Effects of Different Controlling Factors on The Experimental Landform Development

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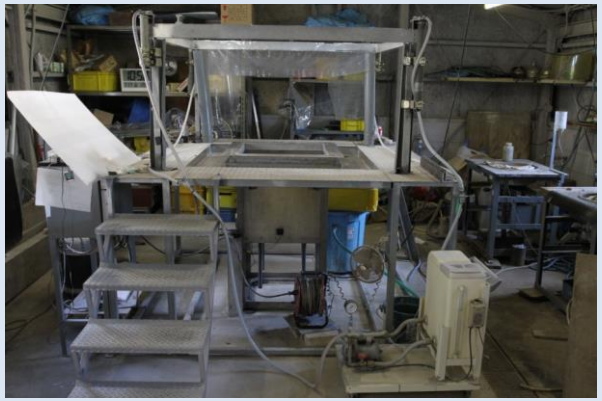
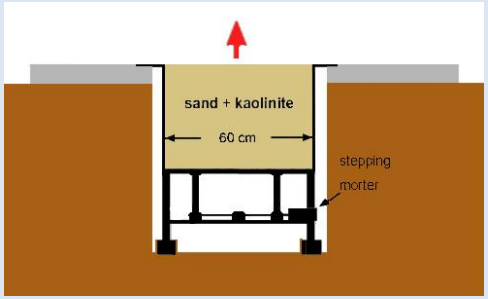
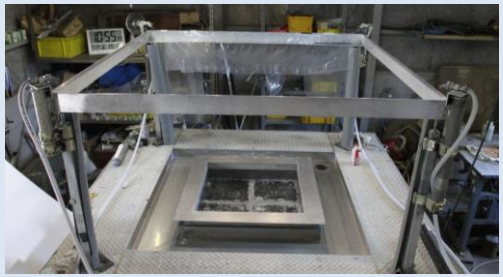
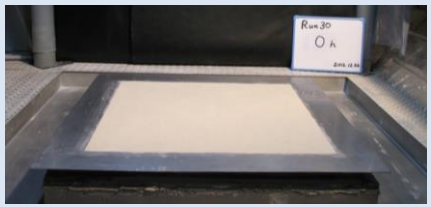
Experimental facilities







