

# **IAEA's MIBA Project and Stable Isotope Studies for USCCC**

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# Outline

- The MIBA network overview
- USCCC contributions to MIBA
- Stable isotope studies for USCCC

# The MIBA network

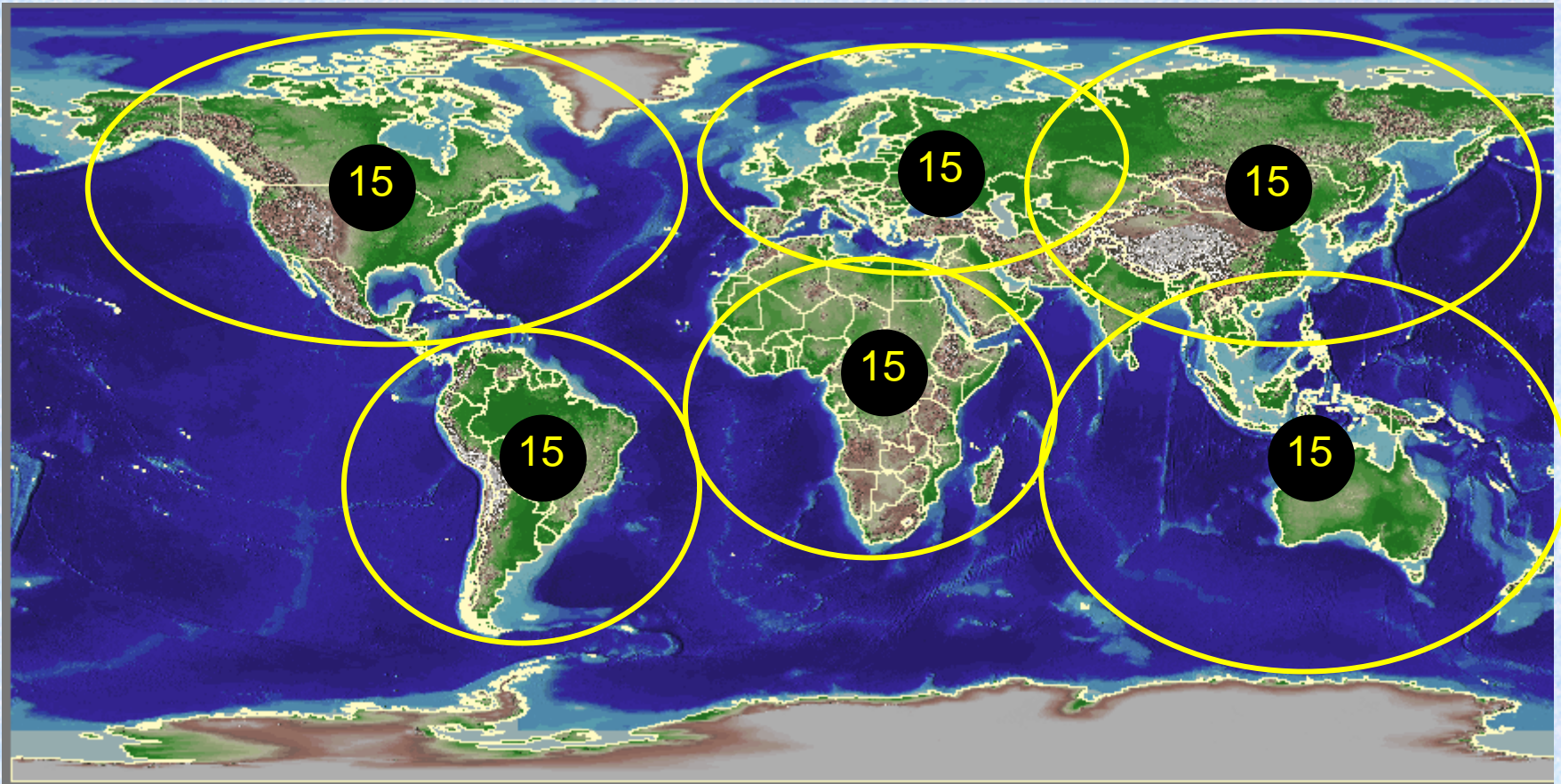
- MIBA: Moisture Isotopes in the Biosphere and Atmosphere
- Established at a meeting in Vienna in May 2004
- Building on GNIP (& GNIR) in collaboration with WMO
- Primary aim - to facilitate acquisition of data on stable isotopes in biospheric and atmospheric water
- Funded mainly by IAEA (for minimum 10 years)



