

ET Cover Modeling

Summary

Codes

- STORAGE ROUTING
 - EPIC
 - HELP
- RICHARDS' EQUATION
 - LEACHM
 - SHAW
 - UNSAT-H
 - SWIM
 - VS2DT
 - VADOSE/W
 - HYDRUS-1D, -2D
 - STOMP

Process Issues

- Certain processes have not been developed at a high enough level (e.g., runoff) to give good agreement with monitoring results
- A number of codes don't incorporate important processes (snow accumulation and melt, plant growth based on θ feedback – even better with θ , O_2 , and nutrient feedback)
- Codes are continually being updated
 - Difficult to know which code/codes to use
 - Updated codes need to be revalidated

LANDFILL GAS EFFECTS ON VEGETATION (not considered with lysimeters)



Data Issues

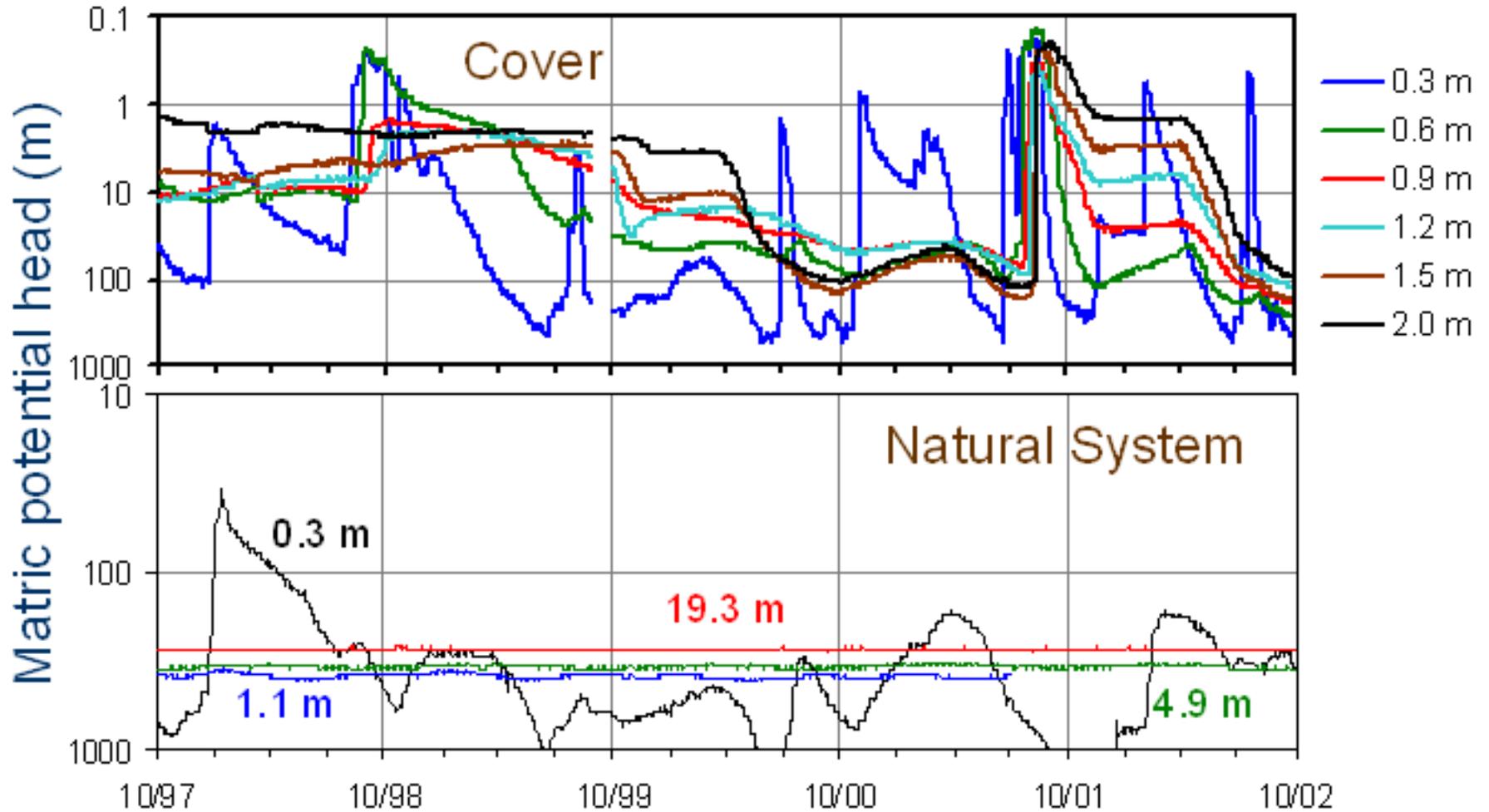
- Limited database for certain input parameters, and certain parameters are difficult to measure
 - Native vegetation transpiration properties
 - Hydraulic conductivity function
 - Water retention function
- Scale Effects
 - Hydraulic conductivity function
- Time Effects
 - Field hydraulic conductivity
 - SWCC
 - Oxygen diffusion
 - Vegetation
- Preferential flow
 - Construction
 - Pedogenesis

