POLITECNICO DI MILANO

European Sediment Network





An hydraulic monitoring system on a Bridge over river Po

8th International SedNet conference, 6-9 November 2013, Lisbon (Portugal)

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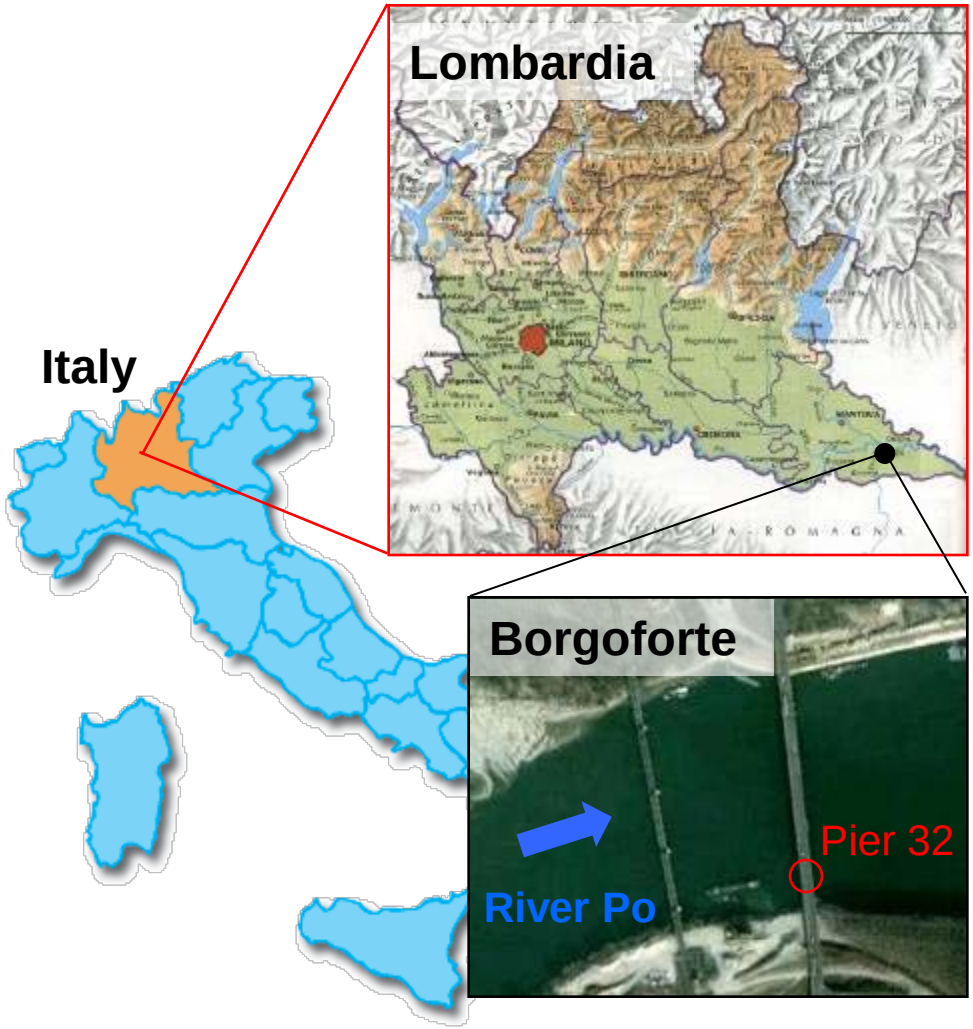
The Monitoring system location