# MIBA objectives

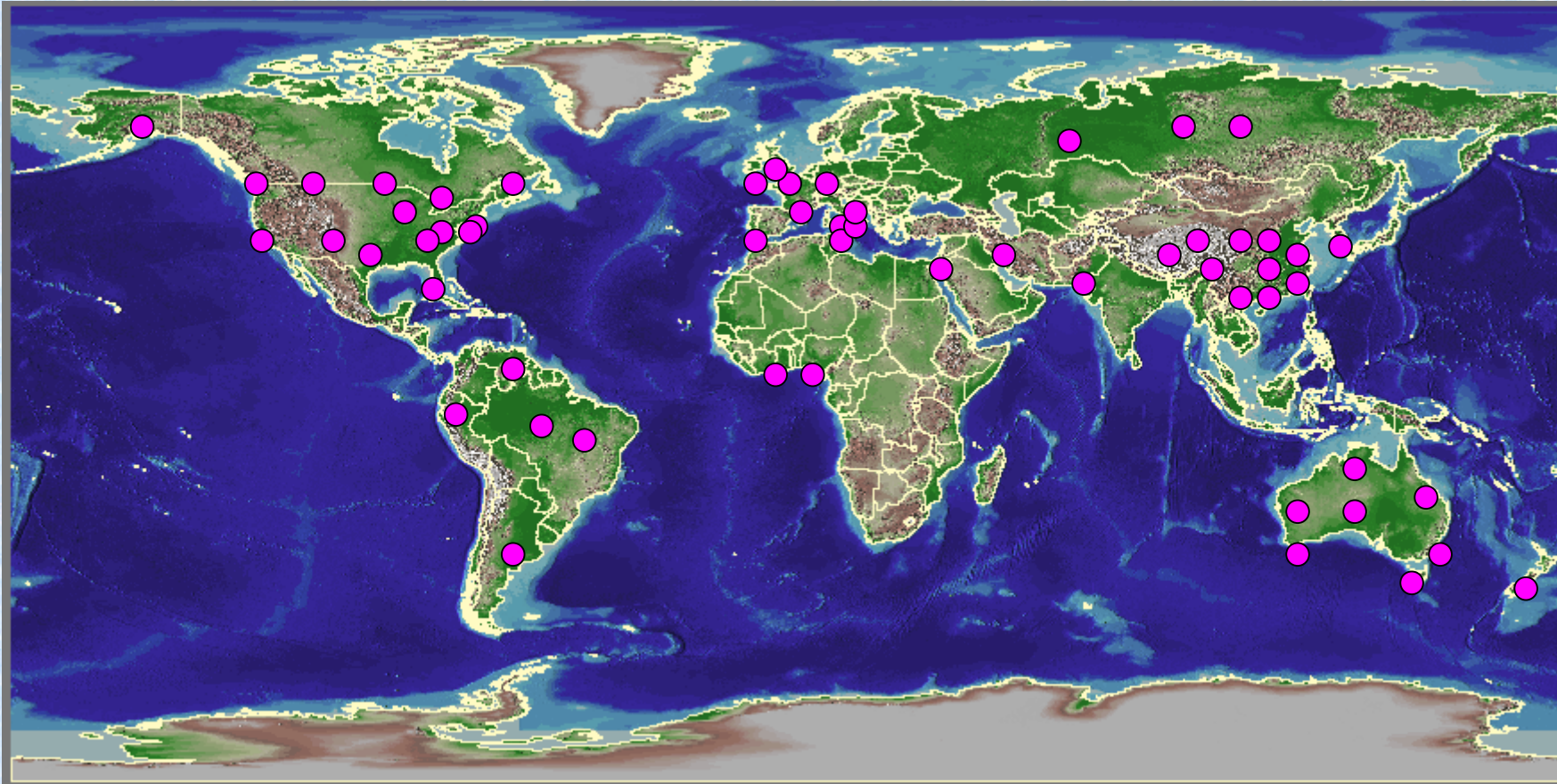
- Regional scale hydrological budgets
- The partitioning of annual carbon fluxes
- The development of new global change indicators
- Ecosystem functioning
- Interpretations of  $^{13}\text{C}$  and  $^{18}\text{O}$  analyses in organic matter
- The validation of general circulation models
- Past global responses to climate change

