

# Fine sediments Project B. Analysis of turbidity time series

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Progress report  
March 2017



Gully carrying soil from winter cereal field, Mains of Balgavies



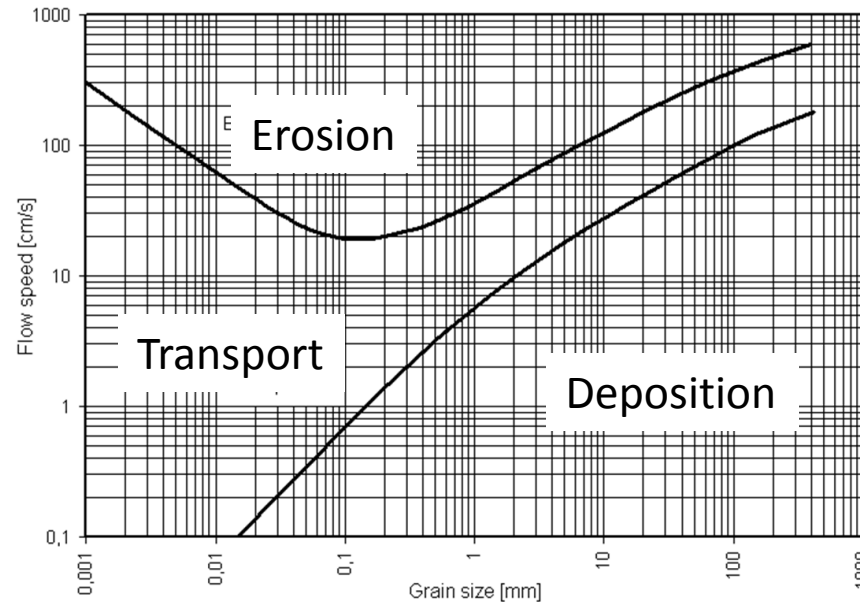
Bund with high flow drain  
and settlement pond



# Project B. Analysis of turbidity time series

- Many catchments of varying typology have NTU/Q/R/chem time series
- Could NTU time series help with BACI analysis of fine sediment impact before/after WFD intervention?

Flow  
Velocity  
(cm/s)

