



ESPAM Unconfined

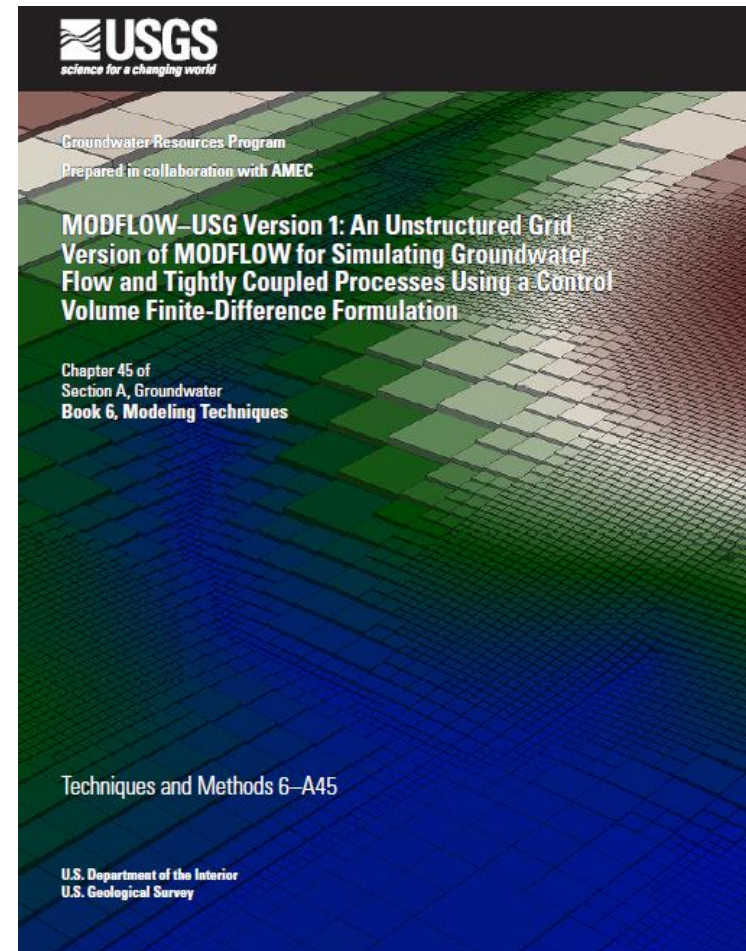
Allan Wylie IDWR

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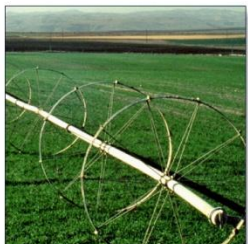
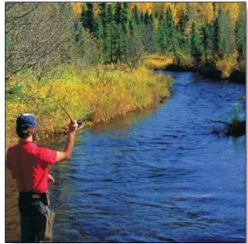
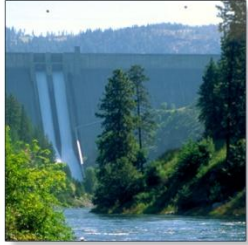
Variable Transmissivity Version of ESPAM

- Outline
 - MFUSG in variable transmissivity mode
 - Incorporation into ESPAM



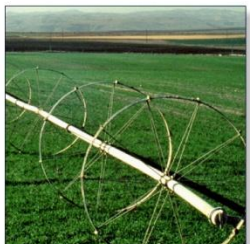
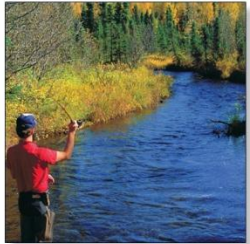
MFUSG in variable transmissivity mode

- Change layer type (LAYCON) in Block Center Flow package (*.BC6) from 0 to 1
- Add IKVFLAG
 - IKVFLAG = 0 read leakance between layers
 - IKVFLAG \neq 0 read vertical hydraulic conductivity between layers
- Bottom of aquifer assigned in Discretization (*.DIS) package needs to be changed to reflect current understanding of aquifer bottom.
 - http://www.if.uidaho.edu/~johnson/DDM012_AquiferBot.pdf
- Minor modification to MKMOD
 - MXACTW (max wells this sp) IWELCB (flag and unit no)



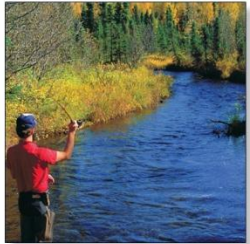
MFUSG in variable transmissivity mode

- MKMOD
- MKWELMFUSG
 - Adds IWELCB each stress period
- MFUSG
 - Run MFUSG
 - Newton nonlinear method with Delta-Bar-Delta under-relaxation
 - CHKLST to check for convergence If yes go to end
 - Run MFUSG
 - Newton nonlinear method with Cooley under-relaxation
 - CHKLST to check for convergence If yes go to end
 - Run MFUSG
 - Slight relaxation of convergence criteria using Newton nonlinear method with Delta-Bar Delta under-relaxation
 - CHKLST to check for convergence If yes go to end
 - Copy unfavorable values for head and discharge to use in PEST match
 - End
- Extract head and discharge values for match with observed

