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6th International Conference on Scour and Erosion

Erosion Detection with a Fiber Optic Sensor-Enabled Geotextile

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Cyril GUIDOUX — geophy*Consult*

eDF

geoϕConsult

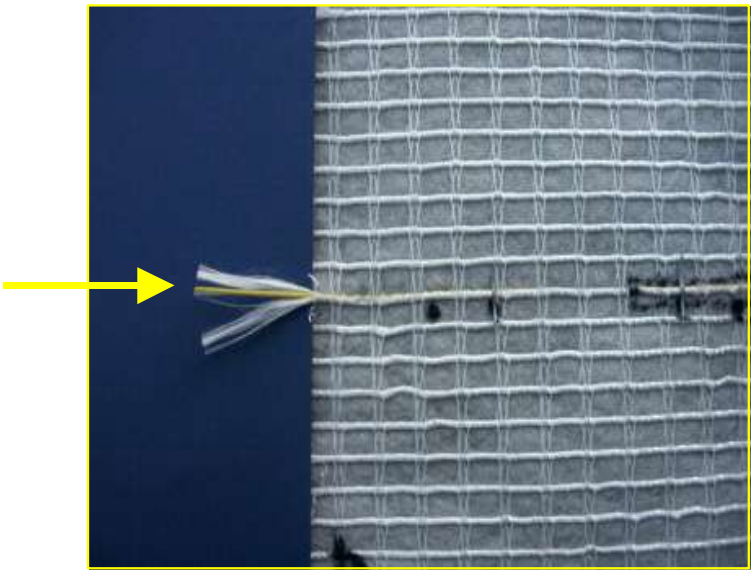
TENCATE
materials that make a difference

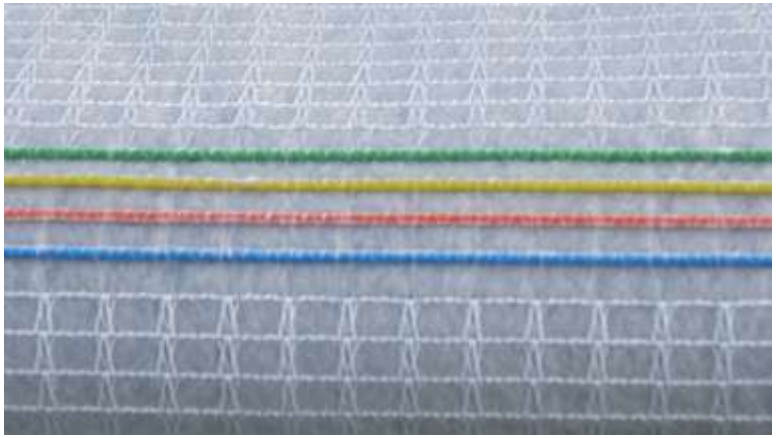
The fiber optic sensor-enabled geotextile

➢ Principle

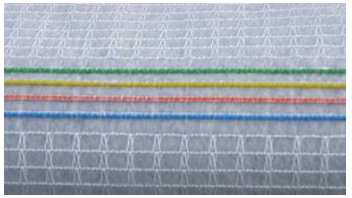
It combines :

1. the geotextile mechanical properties (protection, soil friction, reinforcement) and hydraulic properties (filtration, drainage)
2. with the fiber optic sensing technology.





The fiber optic sensor enabled geotextile :

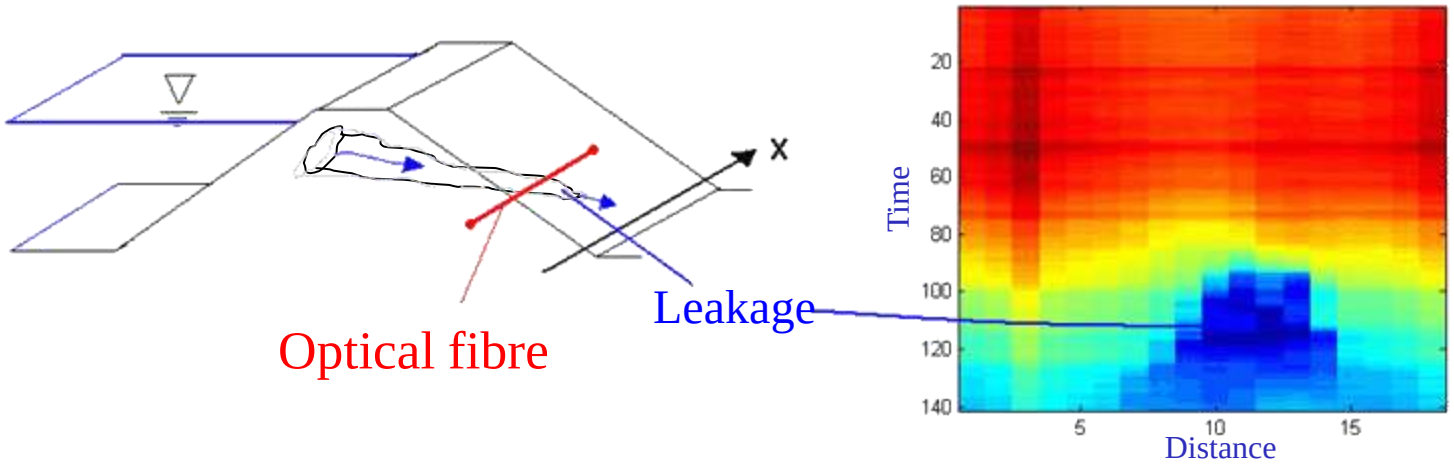


➢ Performance

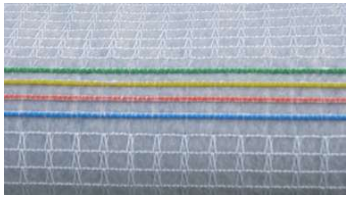
Combined measurement of :

- Temperature (0.1°C)

  good indicator of leakage (< 1 l/m/min.)



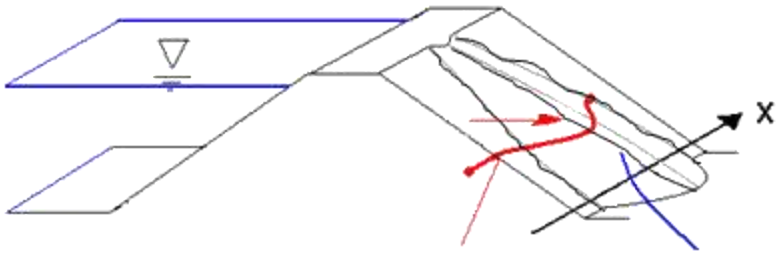
The fiber optic sensor enabled geotextile :

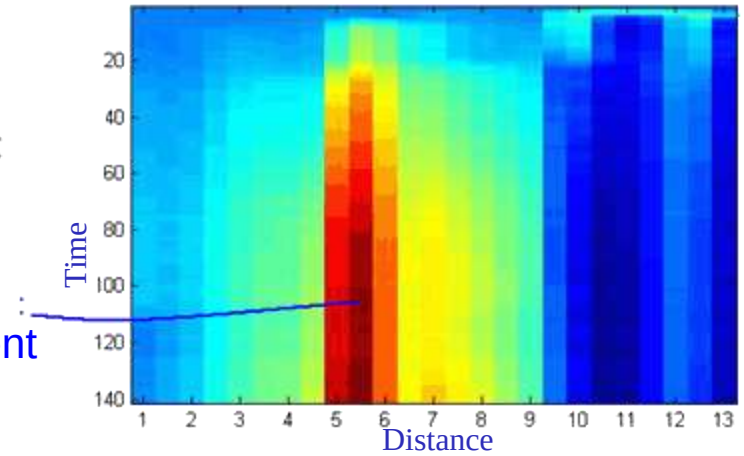


➢ Performance

Combined measurement of :

- Temperature (0.1°C)
  good indicator of leakage (< 1 l/m/min.)
- Strain (0.01%)
  good indicator of movement