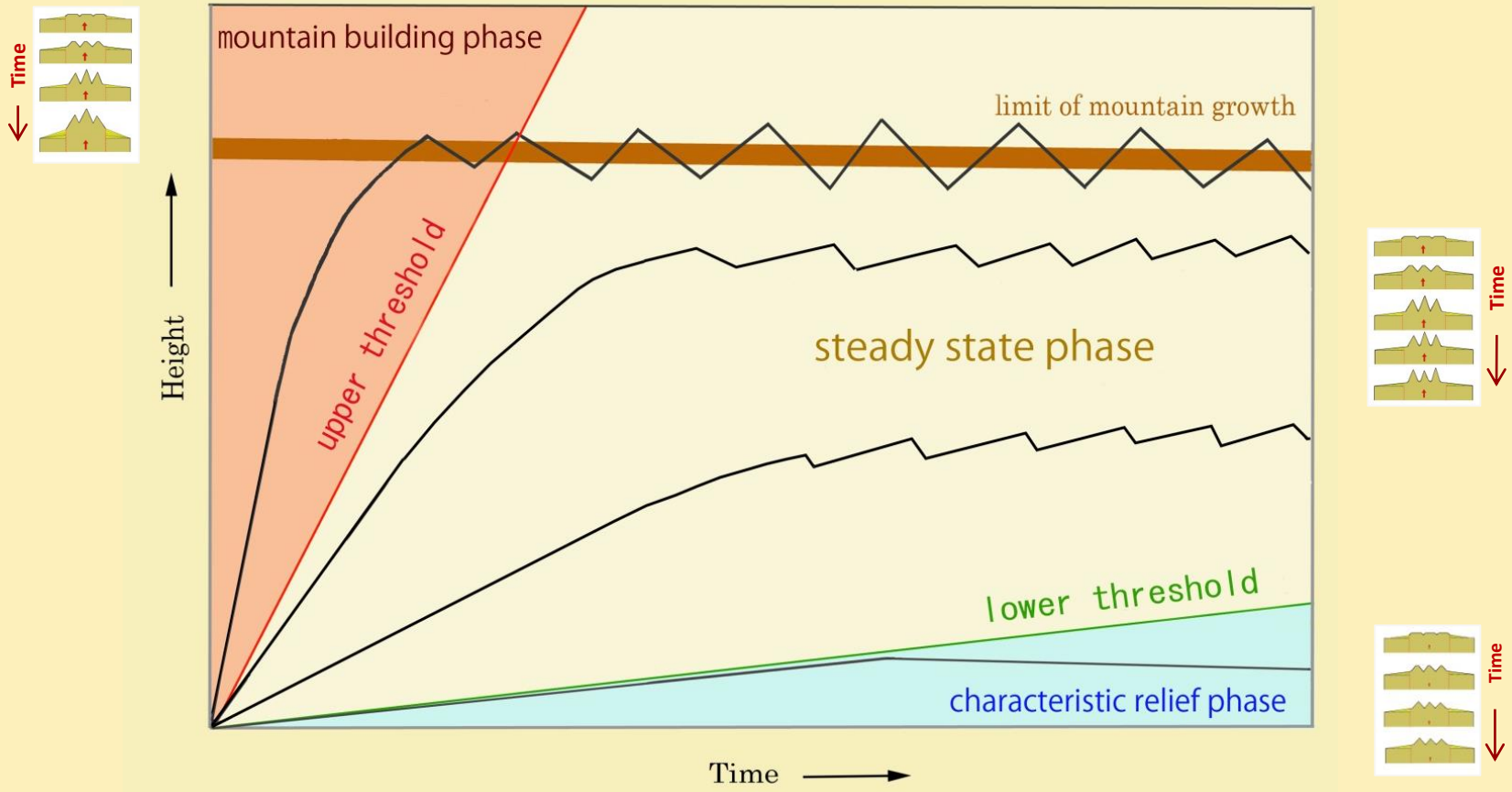


Material : fine sand : kaolinite = 10:1 by weight

	Duration of uplift/rainfall hours	Average rainfall mm/h	Uplift rate	Total uplift	Permeability cm/s	Width of deposition area
Run26	1000/1000	40-50	0.36 mm/h	358 mm	3.2×10^{-4}	100 mm
Run27	970/1000	80-90	0.36 mm/h	348 mm	2.9×10^{-4}	100 mm
Run28	176/256	80-90	2.0 mm/h	354 mm	3.5×10^{-4}	100 mm
Run29	72/160	80-90	5.0 mm/h	361 mm	2.8×10^{-4}	100 mm
Run30	1160/1160	80-90	0.1 mm/h	118 mm	3.0×10^{-4}	100 mm
Run31	1160/1160	80-90	0.1 mm/h	117 mm	4.7×10^{-4}	200 mm
Run32	1000/1000	80-90	0.36 mm/h	364 mm	1.8×10^{-4}	200 mm
Run33	120/176	80-90	3.0 mm/h	363 mm	2.9×10^{-4}	200 mm
Run34	184/184	80-90	2.0 mm/h	368 mm	4.2×10^{-4}	200 mm
Run35	1000/1168	80-90	0.36mm/h	364 mm	4.7×10^{-4}	50, 100, 200mm
Run36	176/432	80-90	2.0 mm/h	354 mm	2.1×10^{-4}	200 mm
Run37	176/336	80-90	2.0 mm/h	355 mm	2.0×10^{-3}	200 mm
Run38	960/1540	80-90	0.36 mm/h	348mm	$\mathbf{1.5 \times 10^{-3}}$	200 mm
Run39	960/1540	40-50	0.36 mm/h	349mm	$\mathbf{1.4 \times 10^{-3}}$	200 mm
Run40	960/1540	80-90	0.36 mm/h	348mm	3.0×10^{-4}	200 mm

Controlling factors considered: **Uplift** - **uplift rate,**
Erosion - **rainfall intensity,**
- **width of deposition area,**
- **permeability**
- **shear strength**