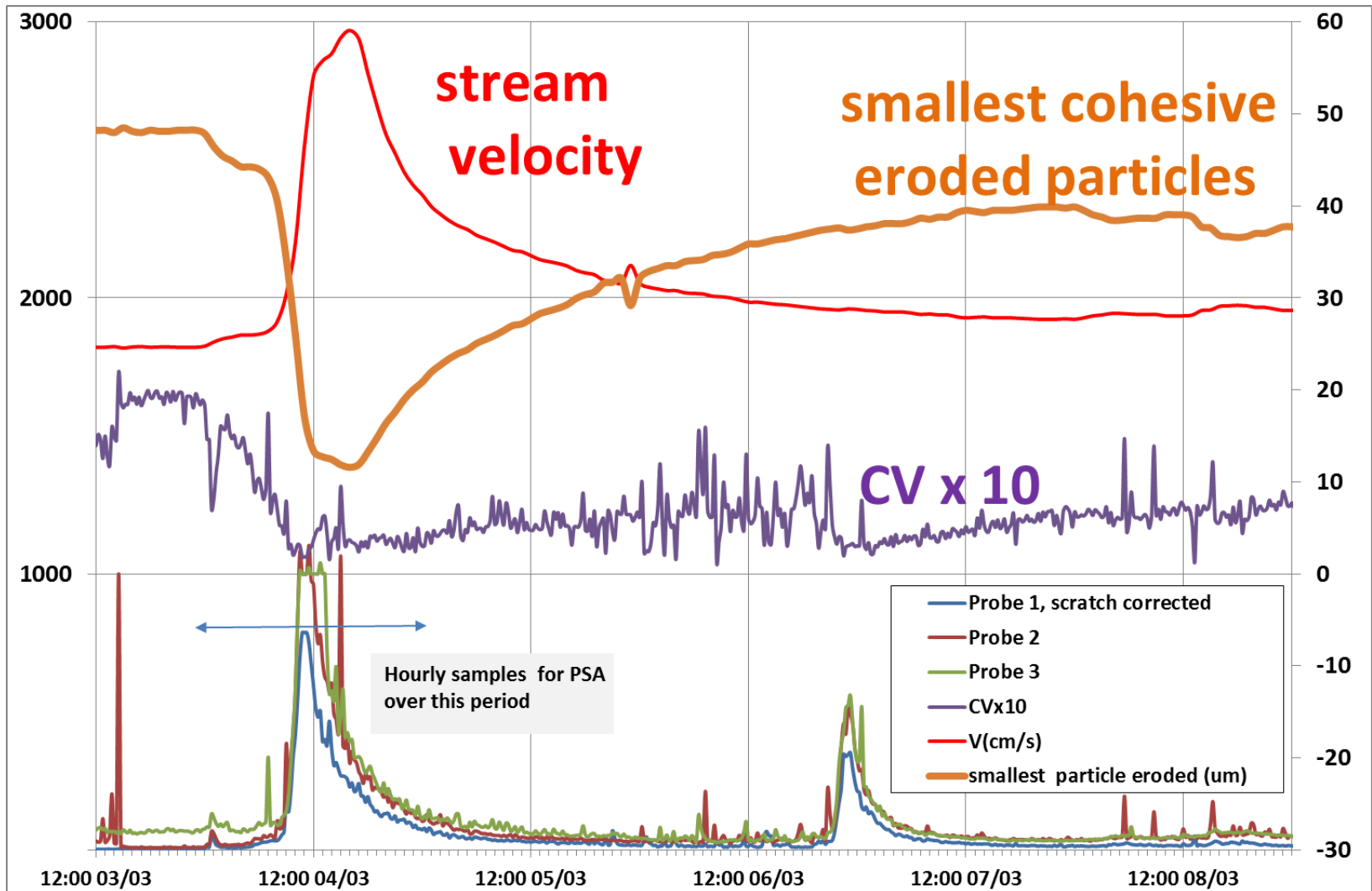


Hjulström-Sundborg  
Diagram

Grain size (mm)

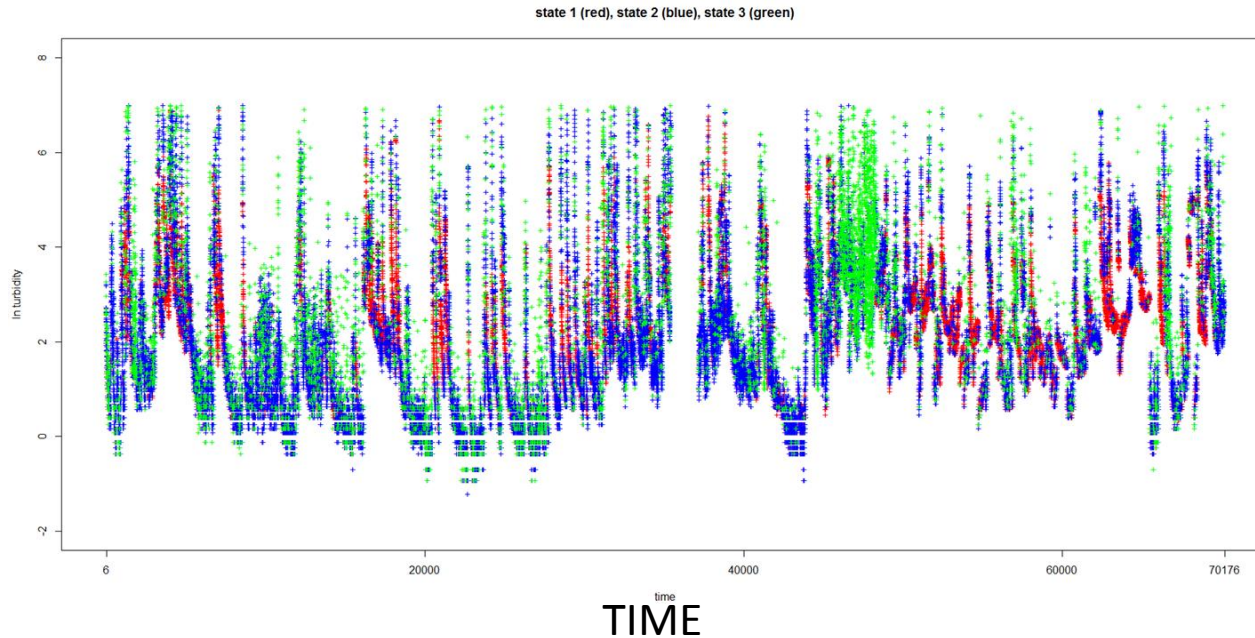
1. Could variance of replicate NTU measurements be used to assess particle size distribution during events?
2. Could hidden Markov analysis identify specific turbidity “states”?

# Turbidity variance during storm event at Burnside (March 2017)



# Progress with hidden Markov analysis

- **Turbidity data analysis** via Markov switching Autoregressive models (MSARMs) with  $m$  hidden states and autoregressions of order  $p$ .
- **DATA** : Wemyss 2011 & 2012; 15min; (3.43% missing ) **Covariates**: Discharge (2.1%); Rainfall (5.8%)



- the hidden chain is a useful tool to efficiently model turbidity data, as it allows obtaining a fitted series close to the actual.
- Clustering the observations in three hidden states looks reasonable, although we haven't found yet the physical interpretation of the three hidden states.
- Covariates not improving model fit
- The missing values in the three series might have an effect in masking the interpretation.

# Summary

## 1) highlights from year 1 research

- Field data capture at Burnside started in March 2017
- Markov method established but not yet a predictive tool

## 2) plans for years 2/3

### Year 2:

- reporting on (1) (? Year 1 Amber)
- 2 potential new SUDS sites on Lunan catchment
- Try Markov analysis on different time series in Lunan water

### Year 3:

- Look at other catchments

## 3) any issues/challenges ahead

- Turbidity probes problematic, just bought 3 replacements

## 4) any integration across the RESAS programme

- Should be integrated with catchment typology work (year 3?)