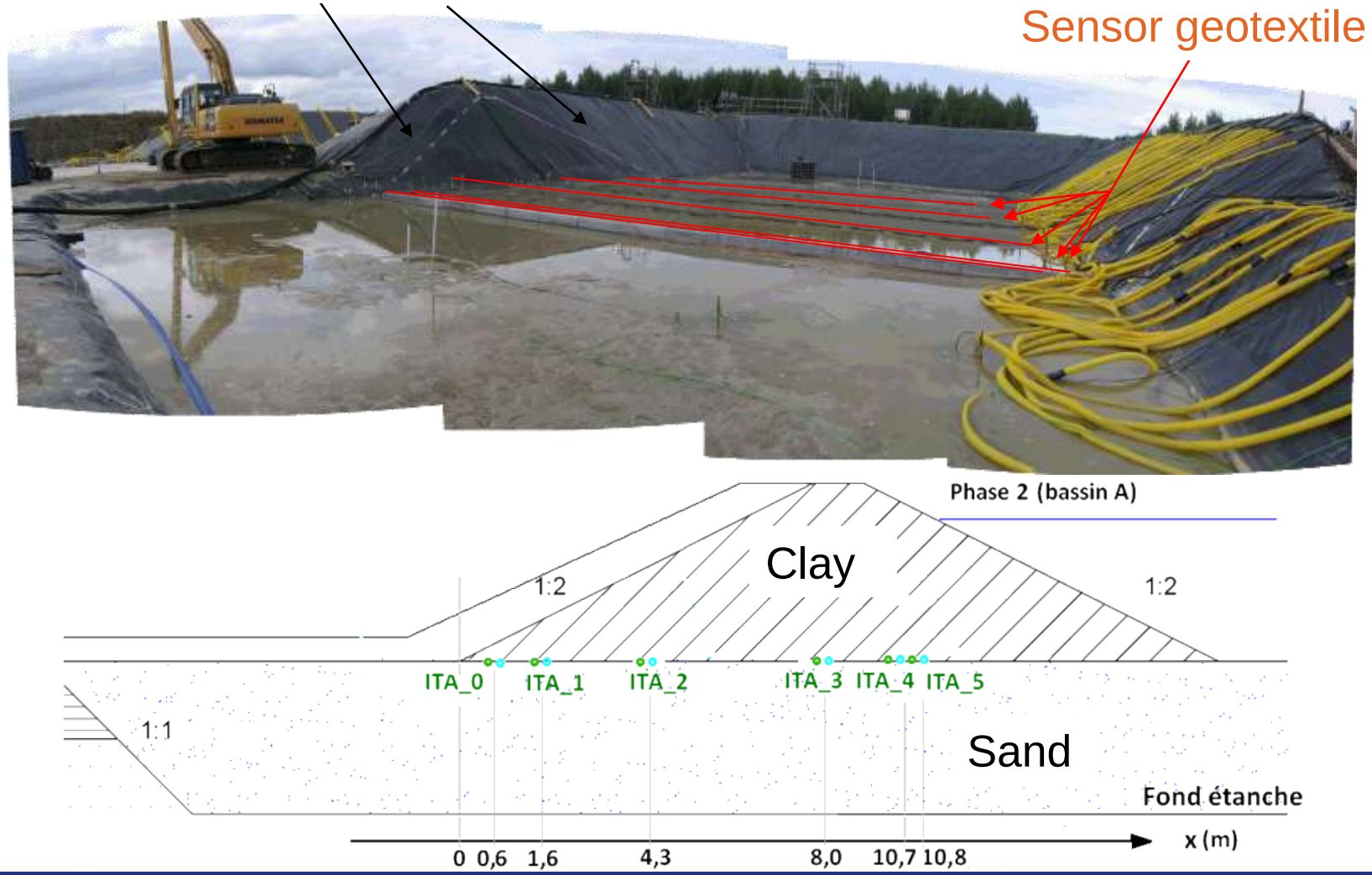


Examples

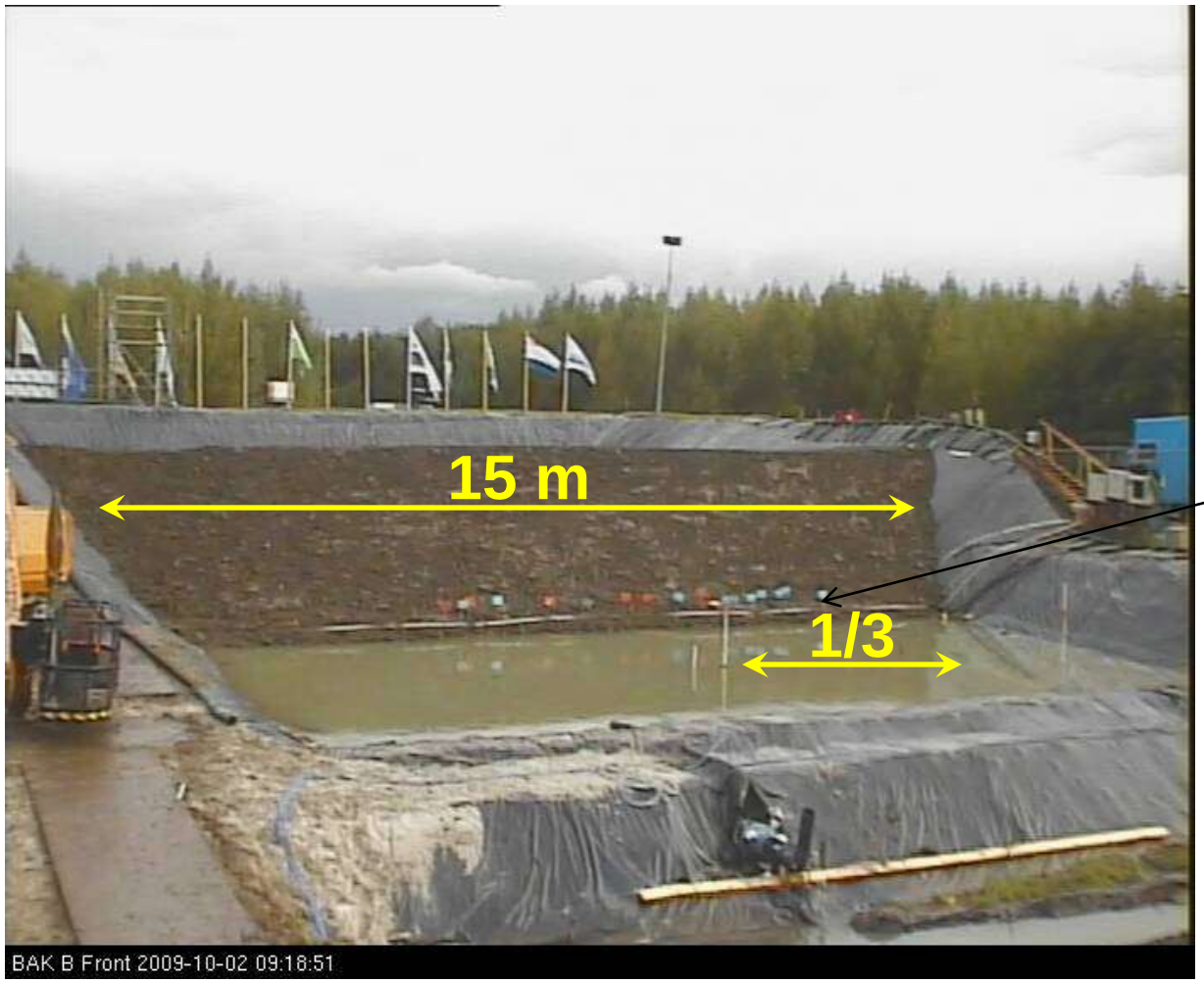
1. Experimental dike : Ijkdijk piping (NL)

2. Canal dike (Marne to Rhine) (F)

IjkDijk project – Piping experiment (2009)