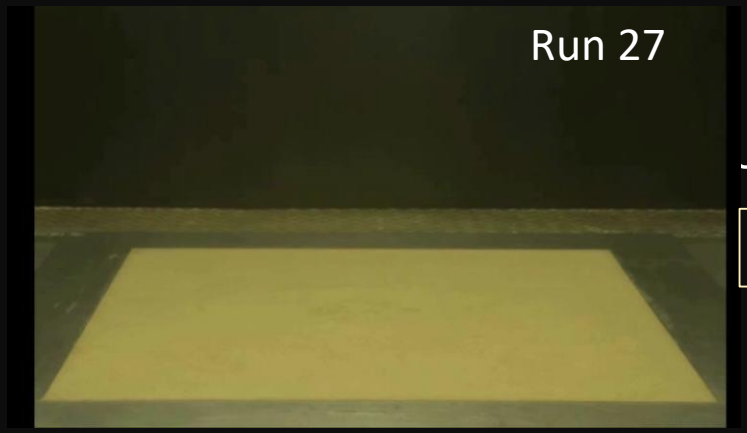
Uplift rate



1000h→1min

Uplift rate = 5.0 mm/h

Mountain building phase



Jplift rate = 0.36 mm/h

Steady state phase

Uplift rate = 0.1 mm/h

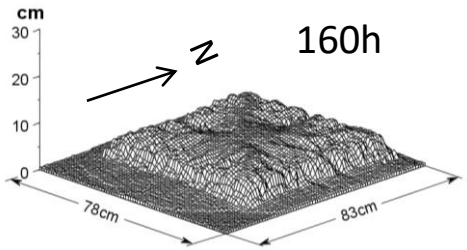
Characteristic relief phase

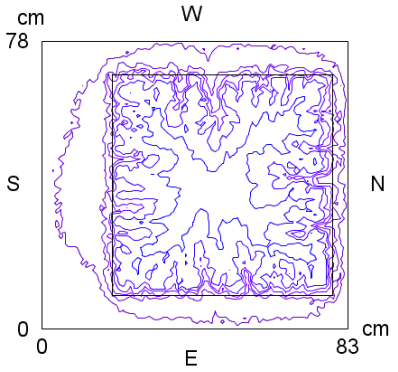
(nearly)

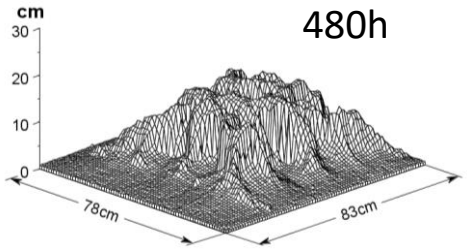
Width of deposition area

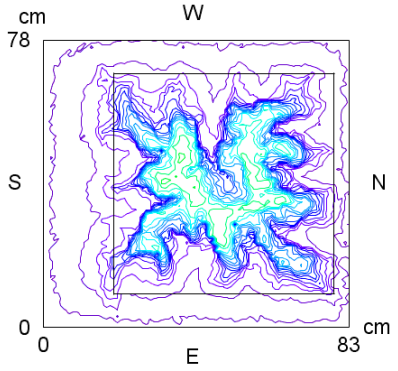
Run 35

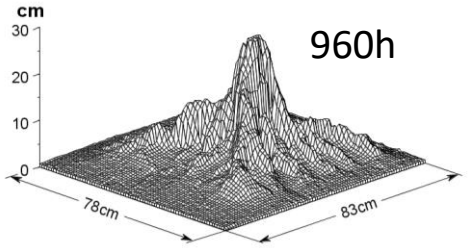
(Contour interval 20mm)