**Idealized distribution- 100 sites:  
90 continental, 10 oceanic (water vapor)**





## MIBA sites so far (May 2005)



[http://www-naweb.iaea.org/naweb/napc/ih/MIBA\\_web/miba.htm](http://www-naweb.iaea.org/naweb/napc/ih/MIBA_web/miba.htm)

# IAEA Membership

- P. Aggarwal, Head, Isotope Hydrology Section IAEA
- D. Yakir (Israel; Chair), G. Farquhar (Australia), A. Henderson-Sellers (Australia), L. Flanagan (Canada), F. Longstaffe (Canada), **G. Lin (China)**, J. Santrucek (Czech Republic), P. Ciais (France), G. Hoffman (France), W. Stichler (Germany), H. Meijer (the Netherlands), R. Siegwolf (Switzerland), N. Buchmann (Switzerland), H. Griffiths (UK), J. Berry (USA), P. Tans (USA), L. Sternberg (USA), T. Dawson (USA), J. White (USA), and Brent Helliker (USA)



# IMPLEMENTATION OF MIBA PROJECT

- The IAEA will facilitate the work of MIBA group
- Participants of worldwide will collect leaf, stem, soil and vapor water samples biweekly for 10 years;
- MIBA group will assist in providing training and logistics according to needs;
- The IAEA isotope laboratory and that of several group members will provide free isotopic analyses;



**Where:** Preferably at flux-net-tower sites or similar

**When:** year around for evergreen forests or during the vegetative period of temperate forests or grasslands

**How often:** Every two weeks

**How:** Fill the sample tubes and seal as soon as possible

**What time of the day:** between 12:00 and 16:00 (solar time)

**Weather conditions:** No rain, no water on the leaves and stems

# USCCC contributions to MIBA

- **Routinely sampling and analyzing vapour isotopic compositions in Beijing suburb (weekly)**
- **Sampling soil, stem and leaf waters bi-weekly for  $\delta^{18}\text{O}$  analyses in grass, desert, plantation, crop field, forest ecosystem across China**
- **Extracting water samples from the above specimen for stable isotope analyses (in IAEA Isotope lab)**
- **Organizing at least one network annual meeting for participating members (2007 or 2008)**



# Roof moisture sampling at IB\_CAS



Started on Apr. 19, 04, and will repeat weekly. . . .