IjkDijk project – Piping experiment



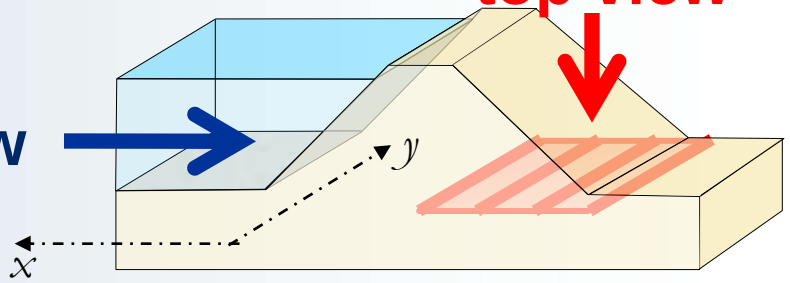
Visible piping channels

IjkDijk project - Piping experiment

Collapse :
05/12/09 – 12:00

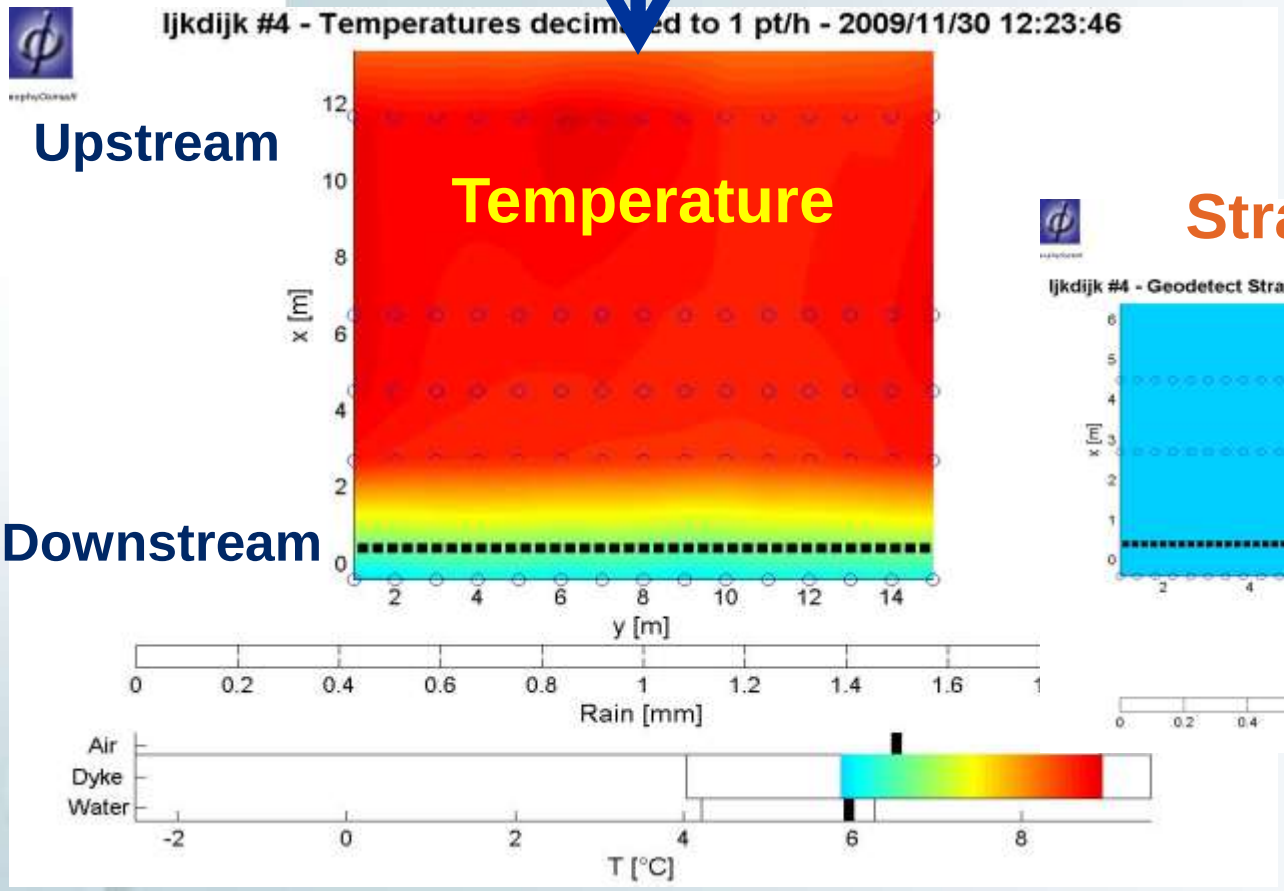
top view

waterflow



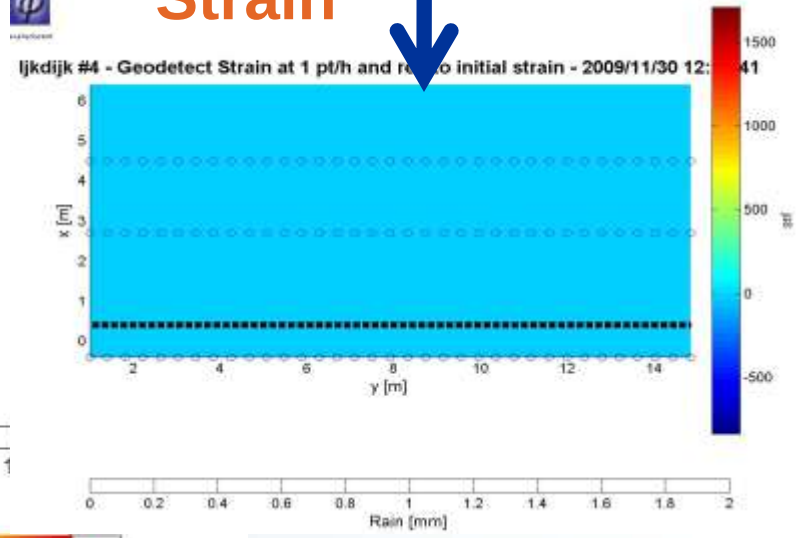
Upstream

Downstream



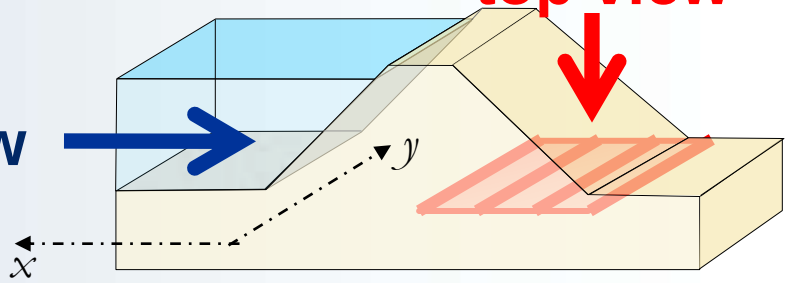
30/11/09 – 12:30

Strain



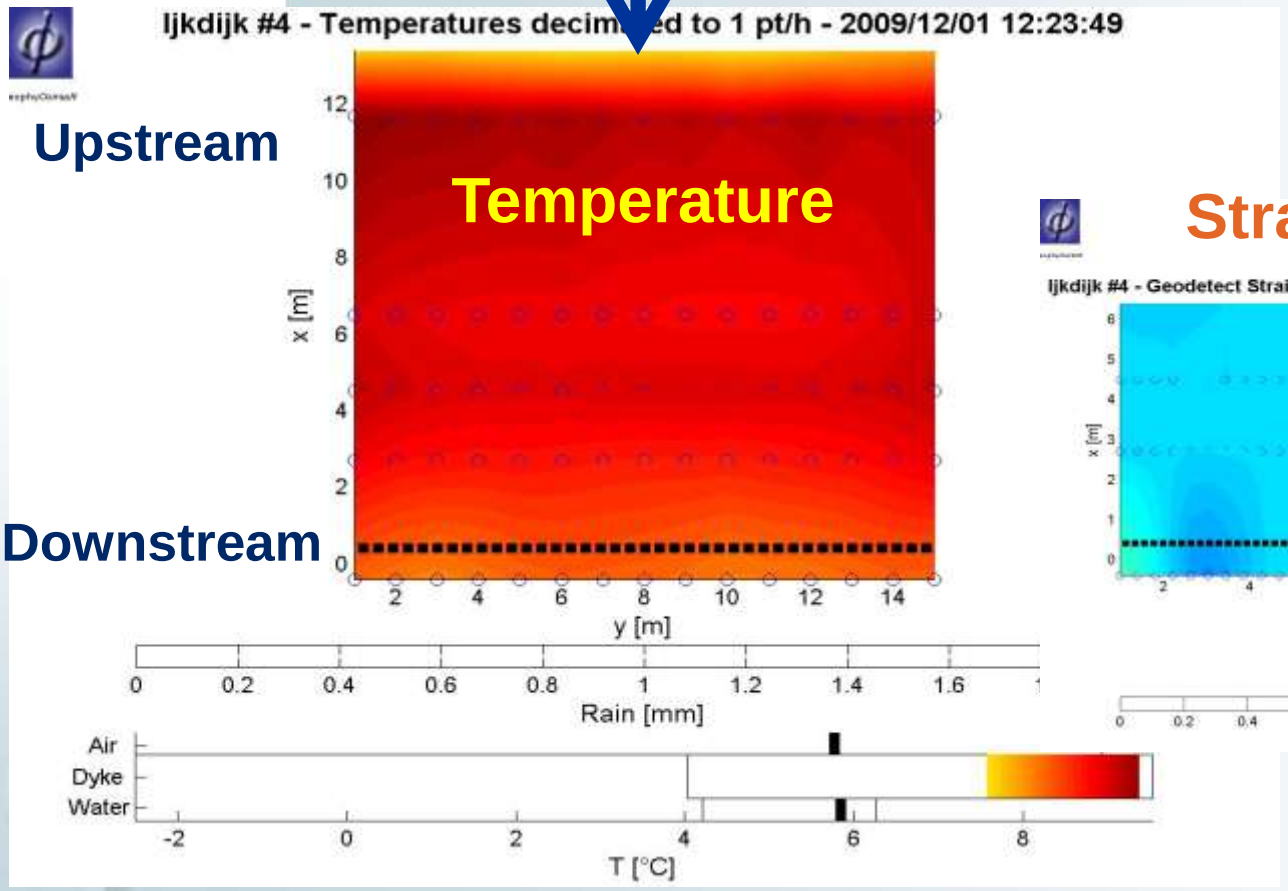
top view

waterflow



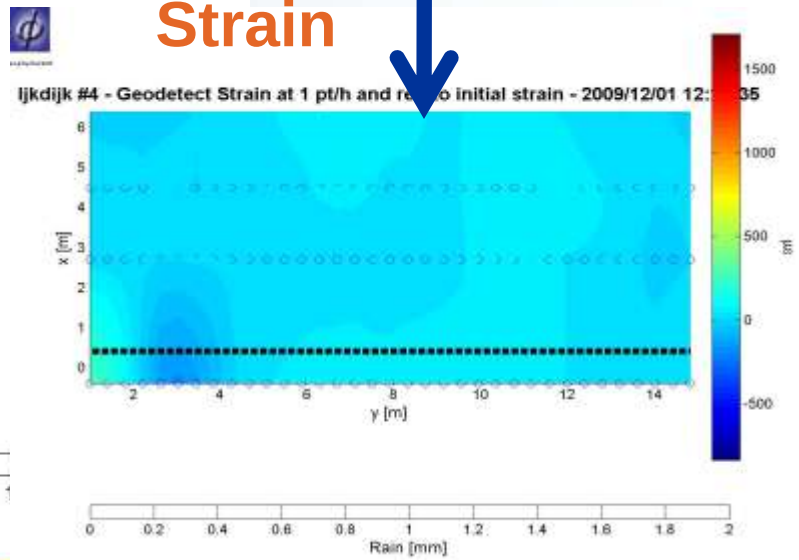