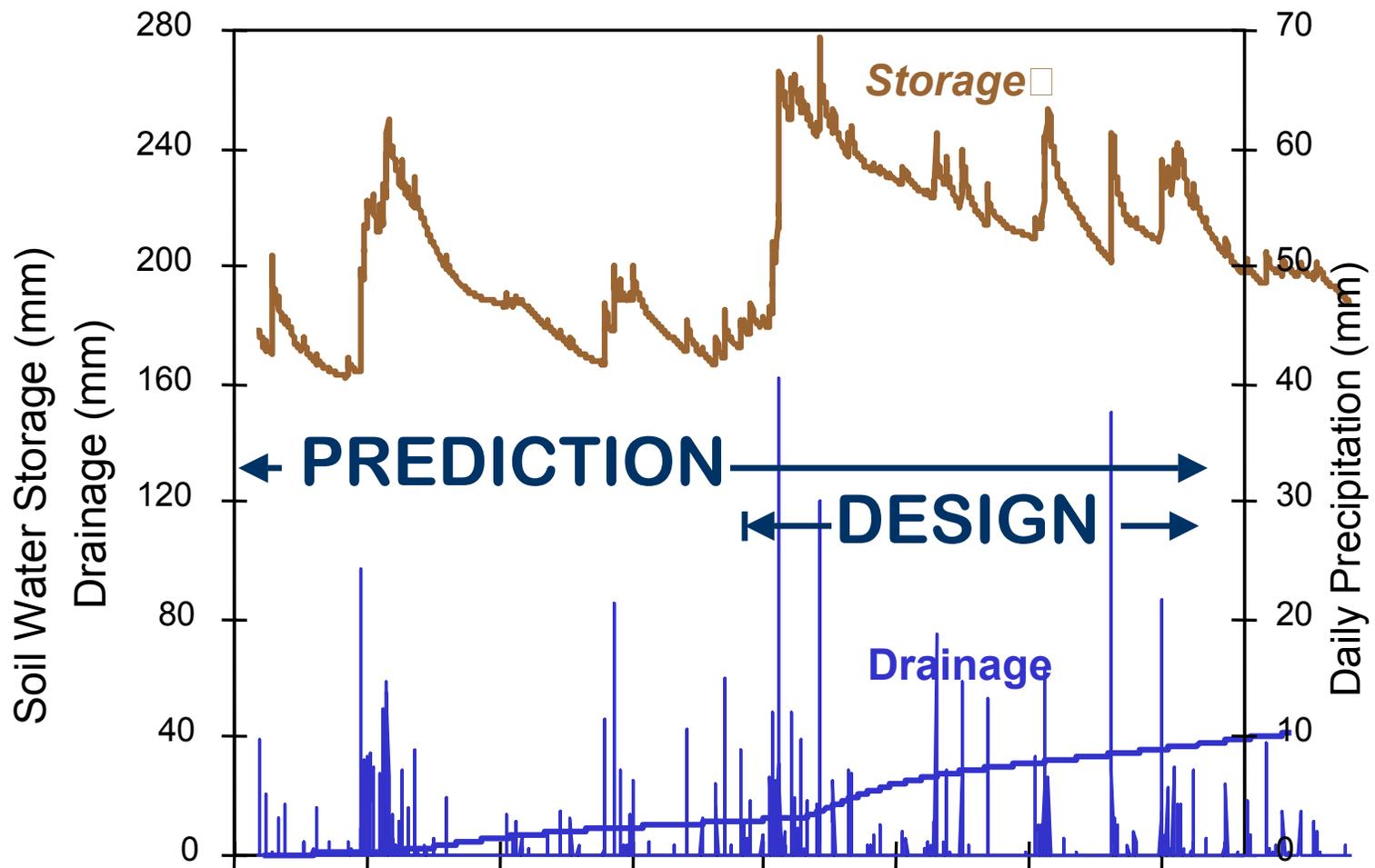


Progress

- Intercode Comparison (Scanlon et al., 2002)
- Improvement of Runoff Process Modeling in HYDRUS-2D (kinematic wave equation, storm intensity function, positive feedback between θ and plant growth)
- Addition of Surface Water Balance to STOMP (3-D Code)
- Inverse Modeling for Long-Term Performance Prediction (requires monitoring and modeling)

Natural Analogs





Modeling Recommendations

- For design, use series of “wet” years.
- Most critical parameters (C. Benson, based on sensitivity analysis and ACAP data)
 - k_s : 10x – 20x geometric mean (GM) value, $\geq 10^{-4}$ cm/s for surface layer
 - a: use design a or GM field a
 - n: increase design n or GM field n by 10%
 - $l < 0$ in van Genuchten-Mualem function describing unsaturated hydraulic conductivity ($l = -1$ to -5 reasonable)