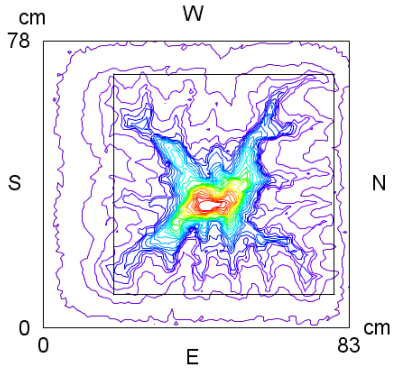






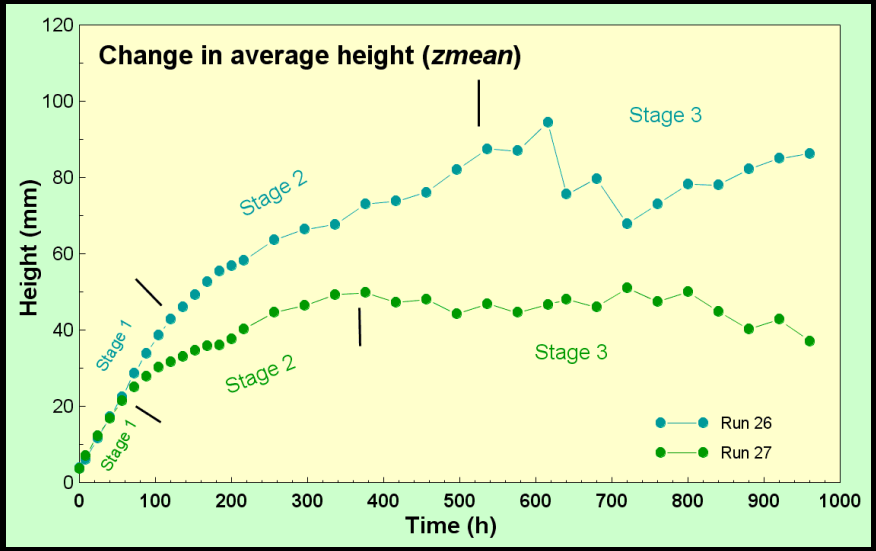






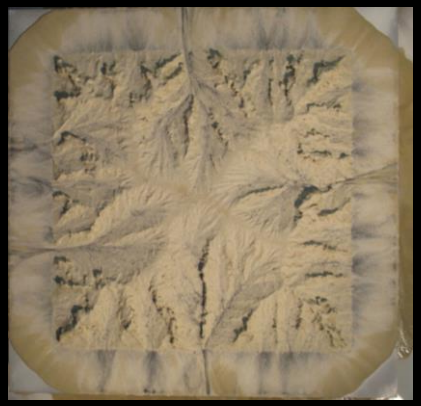
Rainfall intensity

	precipitation	permeability	deposition area
Run26	40-50 mm/h	3.2×10^{-4} cm/s	100 mm
Run27	80-90 mm/h	2.9×10^{-4} cm/s	100 mm