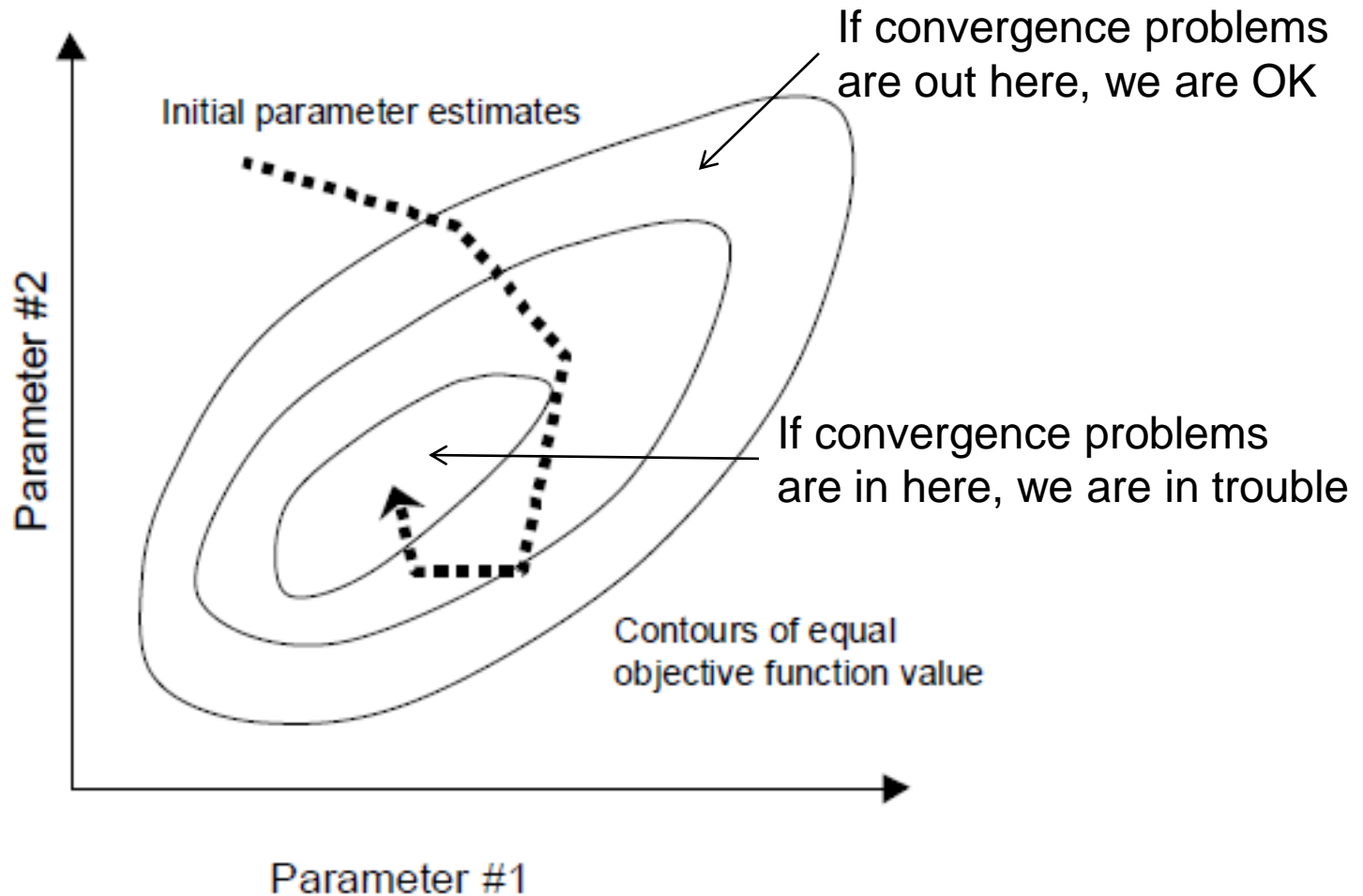
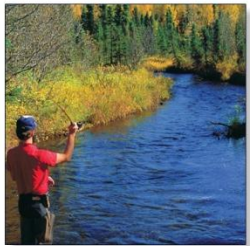


Variable Transmissivity Mode

- If MFUSG converges in any of its attempts, PEST immediately begins processing the model output normally
- If MFUSG fails to converge after three tries, unfavorable model values are copied into the MODFLOW output files
- Failure to converge results in unfavorable match between model output and field observations
- Unfavorable model matches will steer PEST away from that portion of parameter space

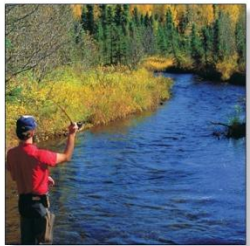


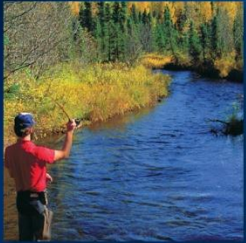
Variable Transmissivity Mode



Variable Transmissivity Mode

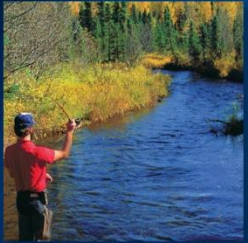
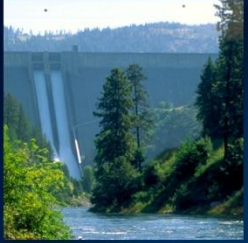
- If convergence problems are rare and only occur at beginning of inversion, they don't occur near the global minimum of ϕ
 - The model is “un-calibrated” in the vast majority of parameter space, thus, the parameter pairings that result in convergence problems likely occur out here
 - If convergence problems only occur less frequently during the calibration process, PEST is not steering toward the convergence problems





Recommendation

- Convert to MFUSG for ESPAM2.2
- Experiment with variable transmissivity



End