1. Motivation & Purpose

This study aims at modeling the evolution of meanders by coupling the Bank Erosion and Retreat Model (BERM, by Chen and Duan, 2006) with a nonlinear flow model (by Blanckaert and de Vriend, 2010).

1.1 Linear flow method

Assume: $\alpha = \beta = 0$

$$\frac{dH}{dt} = \frac{H}{4C_h} (A + A_R + F^2 + 1)$$

1.2 Bank Erosion & Retreat Model (BERM)

Assume: $b >> \lambda \gg b$

$$\frac{dh}{dt} = \frac{K}{4C_h} (A + A_R + F^2 - 1) - H \lambda^2$$

1.3 Nonlinear flow method

Assume: $b >> \lambda \gg b$

$$\frac{dh}{dt} = \frac{K}{4C_h} (A + A_R + F^2 - 1) - H \lambda^2$$

2. Theory – physical process which redistribute flow in curved channels

By Johannesson & Parker (1989)

$$\alpha = \frac{1}{2} H \frac{dH}{dt} + \frac{1}{2} \frac{F^2}{R}$$

3. Verification of linear & nonlinear flow models

Assume: $b >> \lambda \gg b$

$$\frac{dh}{dt} = \frac{K}{4C_h} (A + A_R + F^2 - 1) - H \lambda^2$$

4. Flowchart for meander evolution model

5. Conclusions

- The results of linear & nonlinear flow models are similar in mildly curved channels with a flat bed.
- Linear models underestimate streamwise momentum redistribution by secondary flow in strongly curved channels.
- The nonlinear flow model gives a better result in high-sinuous channels with transverse bed slope.
- A better meander evolution model is expected and being built by coupling the Bank Erosion and Retreat Model (BERM, by Chen and Duan, 2006) with a nonlinear flow model (by Blanckaert and de Vriend, 2010).

6. References