# SILEER

(Stable Isotope Lab for Ecological and Environmental Research)



IAEA's designated isotope lab for MIBA project in China



# MIBA\_China Sites





# MIBA\_China Project Management

## Project Investigators:

Prof. Shuqing An

Prof. Xudong Zhang

Prof. Bo Li

Prof. Zhiqiang Zhang

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Dr. Guangsheng Zhou

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Project technical support: Mr. Leyi Li

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# A possible manuscript

**Title:** Relationship between isotopic signals and ecosystem water use efficiency in selected ecosystems of China

**Authors:** All USCCC site PIs, key associates/students

**Data needed:**

A few weeks of NEE and ET data at each site

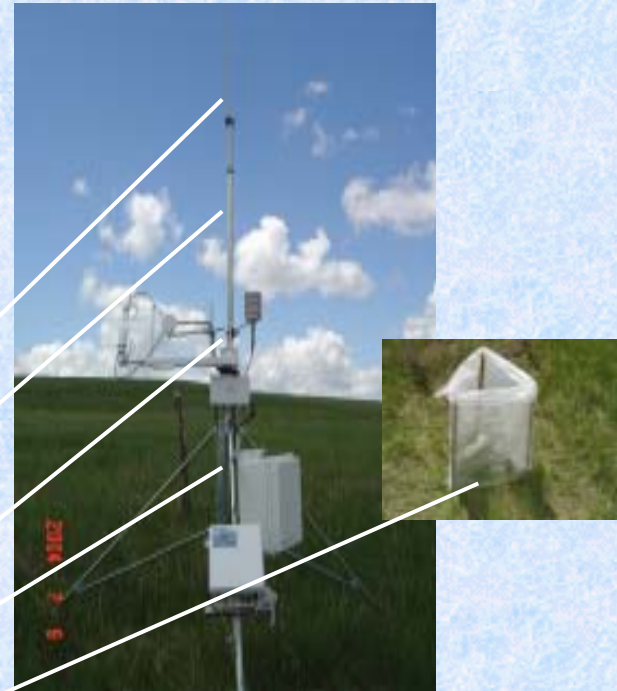
Isotopic ratios of leaf and water samples (IAEA)

$\delta^{13}\text{C}$  of ecosystem or soil respired  $\text{CO}_2$  (selected sites)

**Targeted journal:** PCE or New Phytologist

# CO<sub>2</sub> Trapping System

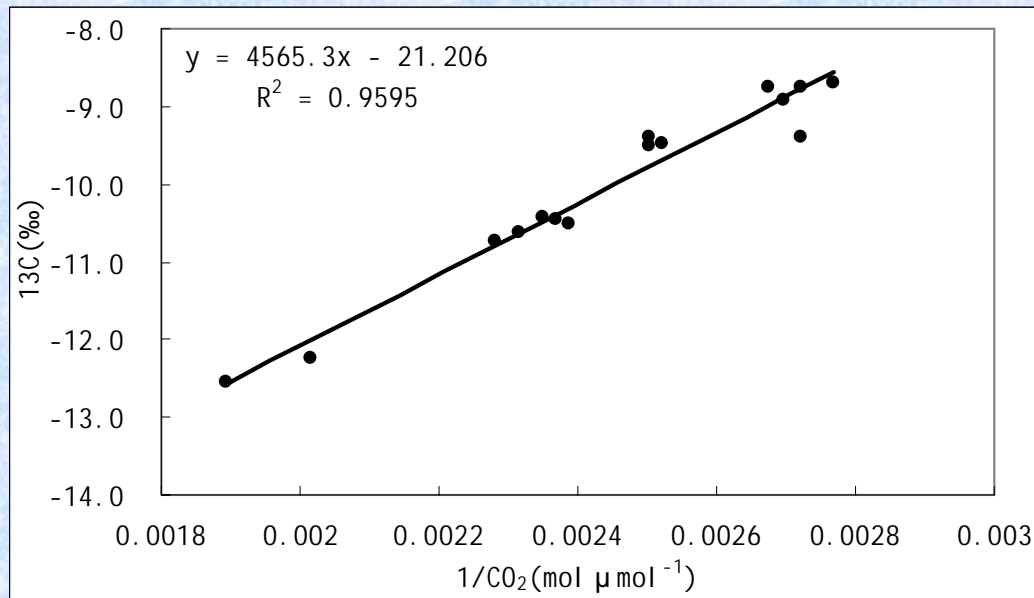
- For  $\delta^{13}\text{C}_r$  → ecosystem WUE
- For NEE partition:  $\text{NEE} \rightarrow \text{A} + \text{R}$ ;  $\text{R} = \text{R}_A + \text{R}_H$