Upstream

Downstream



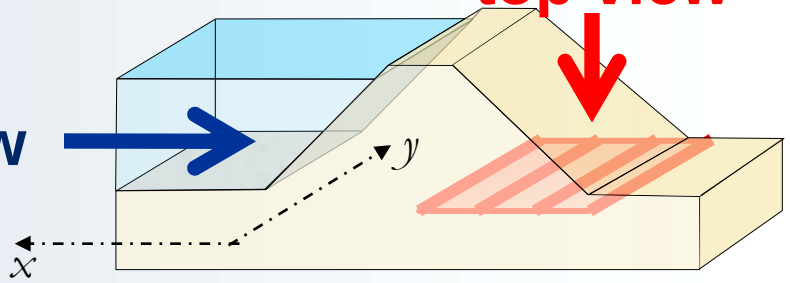
01/12/09 – 12:00

Strain



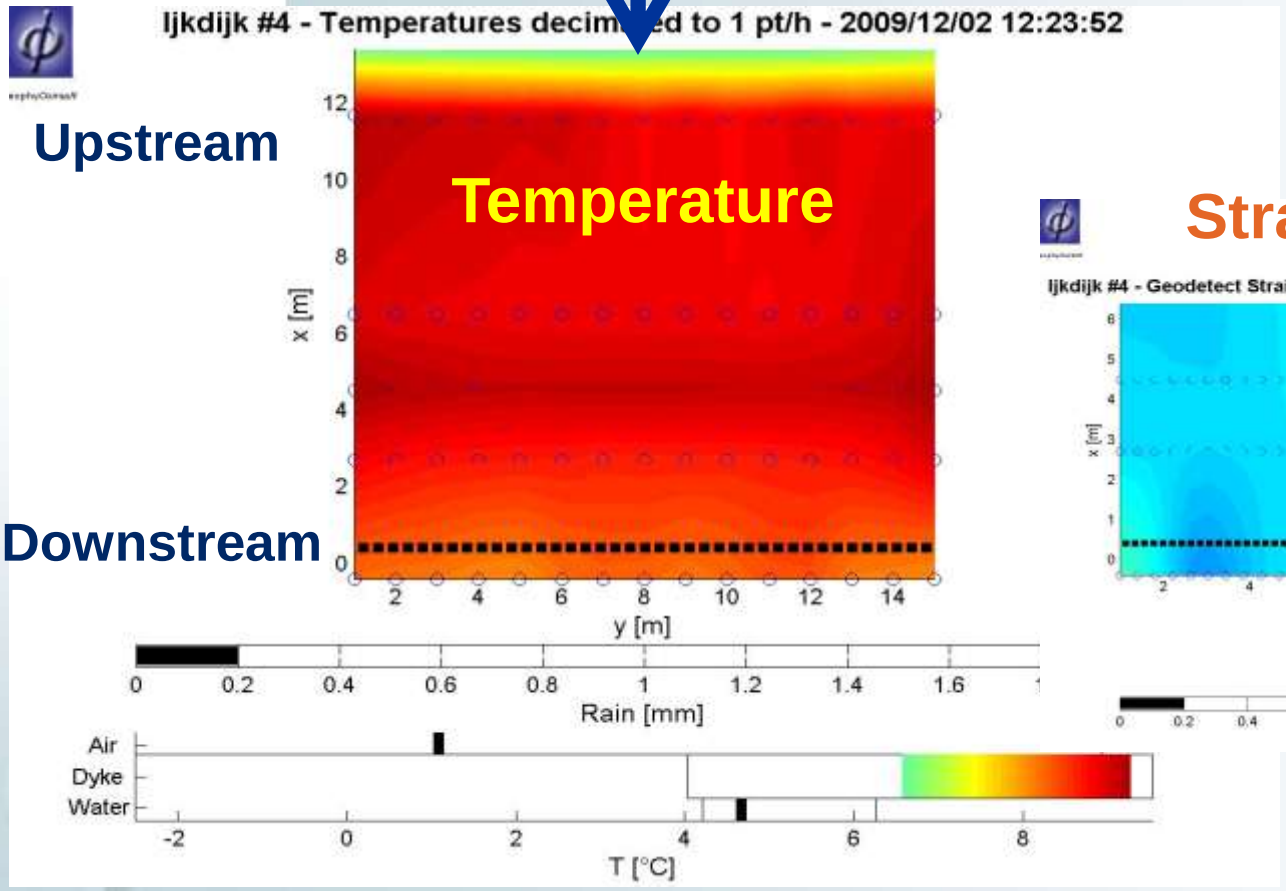
top view

waterflow



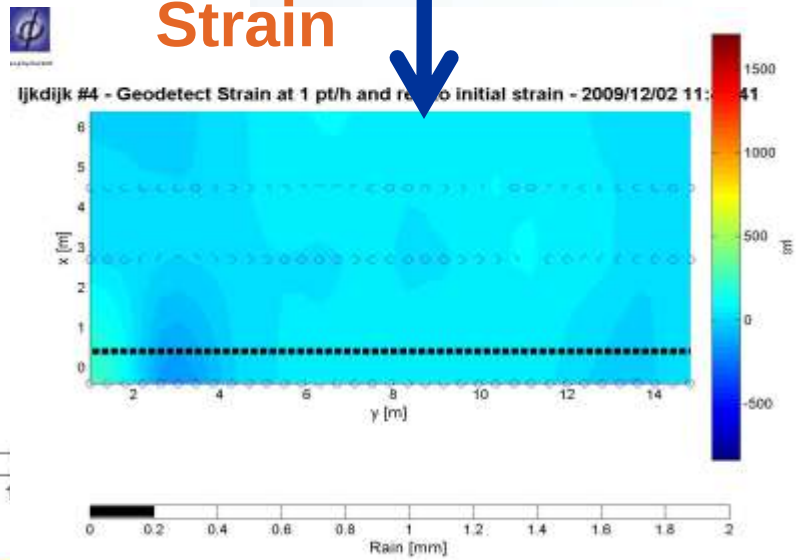
Upstream

Downstream



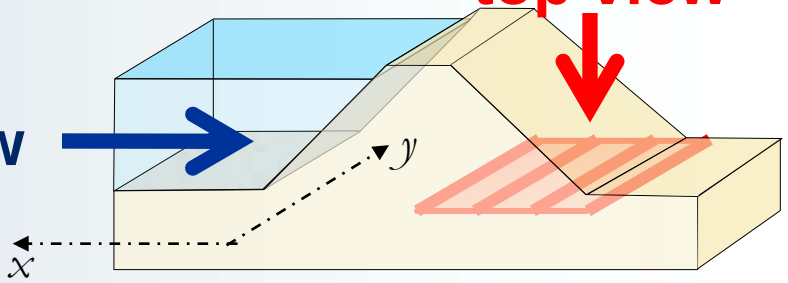
02/12/09 – 12:00

Strain



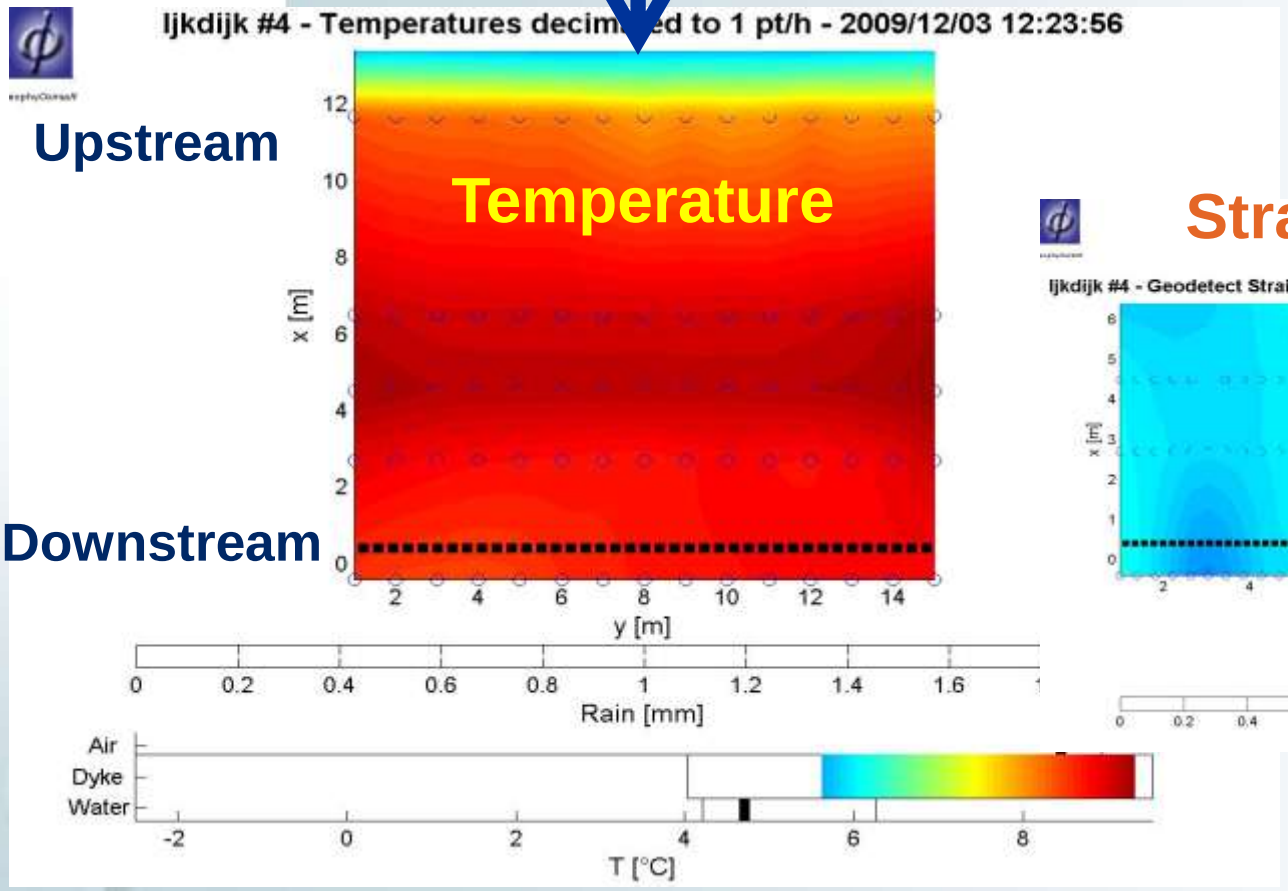
top view

waterflow



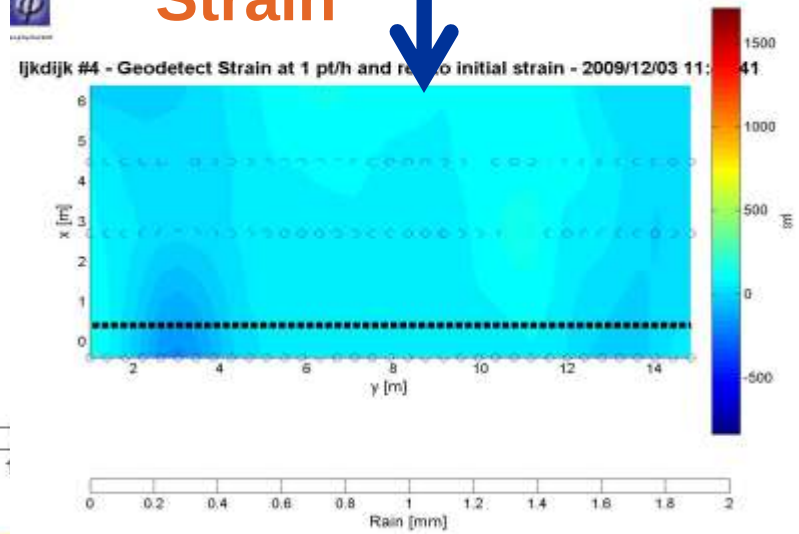
Upstream

Downstream



