Adaptation Parameters
Solution

1 Objective

The goal of this workshop is to gain an understanding of how the adaptation parameters change the sediment transport results so that they can be used to calibrate the model.

2 Total-load Adaption Length

Question: Does reducing the adaptation length, make the actual concentrations more similar to the capacities and why?

Yes. As the adaptation length decreases, the distance over which sediment reaches equilibrium also reduces, and therefore on average, the concentrations will be close to equilibrium (capacity) values.

Question: What would happen if the adaptation length is set to a very small number?

As the adaptation length decreases, the sediment model behaves more like an equilibrium model, meaning the actual concentrations approach the equilibrium concentrations.

Question: What effect did reducing the adaptation length cause on the bed change results?

The bed change is more "upstream" and larger in magnitude. The bed change is also "noiser" or has more variation than with a larger adaptation length.

3 Weighted Bed- and Suspended-Load Lengths

3.1 Constant Suspended Adaptation Coefficient

Question: From the fraction of suspended sediment, most of the sediment transported is in suspension. This makes sense since most of the transport is due to fine sand. What does this mean in terms of the sensitivity of the adaptation parameters for bed and suspended load?

Since most of the transport is suspended the adaptation parameter for bed load will not significantly affect the results. During calibration, it is important to keep in mind what transport mode is dominant so as not to calibrate unsensitive parameters.

Question: What does the suspended-load adaptation coefficient of 1 mean in terms of the near-bed sediment concentration and depth averaged concentrations?

Very simply, an adaptation coefficient of 1.0 means the near-bed suspended sediment concentration is equal to the depth-averaged concentration. It means that the suspended sediment are well distributed within the water column.

Question: For natural rivers, is a suspended-load adaptation coefficient of 1 more appropriate for fine sand or coarse gravel?

An adaptation coefficient of 1.0 is more appropriate for fine sediments since coarse sediments will generally transport near the bed or as bed-load.

3.2 Zhou and Lin Suspended-load Adaptation Coefficient

Question: Based on the comparing the Zhou and Lin results with the previous plan, what can you say about the adaptation coefficient? Is it larger or smaller than 1.0?

The Zhou and Lin formula produces adaptation coefficients larger than 1.0. This is noticeable because the concentrations are closer to the equilibrium values as compared to the adaptation coefficient of 1.0.

Question: Does a larger adaptation coefficient make the concentration field more or less smooth?

A larger adaptation coefficient makes the concentration field more smooth.

Question: Does a smoother concentration field produce a smoother morphology change and explain why?

3.3 Armanini and di Silvio Suspended-load Adaptation Coefficient

Question: Comparing the Armanini and di Silvio results to the Zhou and Lin results, which produced larger adaptation coefficients?

For this dataset, the Armanini and Di Silvio produces generally larger adaptation coefficients. This is noticeably because the actual concentrations are closer to the equilibrium values.

Question: True or false. The adaptation coefficient and lengths are inversely related.

True

Question: Does increasing the adaption coefficient generally increase or decrease the bed change?

Increasing the adaptation coefficient generally **increases** the bed change.

Question: If a model is unstable, does it help to increase or decrease the adaptation coefficient and why?

If a model is unstable, decreasing the adaptation coefficient or likewise increasing the adaptation length will generally make the model more stable because it decreases the magnitude of the erosion and deposition terms locally. However, there are exceptions to rule of thumb because changing the adaptation parameters also changes the extent of the bed change.