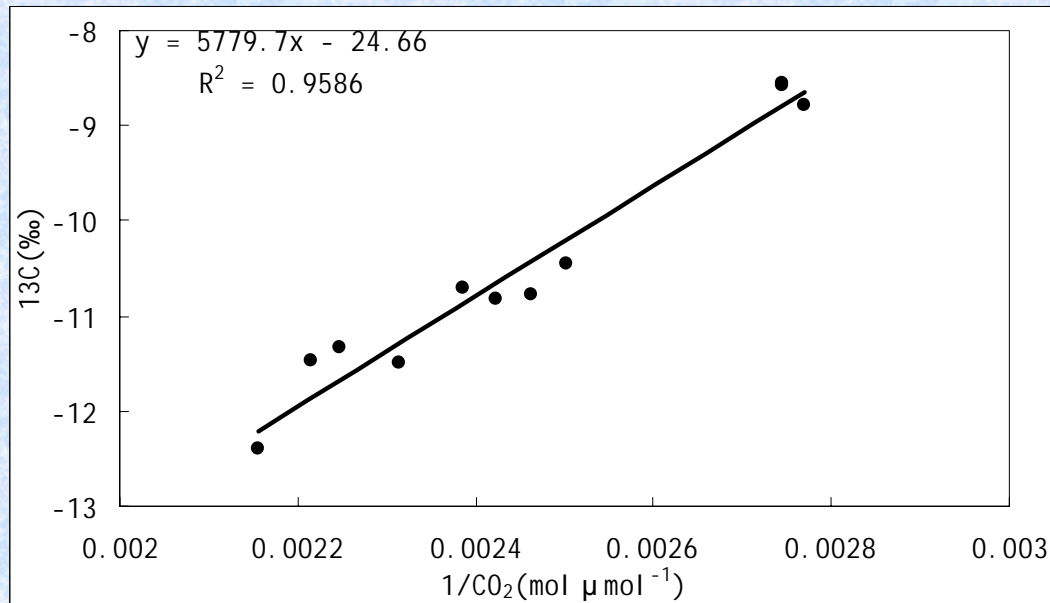
Xi l i n h o t s i t e  
(Fenced grassland)



