Surface and Ground Water Models: their Applications and Limitations

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Overview

- Groundwater Models
- Surface Water Models
- Coupled Surface/Ground Water Models
- Field Scale Model
A simplification of a real-world system that aids in understanding, predicting, and managing water resources.
Types of Models

- Groundwater
- Surface Water
- Coupled Models

These models may be predictive and/or calibrated.
Groundwater Model Applications

- Predictive tools for predicting future conditions or impacts of human activity
- Understanding flow and pollutant patterns
- An assessment tool to evaluate recharge and aquifer processes
Groundwater Model Inputs

- Streambed conductivity
- Recharge
- Aquifer properties
- Model layers
- Boundary conditions
- Water table elevations
Groundwater Model Limitations

- Land use change
- Streamflow
- Impact of Best Management Practices (BMP)
- Evapotranspiration
- Recharge
Transient vs Steady State

- Steady state occurs if there is no change in storage.
- Transient state occurs when water inputs and thus storage change over time.
MODFLOW

- Used worldwide
- USGS product
- Free code
- Multiple user interfaces available
Surface Water Model Applications

- Impact of changes in land use, climate, management practices, BMPs on streamflow, sediment, nutrients, etc.
Hydrologic Model Subdivision

- Watershed delineated into subbasins
- Subbasins divided into Hydrological Response Units (HRUs)
Hydrologic Model Data Requirements

- Landcover
- Topography
- Soils
- Weather
- Management
- Point Sources

Model Predictions
Examples of Surface Water Models

- Soil and Water Assessment Tool (SWAT)
- Hydrological Simulation Program (HSPF)
- TOPMODEL
- Variable Infiltration Capacity Model (VIC)
Soil and Water Assessment Tool (SWAT)

- Product of Agricultural Research Service
- Used worldwide
- Predicts streamflow, sediment, nitrogen, phosphorus, crop yields, etc.
- Evaluates conservation practices
- Pollutant loads for TMDLs
SWAT Model Limitations

- Impact of groundwater pumping
- Groundwater levels
- Groundwater and pollutant transport
SWAT-MODFLOW
Field Scale Model

- Texas Best Management Practice Tool (TBET)
Questions?

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