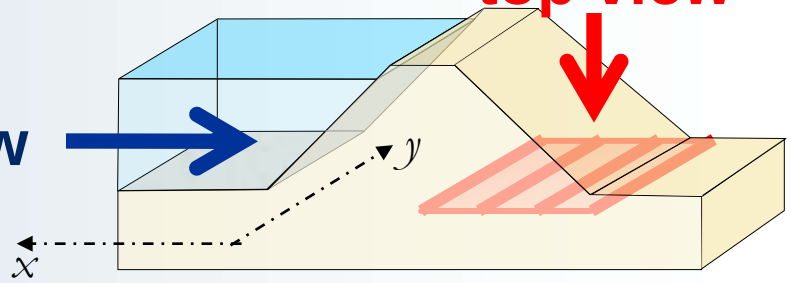
03/12/09 – 12:00

Strain



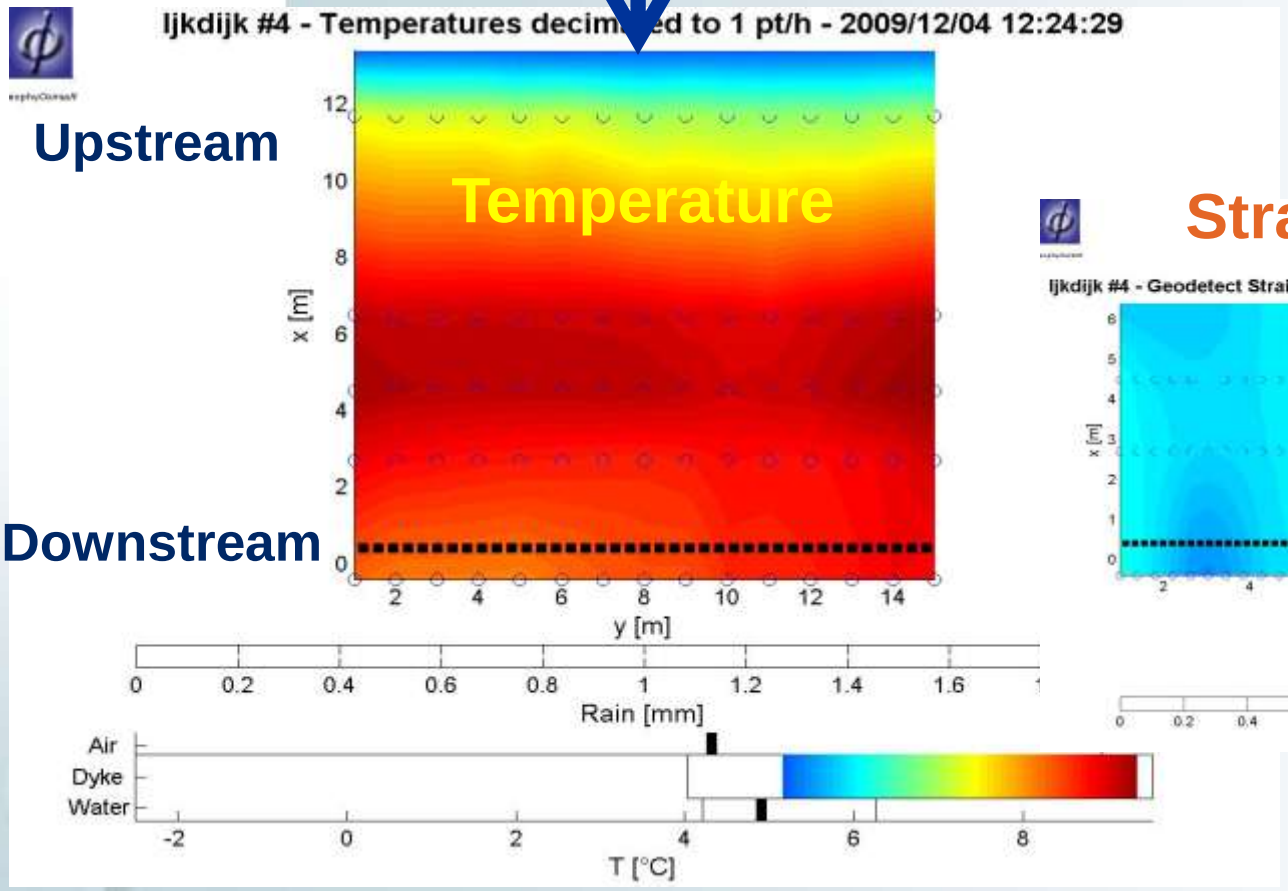
top view

waterflow



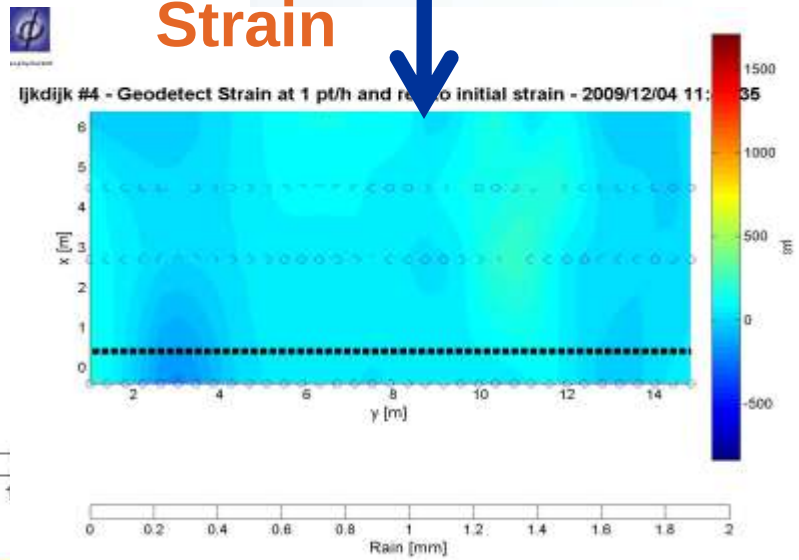
Upstream

Downstream



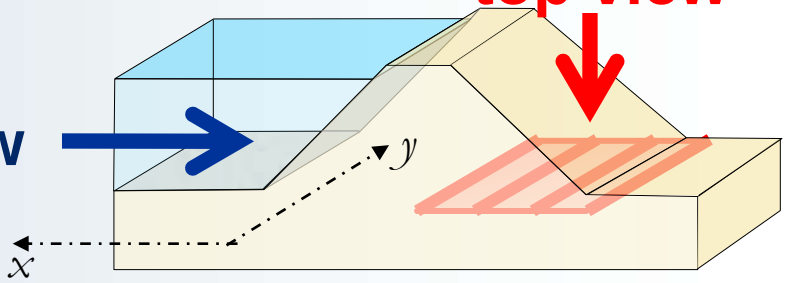
04/12/09 – 12:00

Strain



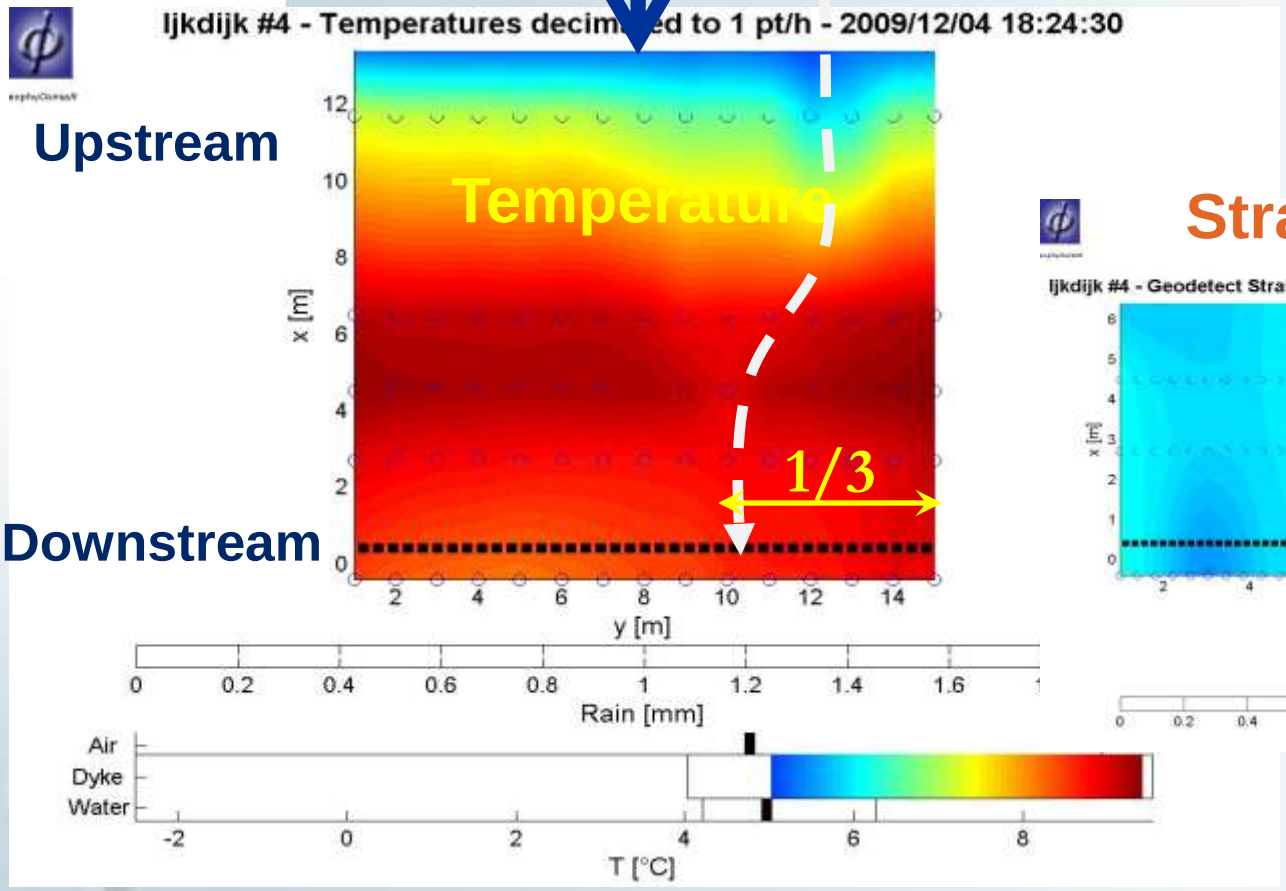
top view

waterflow



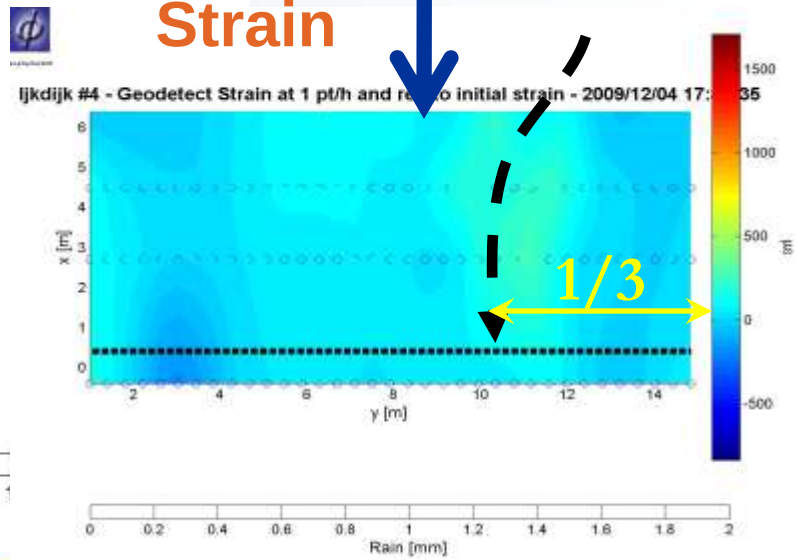
Upstream

Downstream



04/12/09 – 18:00

Strain

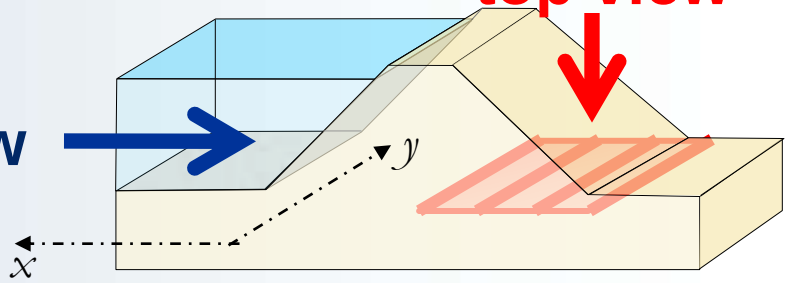