$\delta^{13}\text{C}$   $\rightarrow$   $\text{WUE}_e$



August 2004



September 2005

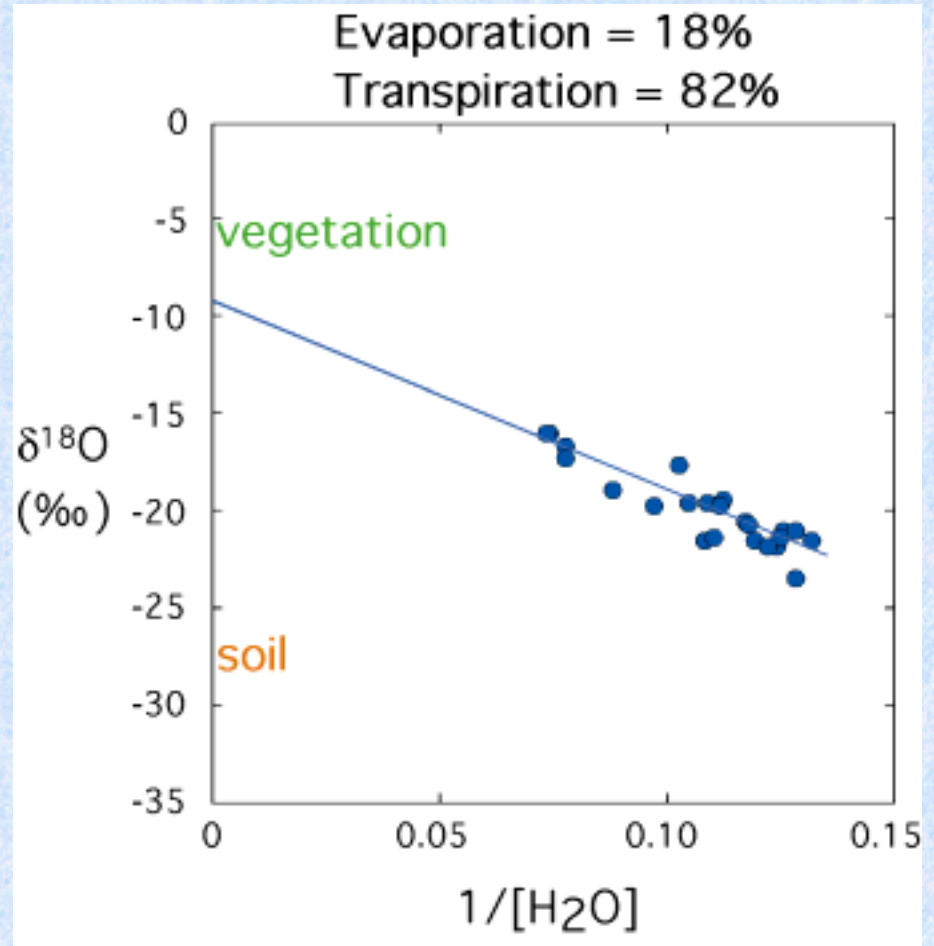
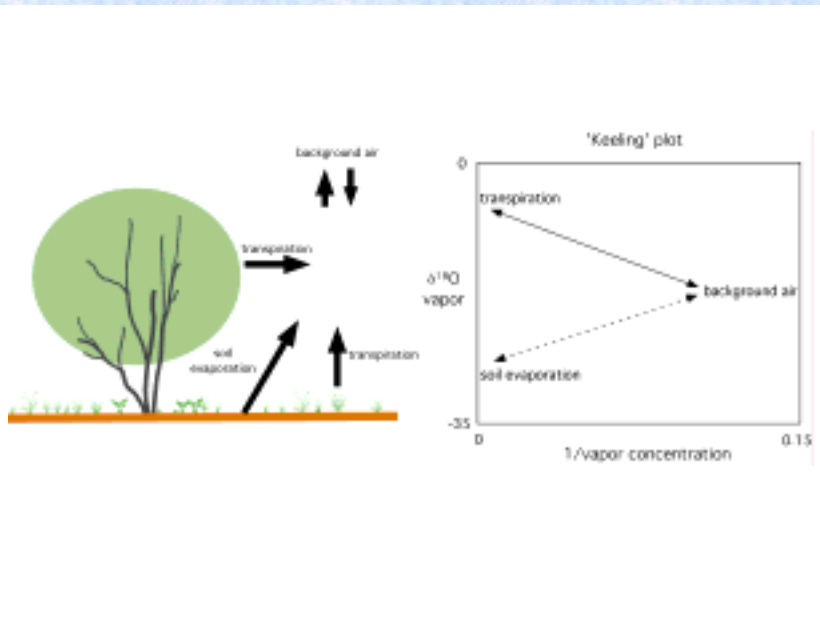
Sun, Chen and Lin,  
unpublished data