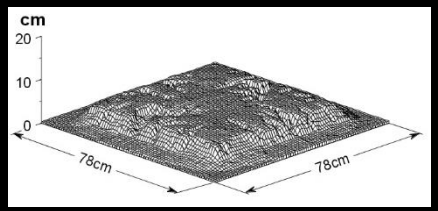
Run 26 120h

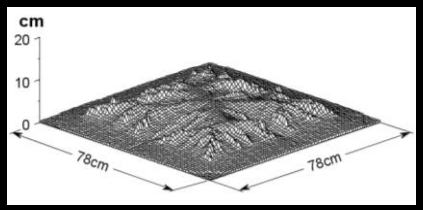
Run 27 120h

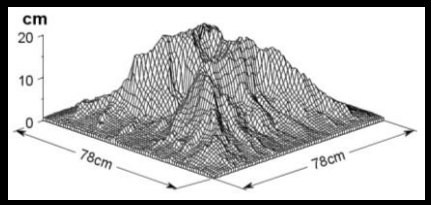


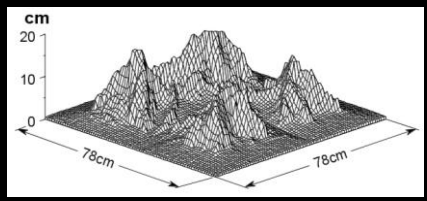
Run 26 640h

Run 27 640h



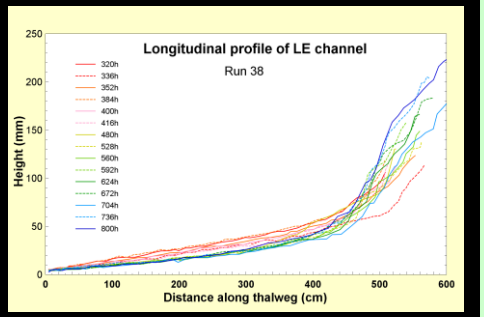


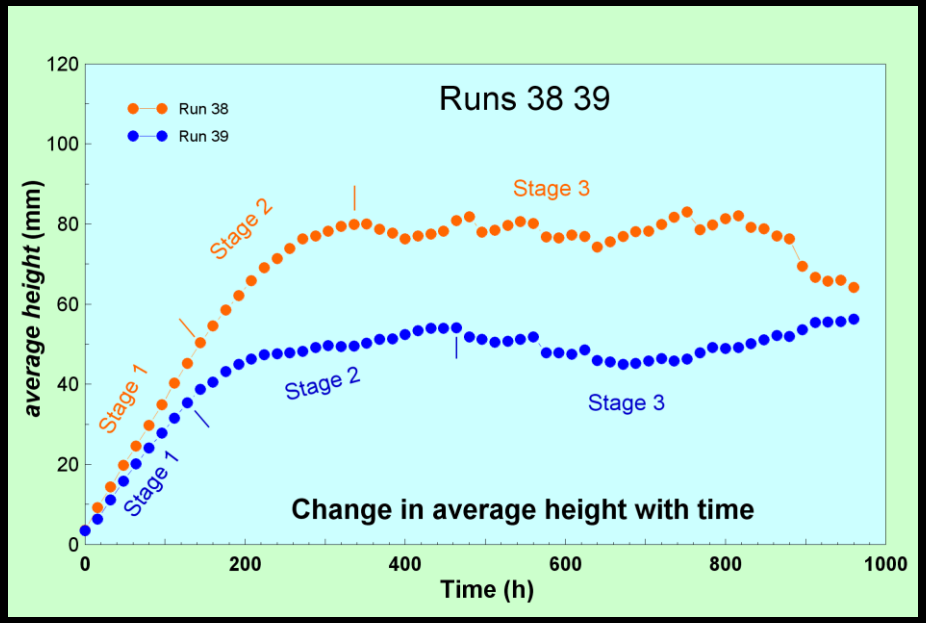




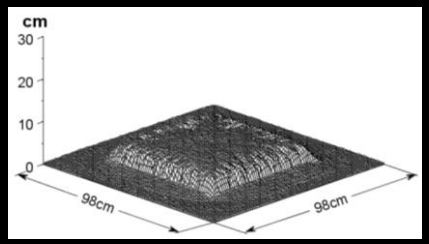
Permeability

	Precipitation		permeability	deposition area	
Run38	80-90	mm/h	1.5×10^{-3} cm/s	200	mm
Run39	40-50	mm/h	1.4×10^{-3} cm/s	200	mm