Collapse – 18 h

05/12/09 – 12:00

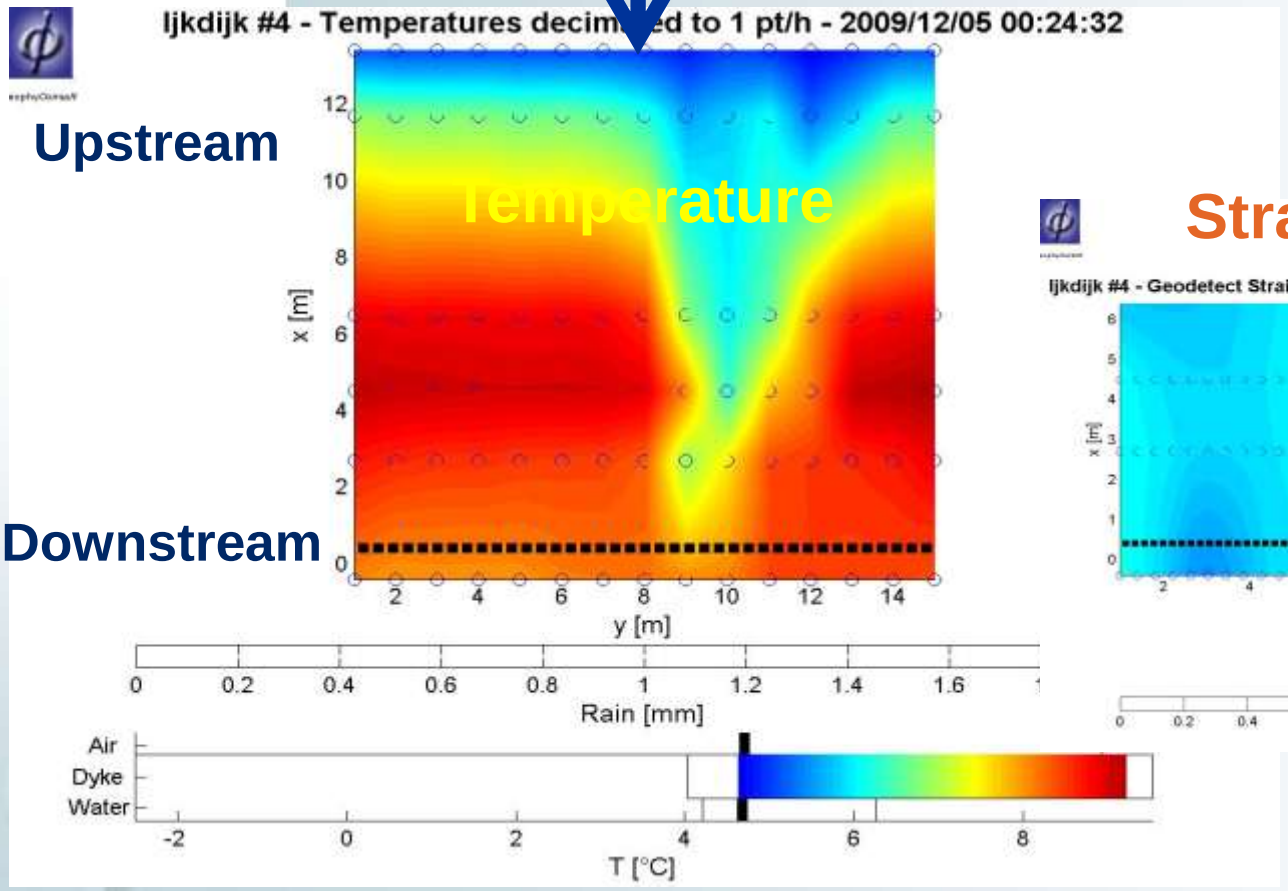
top view

waterflow



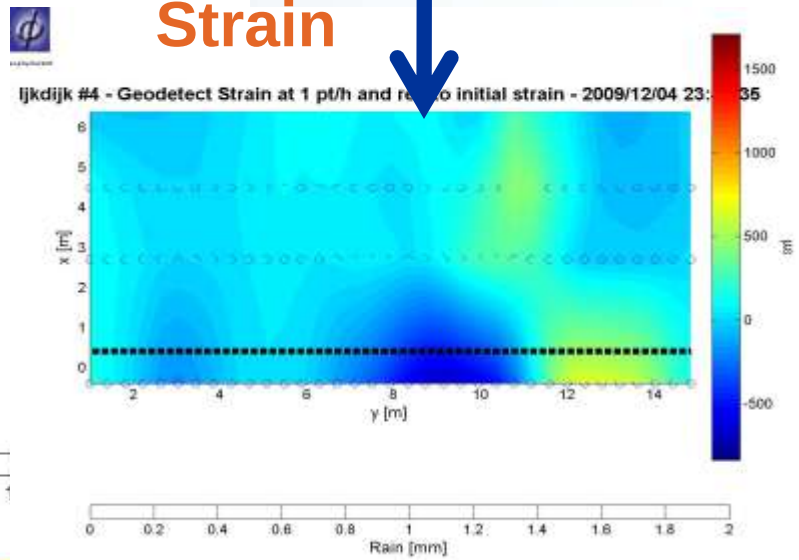
Upstream

Downstream



05/12/09 – 00:00

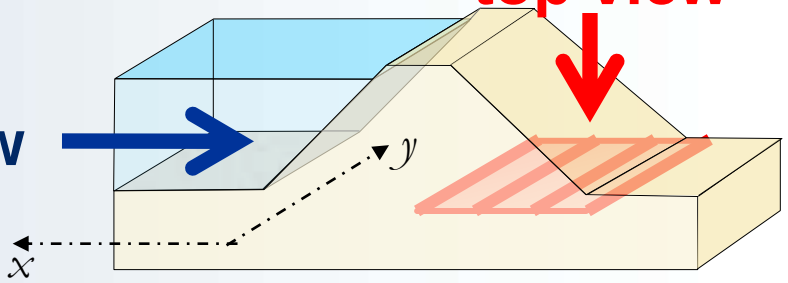
Strain



Collapse – 12 h
05/12/09 – 12:00

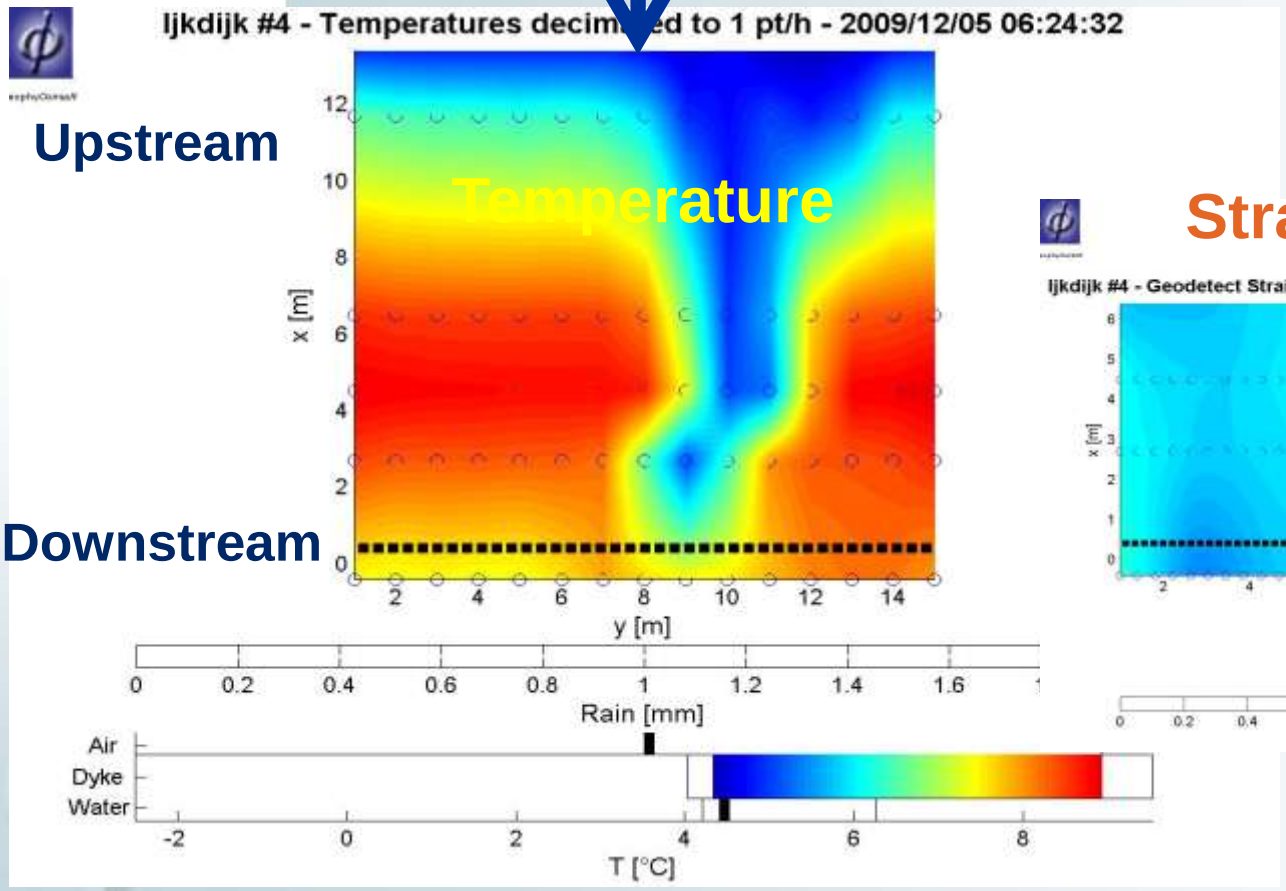
top view

waterflow



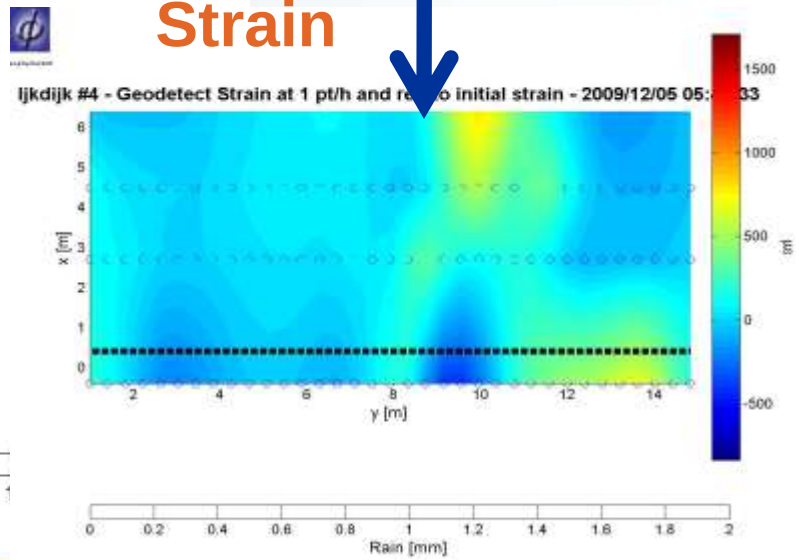
Upstream

Downstream



05/12/09 – 06:00

Strain

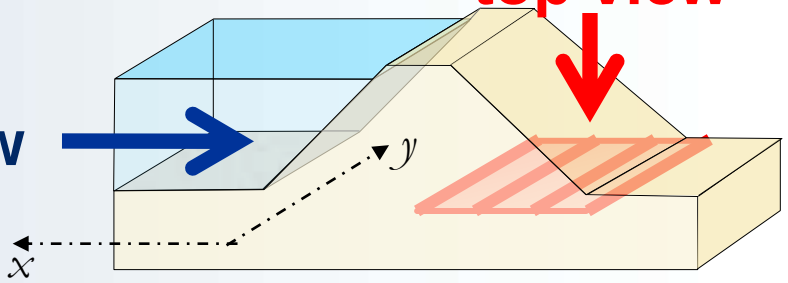