# Vapor Trapping System (for ET partition)



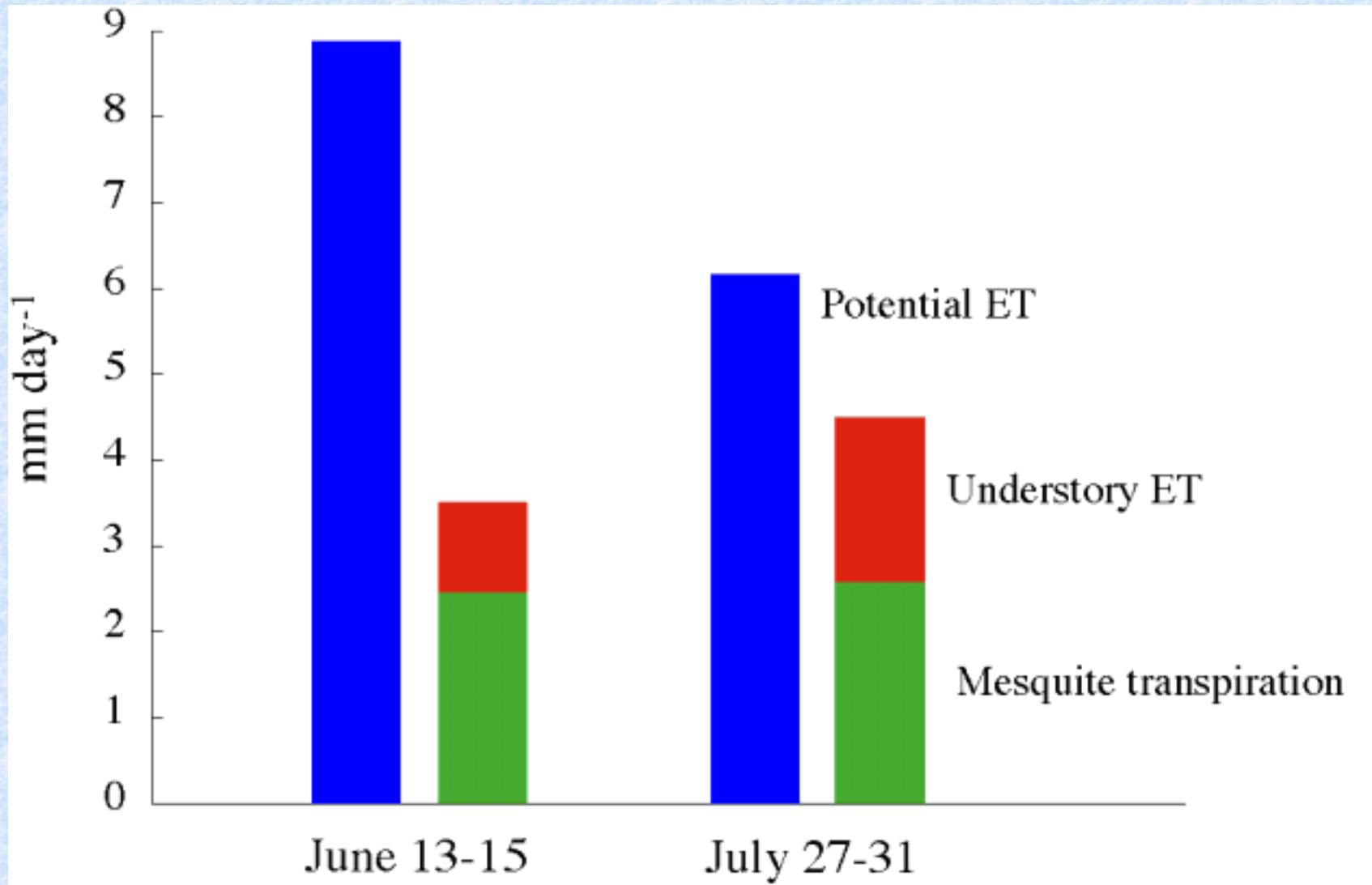


# Mesquite woodland, USA



Yepez et al. (2003)

# Evapotranspiration at mesquite site, 2001





# Other topics for isotope study

- NUE and N cycles in ecosystem
- Differential water use patterns
- Plant-animal interactions
- Sources and fate of trace gases ( $\text{CH}_4$ ,  $\text{N}_2\text{O}$ )