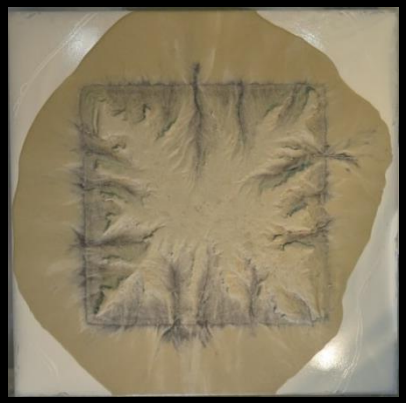


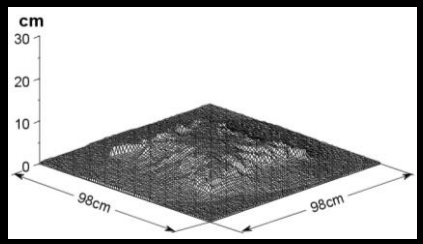


Run 38 128h

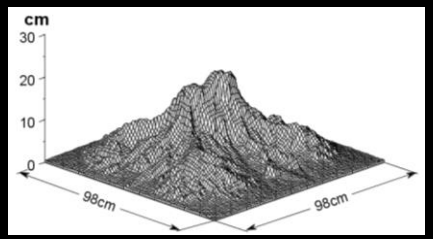


Run 39 128h

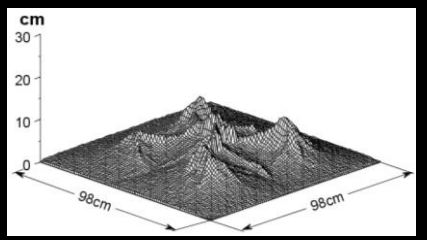




Run 38 640h

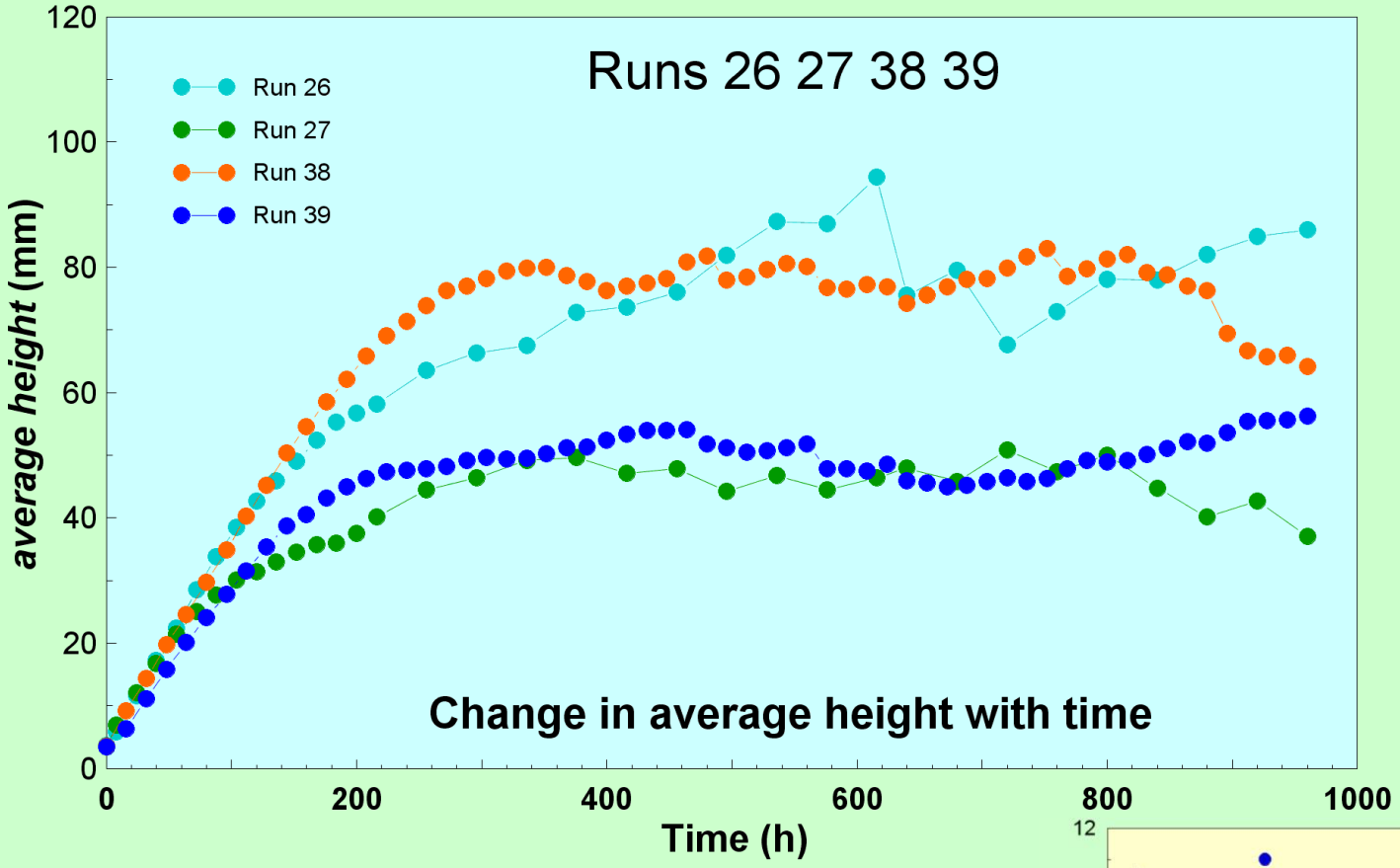


Run 39 640h

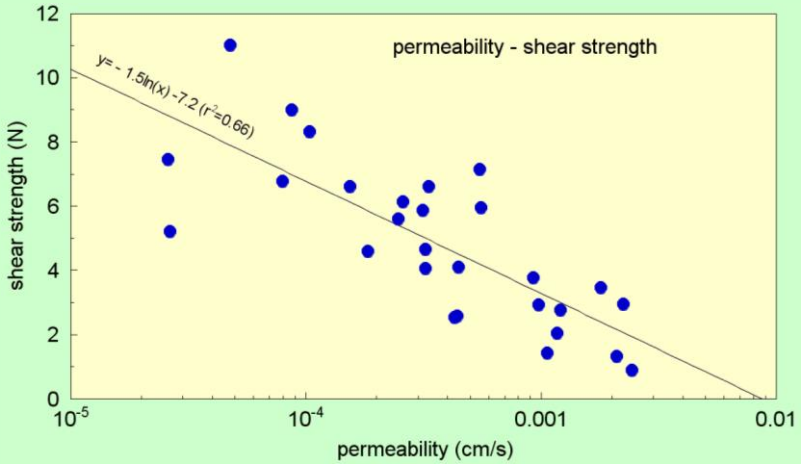


Rainfall intensity

Permeability and shear strength



	precipitation mm/h	permeability cm/s
Run26	40-50	3.2×10^{-4}
Run38	80-90	1.5×10^{-3}
Run27	80-90	2.9×10^{-4}
Run39	40-50	1.4×10^{-3}



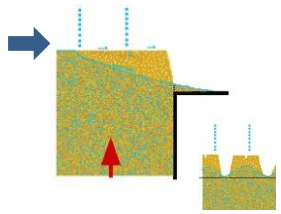
*water available for possible Hortonian overland flow (precipitation – permeability)