Collapse – 6 h

05/12/09 – 12:00

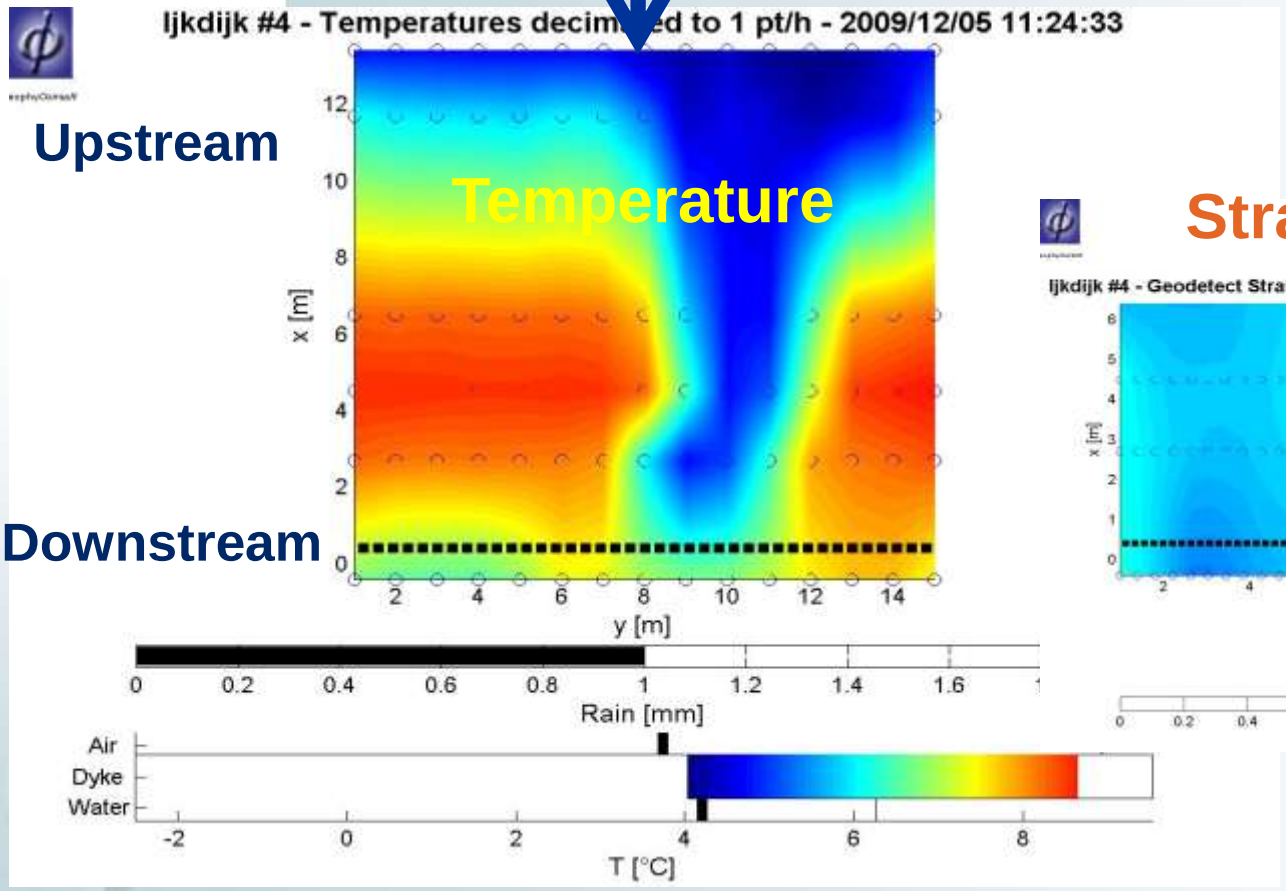
top view

waterflow



Upstream

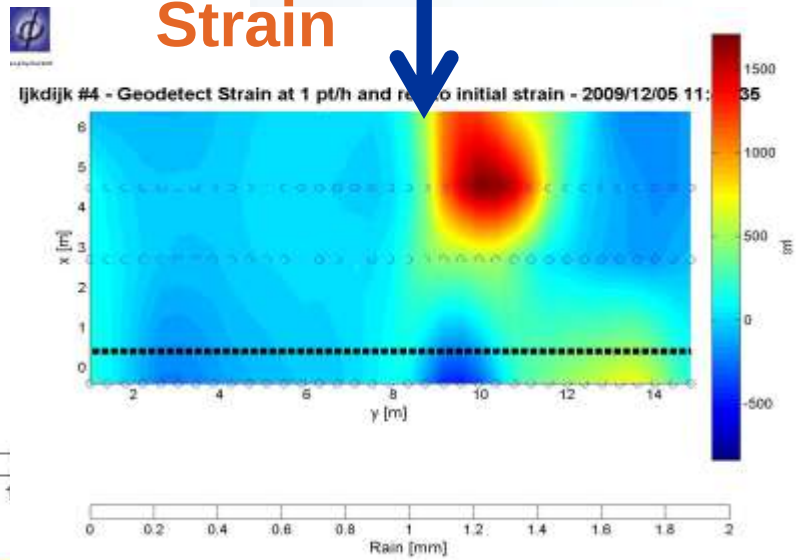
Downstream



Temperature

05/12/09 – 12:00

Strain



Collapse
05/12/09 – 12:00

Examples

1. Experimental dike : Ijkdijk piping (NL)

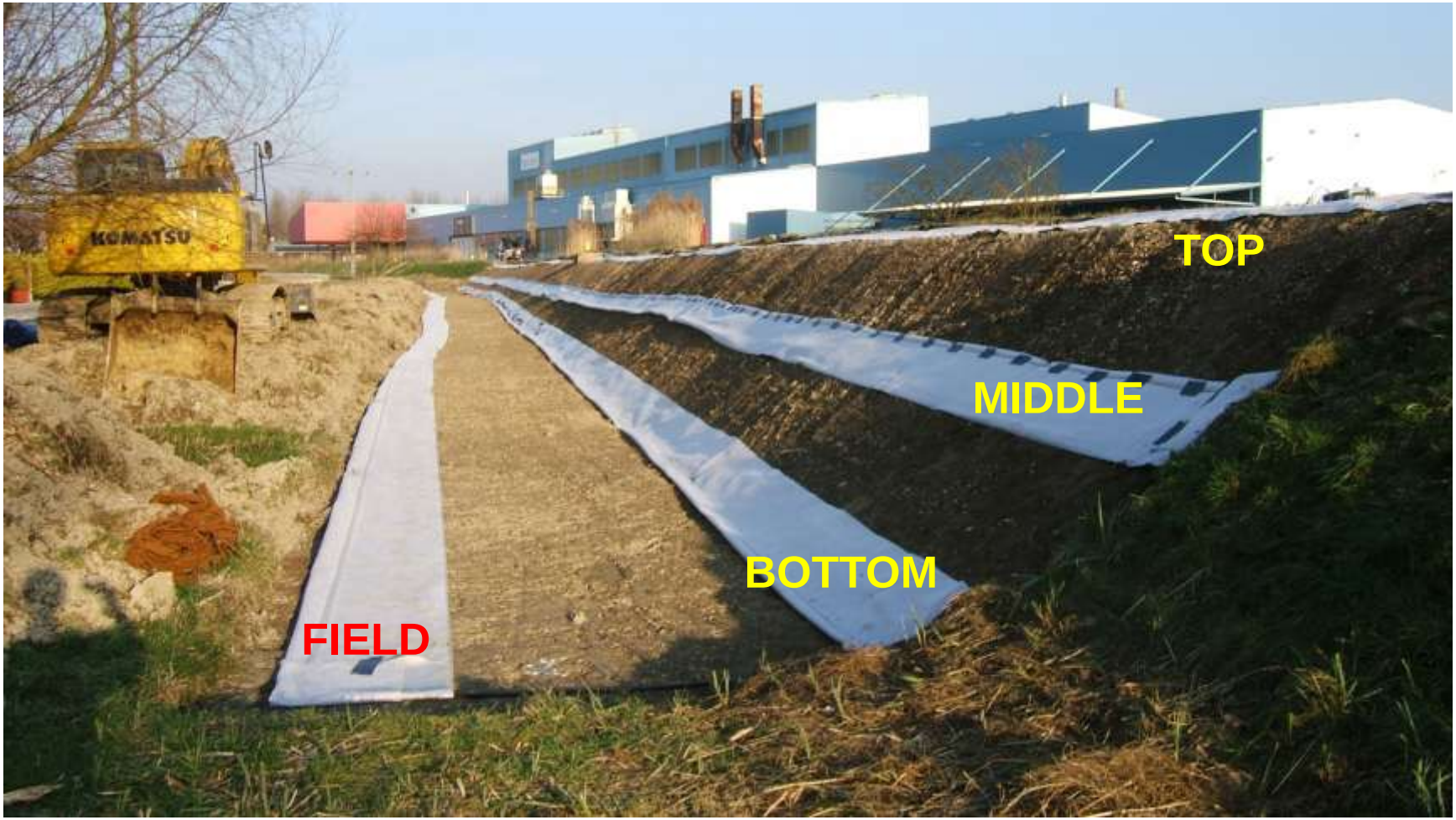
2. Canal dike (Marne to Rhine) (F)

Marne to Rhine canal dike (F)

Marne to Rhine canal dike (F)

Marne to Rhine canal dike (F)

