | ecophysio. | modeling | grassland | SALSA |
| Pan et al. | ET | hydromet. | modeling | mixed | ISU |
| Prueger et al. | surface fluxes | hydromet. | direct | grass/shrub steppe | JER |
| Richardson et al. | ET | hydromet. | direct | irrigated crop | AZET |
| Schaeffer and Williams | transpiration | ecophysio. | direct | riparian | SALSA |
| Scott et al. | ET | hydromet. | direct | grass/shrub steppe | SALSA |
| Snyder et al. | water source | ecophysio. | direct (isotopes) | riparian | SALSA |
| Venencio and Garcia | drought | hydromet. | modeling | grass/shrub steppe | UNL |
| Watts et al. | surface fluxes | hydromet. | remote sensing | grass/shrub steppe | SALSA |
| Whitaker et al. | stream-aquifer | hydromet. | direct | riparian | SALSA |
| Yucel et al. | surface fluxes | hydromet. | remote sensing | mixed | SALSA |

* See references list for citation. (Note: some poster presentations may not have a paper in this issue).

Others employed remote sensing technology to make indirect measurements of these variables. Remote sensing data were usually supplemented by direct measurements. The remote sensing techniques included satellite, aircraft, and ground-based radiometry, (Moran et al., Watts et al., Yucel et al.), lidar (Eichinger et al.), and scintillometry (Chehbouni et al. a & b, Watts et al.). In addition, a few studies employed computer modeling

combined with existing data sets to simulate interaction among hydrometeorological processes. These include the modeling of grassland function (Bégué et al., Lhomme et al., and Nouvellon et al.), surface fluxes and ET (Harlow et al. and Konrad et al., Pan et al.), and drought (Venencio and Garcia).

2.4 Vegetation Type

Grasslands and shrub steppe represent the most extensive vegetation types examined in the poster studies. (e.g., Bégué et al., Hymer et al., Moran et al., Nouvellon et al., Prueger et al., Scott et al., Venencio and Garcia, Watts et al.). The riparian vegetation along the San Pedro River in SE Arizona and NE Sonora is an inclusion within the grassland and shrub steppe vegetation types. Riparian vegetation is highly susceptible to natural or human induced changes in the hydrologic regime. Consequently, several poster presentations focus on this critical issue (e.g., Goodrich et al., MacNish et al., Schaeffer and Williams, Snyder et al., Whitaker et al.). Other investigators examined ET from irrigated crops and natural vegetation in central and southern Arizona (Gay a & b, Honaman et al., Konrad et al., Richardson et al.). Studies listed as having a "mixed" vegetation type were typically those of a regional or continental nature.

2.5 Program Affiliation

The majority of studies summarized here were done as part of the Semi-Arid Land-Surface-Atmosphere (SALSA) Program, a multi-agency global change research effort led by the USDA Agricultural Research Service (e.g., Goff and Goodrich, Goodrich et al.). Similarly, the study by LeMone et al. was part of the CASES-97 global change research effort in SE Kansas and the work of Prueger et al. was part of the JORNEX campaign in New Mexico. Several other poster presentations describe results of the AZET program, a long-term ET inventory program of the Arizona Agricultural Experiment Station.

3. CONCLUDING REMARKS

This paper briefly summarized some of the important research themes discussed in the poster presentations of the Integrated Observations of Semi-Arid Land-Surface-Atmosphere Interactions session of this Symposium. It is hoped that this review will give readers a broader perspective of the breadth and depth of hydrometeorological research being conducted in semi-arid lands, and promote future cooperation in this kind of integrated research.

4. ACKNOWLEDGMENTS

Financial support from the USDA-ARS Global Change Research Program and NASA grant W-18,997 is gratefully acknowledged.

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