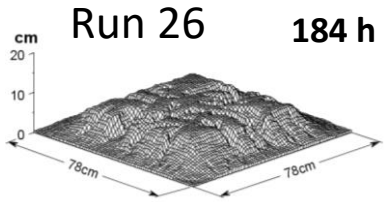
Lower rainfall

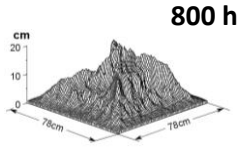
Lower permeability

Run26 41 mm/h*

Higher strength





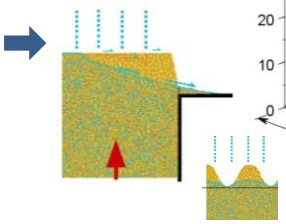


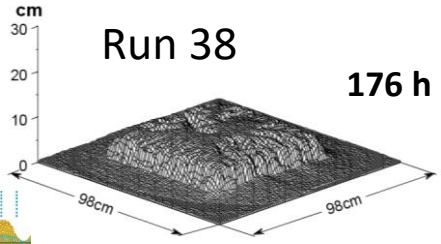
Higher rainfall

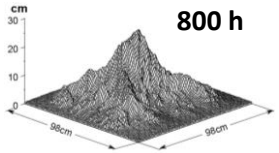
Higher permeability

Run38 35 mm/h*

Lower strength





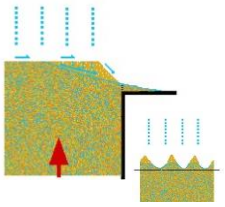


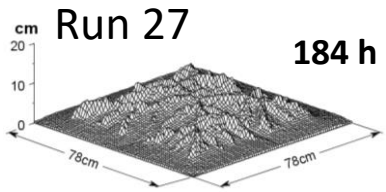
Higher rainfall

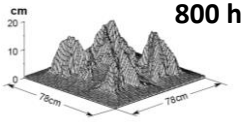
Lower permeability

Run27 78 mm/h*

Higher strength





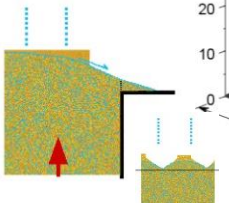


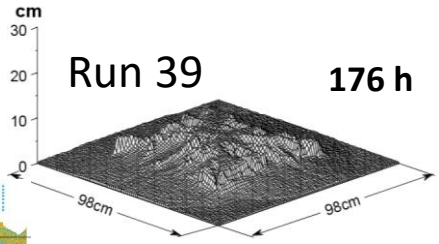
Lower rainfall

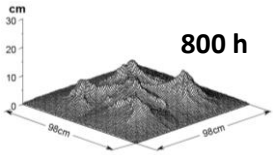
Higher permeability

Run39 0.7 mm/h*

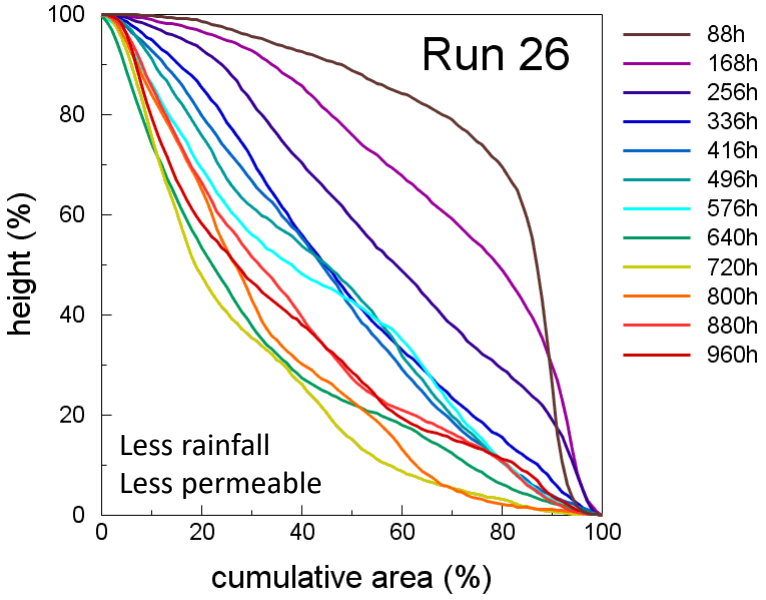
Lower strength

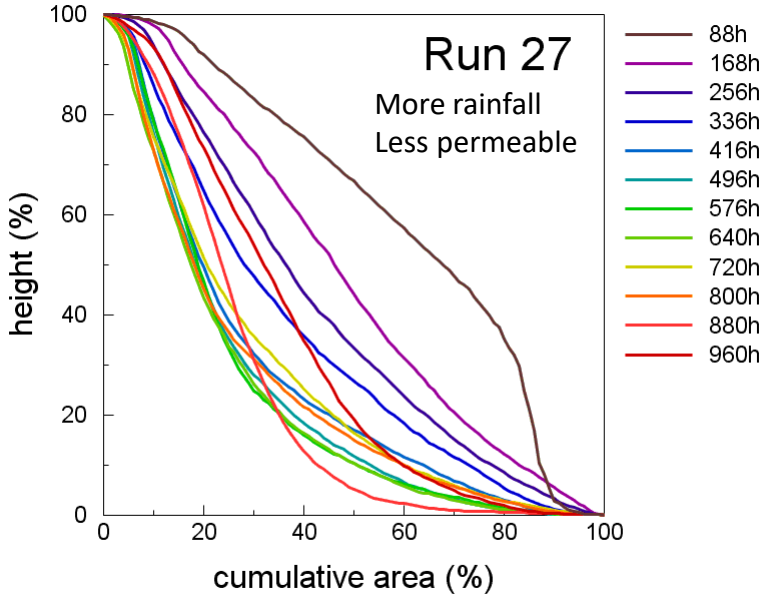


