Exercises on quantification and uncertainty propagation

Application to a toy hydraulic model

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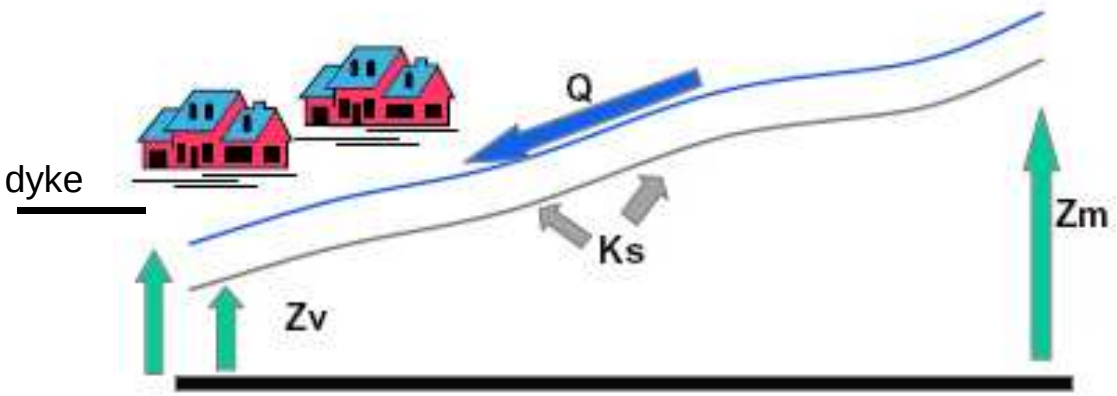
Example: Flood model



Simplified physical model (hydraulics)

S = overflowing heigth

$$S = Z_v + H - H_d - C_b \quad \text{avec} \quad H = \left(\frac{Q}{BK_s \sqrt{\frac{Z_m - Z_v}{L}}} \right)^{0.6}$$

Cp = annual cost of dyke maintenance

$$C_p = \mathbb{1}_{S>0} + \left\{ 0.2 + 0.8 \left[1 - \exp\left(-\frac{1000}{S^4} \right) \right] \right\} \mathbb{1}_{S \leq 0} + \frac{1}{20} \left(H_d \mathbb{1}_{H_d > 8} + 8 \mathbb{1}_{8 \leq H_d} \right) ,$$

Inputs

Q = river flowrate ~ Gumbel on [500,3000]

Ks = friction coefficient ~ normal(30,8) on [15,50]

Zv = downstream river bed heigth ~ triangular on [49,51]

Zm = upstream river bed heigth (=55 m)

Hd = dyke heigth ~ triangular on [7,9]

Cb = bank heigth ~ triangular on [55,56]

L = river length (=5000m)

B = river width (=300m)