JÜLICH
FORSCHUNGSZENTRUM

review paper infiltration

recent activities

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working title:

‚A review on point scale and spatially variable infiltration in land surface models‘

Authors (so far):

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+ GEWEX community

structure

1. Introduction (Lutz, Mehdi, Harry, Jirka, Jan)

1.1 Point scale infiltration process

1.1.1 Analytical and semi-analytical solutions (Mehdi, Lutz, …)

1.1.2 Empirical equations describing infiltration (Lutz, …)

1.1.3 Numerical solutions of point scale infiltration processes (Jirka)

1.2 Infiltration in spatially heterogeneous soil property fields (Michael, Harry)

2. Infiltration process in LSM (Anne, Lutz, Harry, …)

3. Description of the spatial heterogeneity of soil moisture and infiltration in LSM (Harry, Michael, …)

3.1 Maximum Infiltration rate in LSM

3.2 Spatial heterogeneity in soil moisture using probability densities

3.3 Determining the b parameter

3.4 Estimating the areal saturation fraction

3.5 Sensitivity of infiltration-runoff processes to model parameters

4. Soil structural effects on infiltration – status in LSM (Nicole, Anne, …)

5. Upscaling approaches for soil hydraulic parameters relevant for infiltration in LSM (Carsten, Nicole?, Lutz, ...)

2. Infiltration process in LSM / survey

	F_{sat}	I_{max}	soil moisture variability	b
ORCHIDEE				
ISBA (Decharme and Douville, 2016)	$\sim 1/(D_t = (\theta_{sat} - \langle\theta\rangle)\langle d_2\rangle)$	$I_{unf,i} = K_{sat,i}\left[\frac{b_{BC}h_{sat}}{\Delta z}\left(\frac{\theta}{\theta_{sat}} - 1\right) + 1\right]$		
NOAH-MP (Niu et al., 2011)	TOPMODEL (Niu et al., 2005)	$(1 - F_{frz})F_{max}e^{-0.5f_d(z_\nabla - z_{bot})} + F_{frz}$		
NOAH-LSM	$\left(1 - \frac{W}{W_{MM}}\right)^{B_{TW}}$	$\frac{P_x D_x[1 - \exp(-kdt\delta_t]}{P_x + [1 - exp(-kdt\delta_t]}$		
JULES (Best et al., 2010)	$a_s \exp(-c_s f \lambda_{ic})$	$K = \beta_s K_{sat}$		
VIC (Liang and Xie, 2001)		$f_{mm} = \int_0^1 f_m[1 - (1 - C)^{1/B}]dC$		
CABLE (Decker, 2015)	$1 - erf\left(\sqrt{\frac{\kappa}{\lambda_s}}\right)$		$f_s(s) = \frac{\lambda_s^{\alpha_c}}{\Gamma(\alpha_c)}s^{\alpha_c - 1}e^{-\lambda s}$	
CLM4.5 (Oleson et al., 2013)	$F_{max}exp(-0.5f_d z_\nabla)$	$(1 - F_{sat})K_{sat}C_{ice}$		
TOPMODEL (Niu et al., 2005)	$\int_{\lambda \geq (\lambda_m + f_d z_\nabla)} pdf(\lambda)d\lambda$			
H-TESSEL (Balsamo et al., 2009)		$(W_{sat} - W) + max\left(0, W_{sat}\left\{(1 - \frac{W}{W_{sat}})^{\frac{1}{b+1}} - (\frac{P_T + P_M}{(b+1)W_{sat}})\right\}^{b+1}\right)$		$max\left[\frac{\sigma_{or} - \sigma_{min}}{\sigma_{or} + \sigma_{max}}\right]$
Entekhabi and Eagleson (1989)		$f^* = K_{sat}vs + K_{sat}(1 - v)$	$f_s(s) = \frac{\lambda_s^{\alpha_c}}{\Gamma(\alpha_c)}s^{\alpha_c - 1}e^{-\lambda s}$	
LM3 (Milly et al., 2014)				
LPJ_GUESS (Gerten et al., 2004; Tang et al., 2014)				