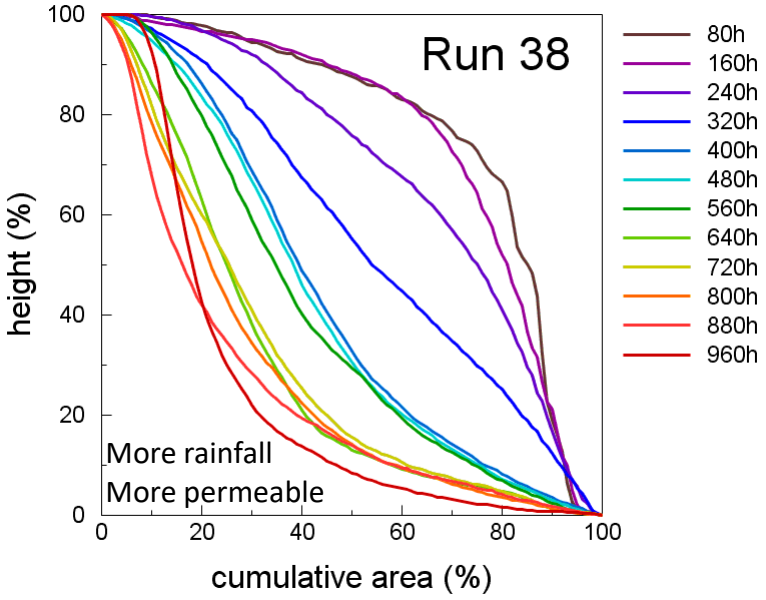


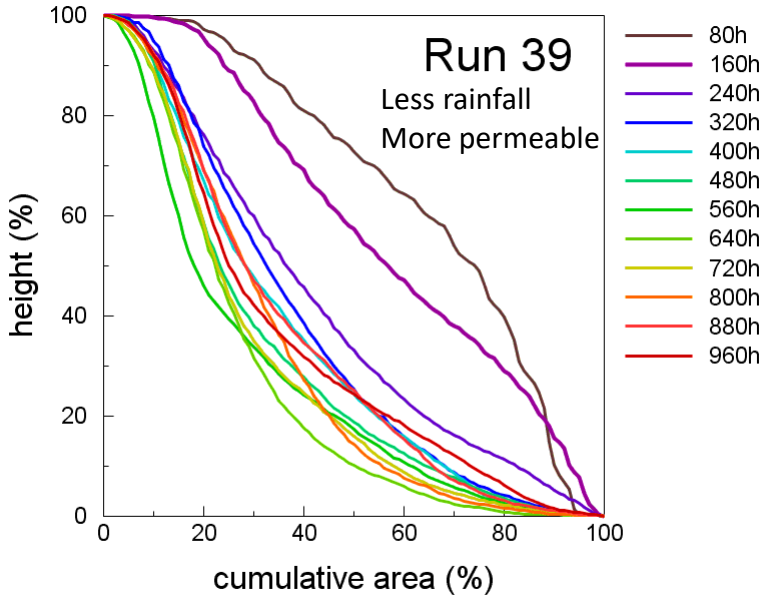


Percentage hypsometric curves









Concluding remarks

· Factors, such as uplift rate, rainfall intensity, permeability and shear strength, have certain significant effects on the way of experimental landform development. Their effects, however, appear in a complicated way with possible interactions among these controlling factors.

· Landform development is a complicated process even in the simplified experimental setting. Real landforms that develop in geographical space through geological/historical time with the almost infinite number of controlling factors, therefore, seems to be hopelessly complicated.

· Do not try to rush into a clear and simple conclusion. You've got to keep your mind strong!