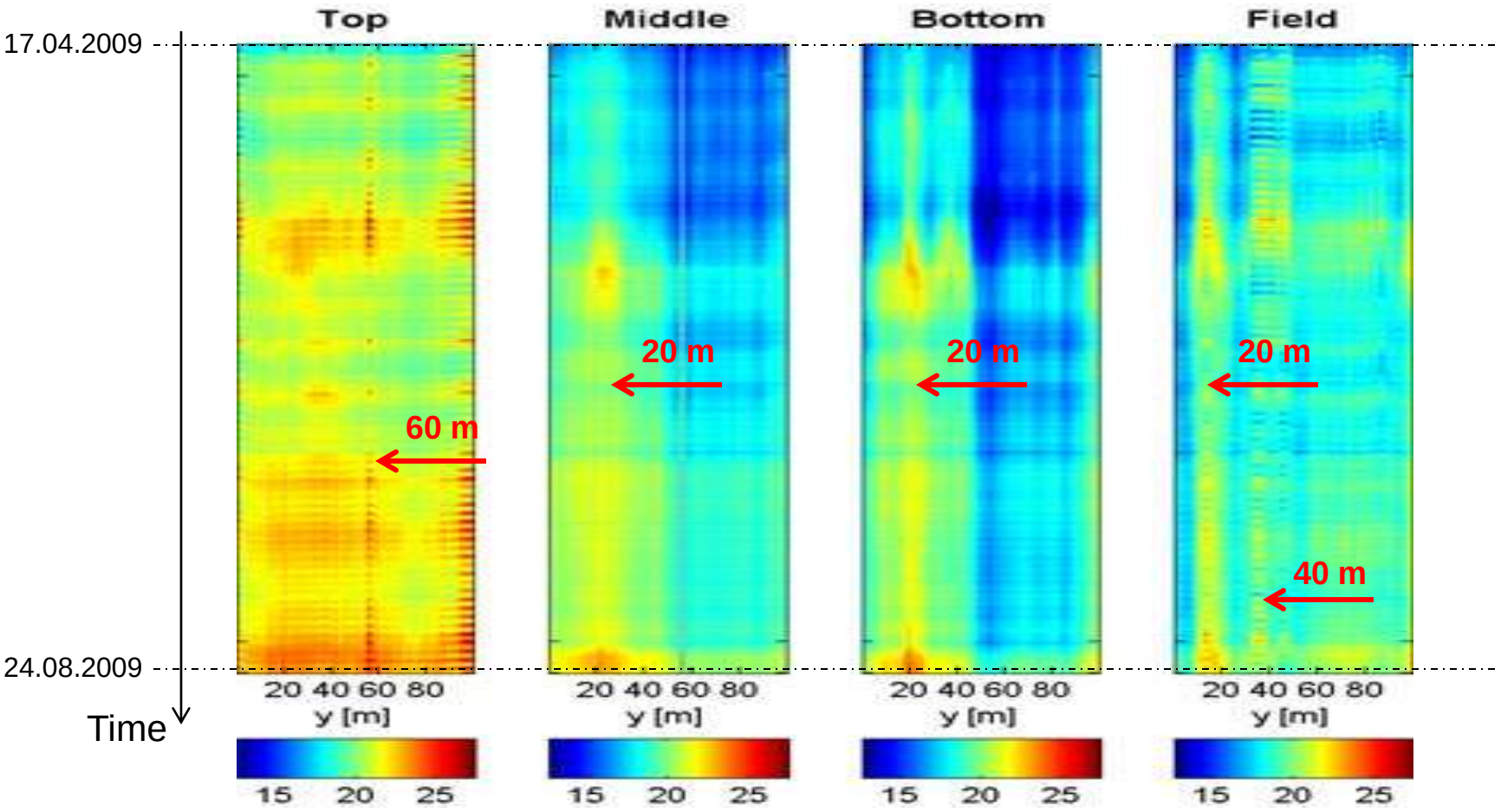
Marne to Rhine canal dike (F)



Marne to Rhine canal dike (F)

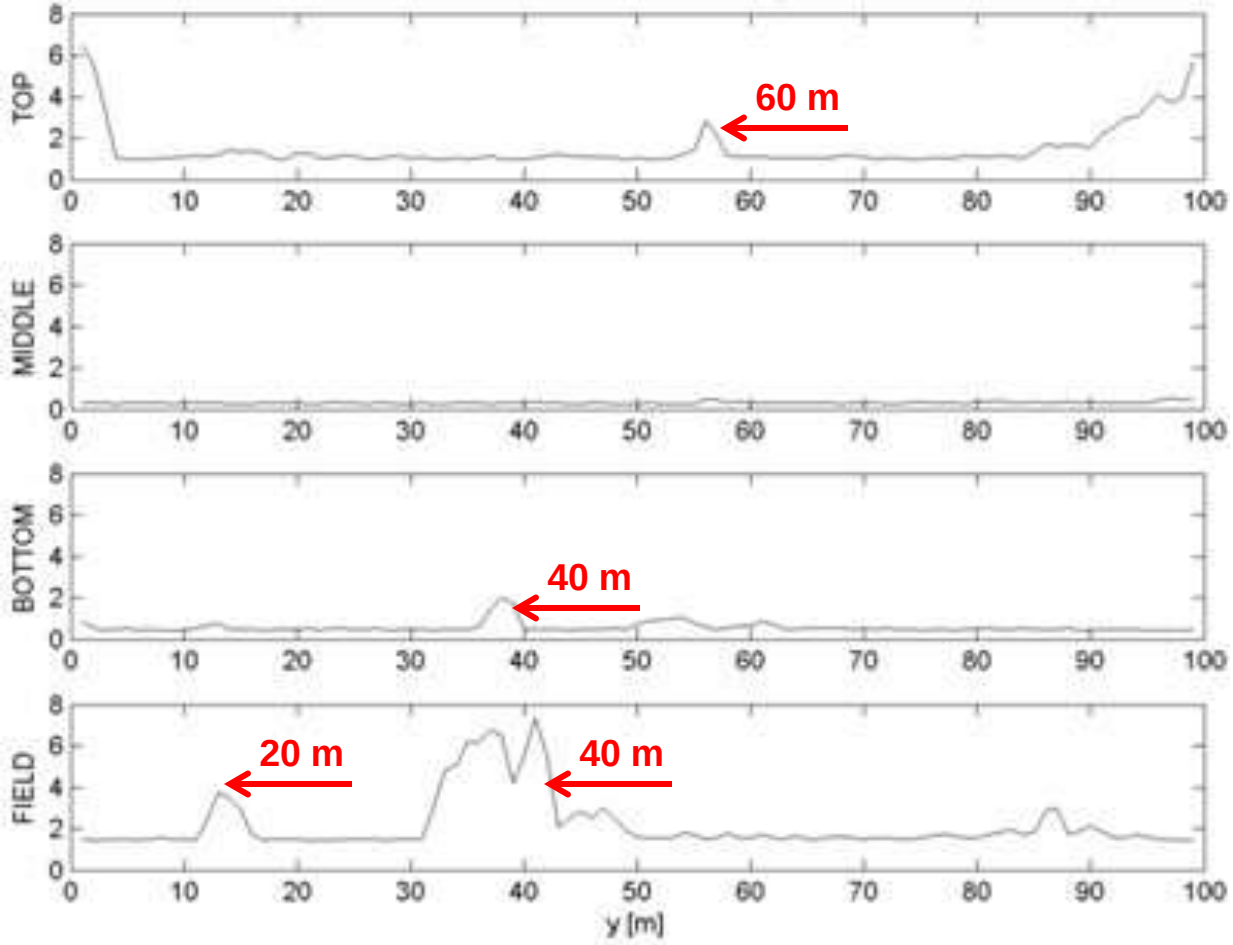
Marne to Rhine canal dike (F)

Raw temperature data



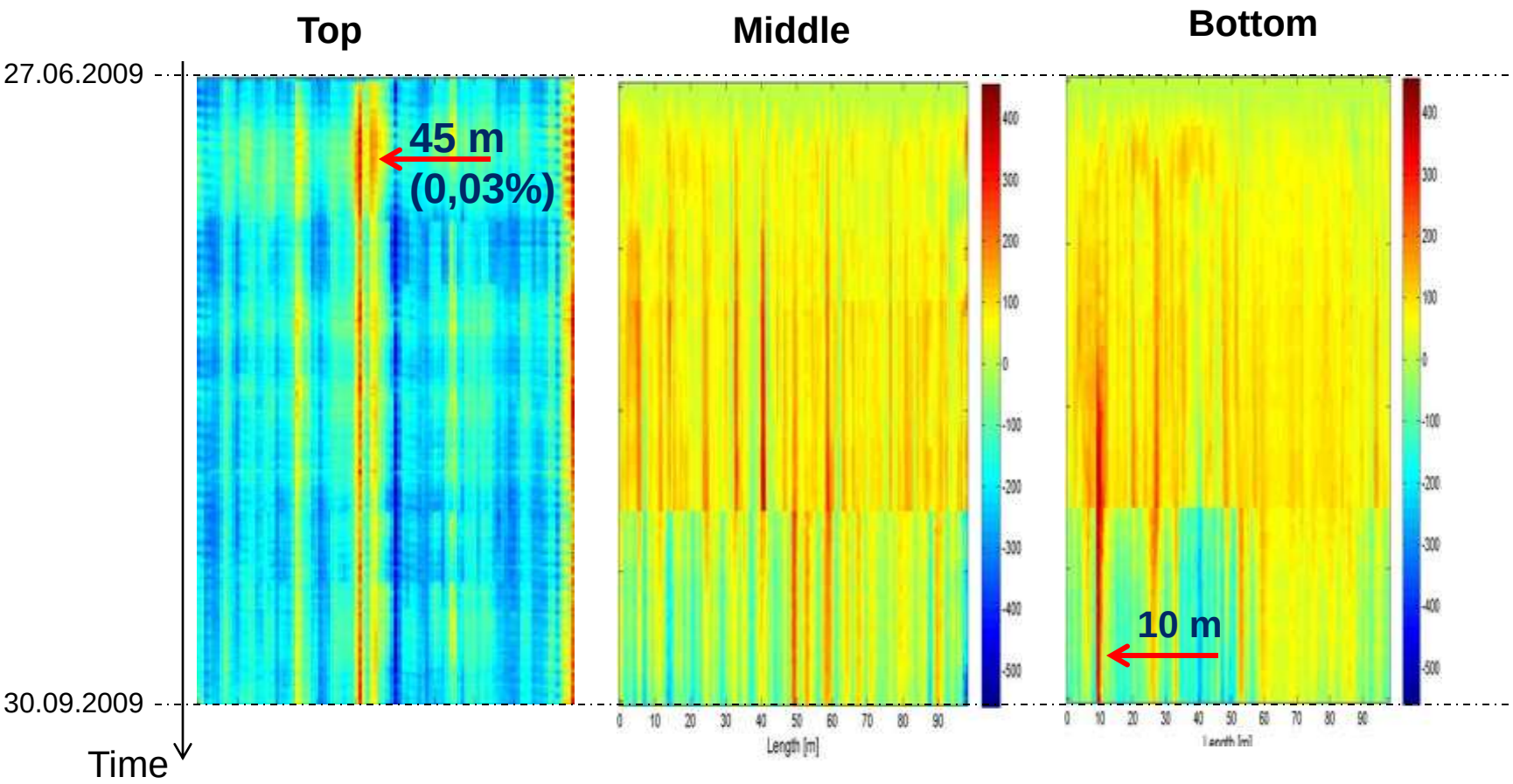
Marne to Rhine canal dike (F)

Processed temperature data on 25.04.2009 – eDF models



Marne to Rhine canal dike (F)

Raw strain data



TENCATE GeoDetect

Conclusions

- The fiber optic sensor technology is accurate, reliable, durable and fit the need to monitor long distance hydraulic works
- The fiber optic sensor-enabled geotextile combines strain/movement and temperature/leakage monitoring, helpful for scour erosion detection

Thank you for your attention