Five common mistakes in fluvial morphodynamic modelling

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Rationale
- Increased availability of morphodynamic models
- Proliferation of new morphodynamic codes
- Increased use of models by non-experts

Approach
- Computations for EGU 2014 (mistakes 1 and 2)
- Examples from existing studies (mistakes 3, 4 and 5)

Reference computation

- Sediment transport formula of Engelund & Hansen
- Bed slope effect on sediment transport direction: $f(s_0) = 0.5s_0^{0.5}$
- Morphological factor = 10

Mistake 1: New codes without essential physics

Mistake 2: Imposing of solutions by so-called “fine-tuning” of calibration

Sediment transport:

- $i = 0.1 \text{ m/km}$
- $L = 10 \text{ km}$
- $B = 90 \text{ m}$
- $Q = 180 \text{ m}^3/\text{s}$
- $b_0 = 3 \text{ m}$
- $D = 0.2 \text{ mm}$
- $C = 42.84 \text{ m}^{1/2}/\text{s}$

Mistake 2: Imposing of solutions by so-called “fine-tuning” of calibration

Mistake 3: Inadequate upscaling

Meuse: graded sediment with active-layer thickness = 0.1 m

Result: no morphological response to giving more space to the river

\[ \frac{T_{\text{sea}}}{T_{\text{bed}}} \propto \frac{\delta_{\text{active layer}}}{h} \]

Mistake 4: Confusion of physical and numerical phenomena

Observed oscillation suppressed in computation:
- due to roughness submodel? (Lesser et al., 2004)
- due to numerical scheme as analytical model predicts less damping?

Mistake 5: Belief that 2D and 3D models require more data than 1D

Implications for validation … … and review!

Thanks!