



**Evapotranspiration**  
from  
**Remote Sensing**  
using  
**Surface Energy Balance**

A Workshop

Covering  
Fundamentals of METRIC and SEBAL Processes  
Comparisons Among Approaches  
Applications to Western Water Management

# ACRONYMS

## SEBAL

**S**urface **E**nergy **B**alance **A**lgorithm for **L**and

## METRIC

**M**apping **E**vapo**T**ranspiration at High  
**R**esolution with **I**nternalized **C**alibration

# SPEAKERS

**Richard G. Allen** Principal Investigator- Research  
Research Professor  
University of Idaho  
Kimberly, Idaho



**Anthony Morse** Principal Investigator- Applications  
Manager, Geospatial Technology  
Idaho Department of Water Resources  
Boise, Idaho



**Wim Bastiaanssen** Collaborator  
Scientific Director  
WaterWatch  
Wageningen, The Netherlands  
SEBAL North America, Inc.



# WORKSHOP GOALS

Encourage the adoption of energy-balance technology

Provide information to assess the utility of energy-balance models

Enable coding of basic-level METRIC

# SCHEDULE

## Monday Afternoon, February 7, 2005

- 12:30 – 1:00 pm Registration
- 1:00 – 1:10 pm Introduction
- 1:10 – 1:30 pm The origin and evolution of SEBAL and METRIC in Idaho
- 1:30 – 2:00 pm Fundamentals of the surface energy balance
- 2:00 – 3:00 pm Parameterization of net radiation, soil heat flux and sensible heat flux;  
Purpose, meaning and identification of anchor points
  
- 3:00 – 3:30 pm Break
  
- 3:30 – 4:00 pm Reference ET to calibrate the energy balance surface
- 4:00 – 4:30 pm Significance of the human in identifying and quantifying ET conditions  
in an image; Use of daily soil water balance during wet periods,  
calibration during dormant periods
- 4:30 – 5:00 pm Comparison of METRIC and SEBAL ET with ground measurements
- 5:00 – 5:30 pm Questions, Answers, Discussion
- 7:30 - ~9:pm Informal Discussions

# SCHEDULE

**Tuesday morning, February 7, 2005**

- 8:00 – 8:30 am – Requirements of the satellite and impacts on spatial resolution
- 8:30 – 9:00 am – Comparison of the common energy balance methods (METRIC, SEBAL, SEBI/SEBS, TSEB) as to approach and data requirements
- 9:00 – 9:30 am – Strengths and weaknesses of METRIC and SEBAL: Application to irrigated agriculture, desert, riparian systems and wetlands
- 9:30 – 10:00 am – ET from surface energy balance to calibrate vegetation-based ET procedures
  
- 10:00 – 10:30 am – Break
  
- 10:30 – 11:30 am – METRIC applications in Idaho water management and modeling
- 11:30 – 11:45 pm – METRIC and SEBAL applications in California, New Mexico, Washington and elsewhere

# PROJECT ORGANIZATION

Summarizes Work Supported by NASA Synergy Grant

Research: University of Idaho

Applications: Idaho Department of Water Resources

Project Management: Raytheon Company

# PROJECT HISTORY

1998 - Allen and Bastiaanssen Met in Turkey

Jan. 2000 - Submitted Proposal to Raytheon

Summer 2000 - Bastiaanssen Visited Boise

## 5 Phases

2000 - Phase 1 - The Bear River Basin

2001 - Phase 2 - The Eastern Snake Plain

2002 - Phase 3 - Operational Demonstration

2003 - Phase 4 - Transition to Operational System

2004 - Phase 5 - Transition to Operational System

**Dr. Richard G. Allen**

**“Evapotranspiration from Remote Sensing Using  
Surface Energy Balance”**