Monitoring system is working from March 2011



The Monitoring system location

Monitoring system is working from March 2011

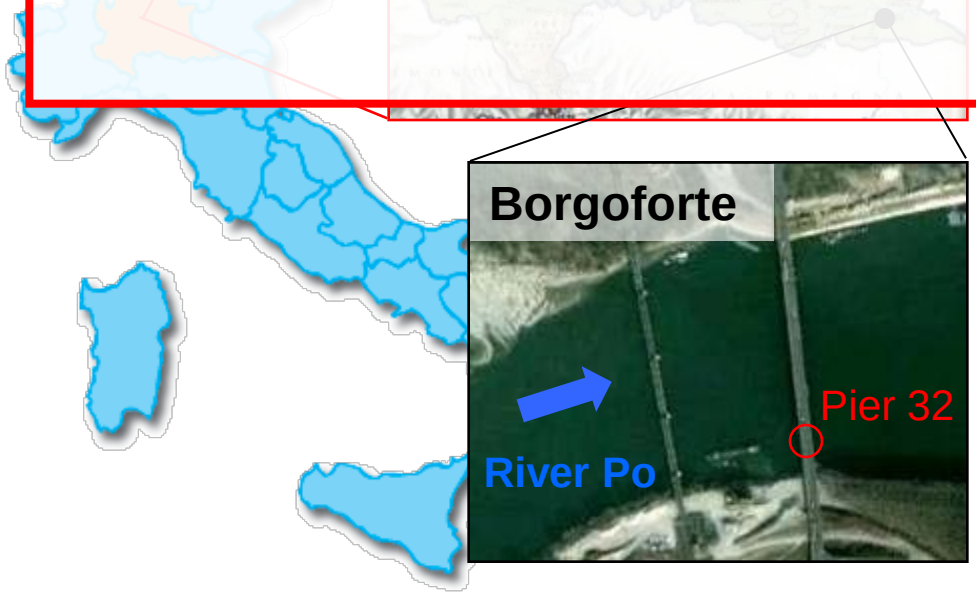
Reference (bankfull) values:

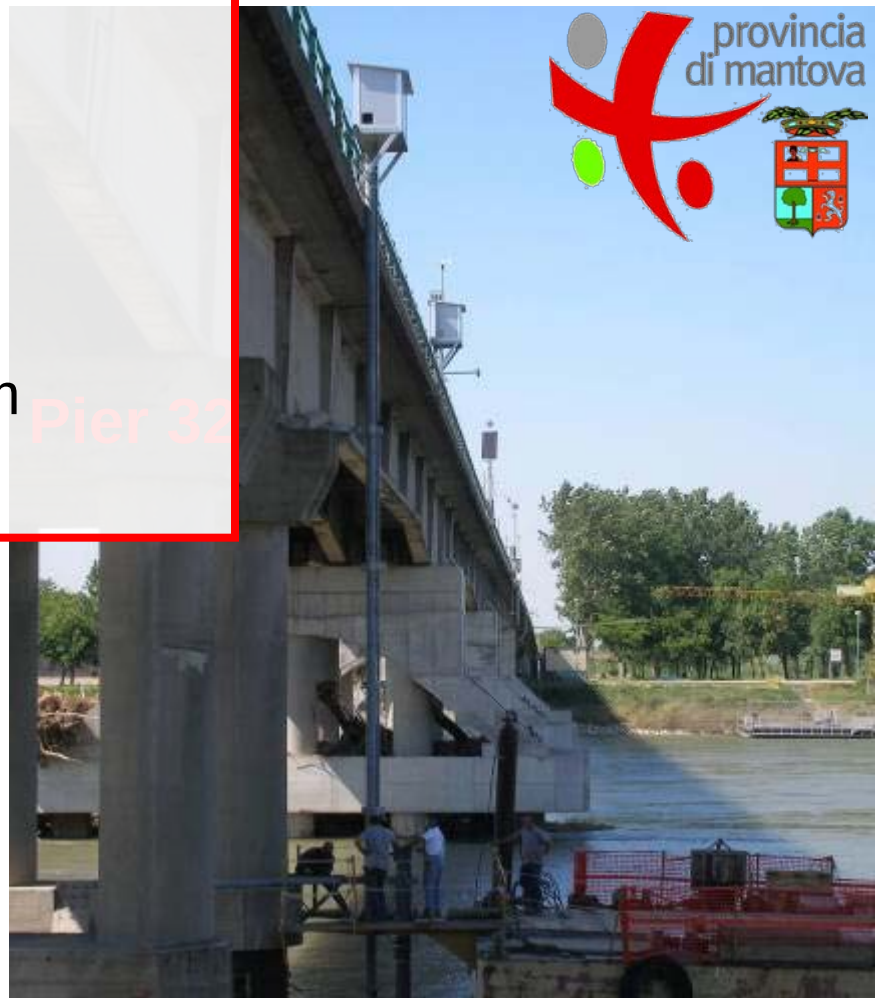
Depth = 16 m

Velocity = 4.5 m/s

Width = 300 m

Expected scour / degradation > 15 m





Goals of the project

1) Define the Bridge loads

- *Wind drag force*
- *Water drag force*
- *Traffic forces*

2) Define others additional phenomena

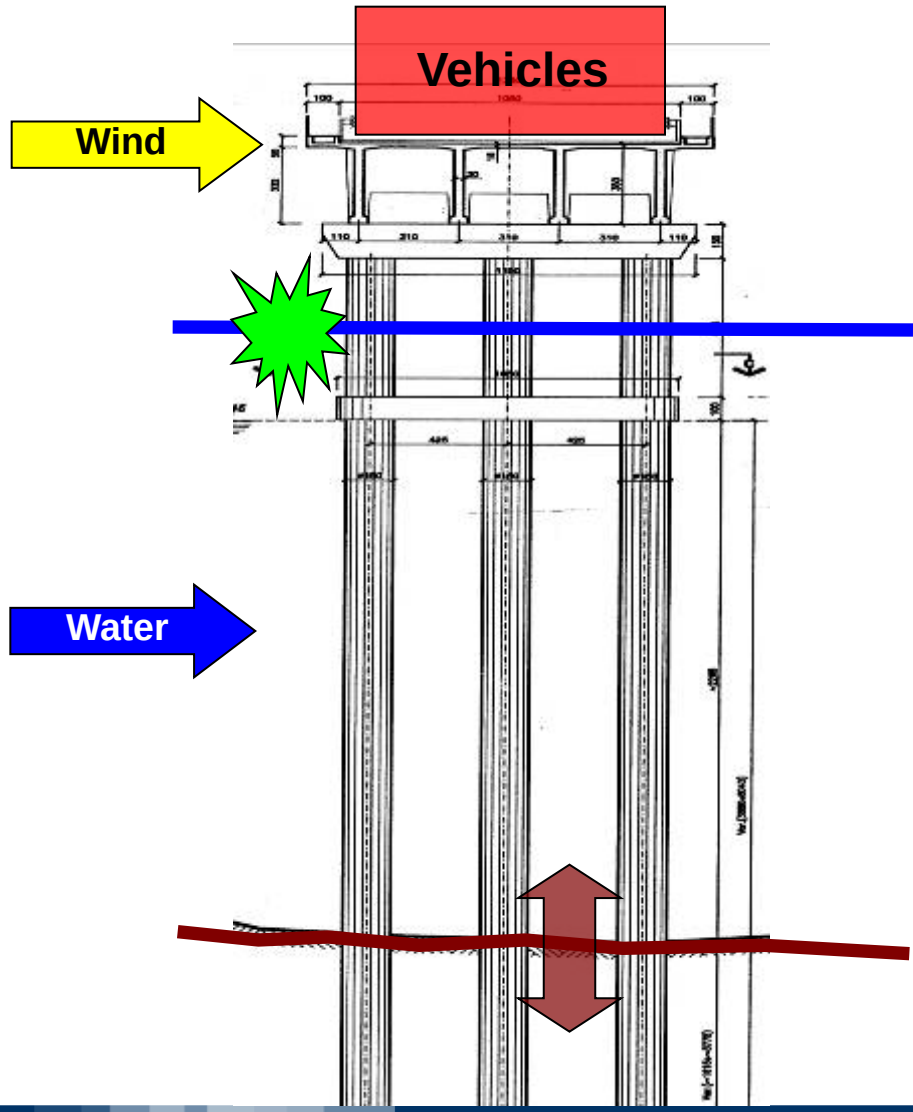
- *Scour around pier*
- *Trapped debris upstream the pier*

3) Define monitoring system configuration

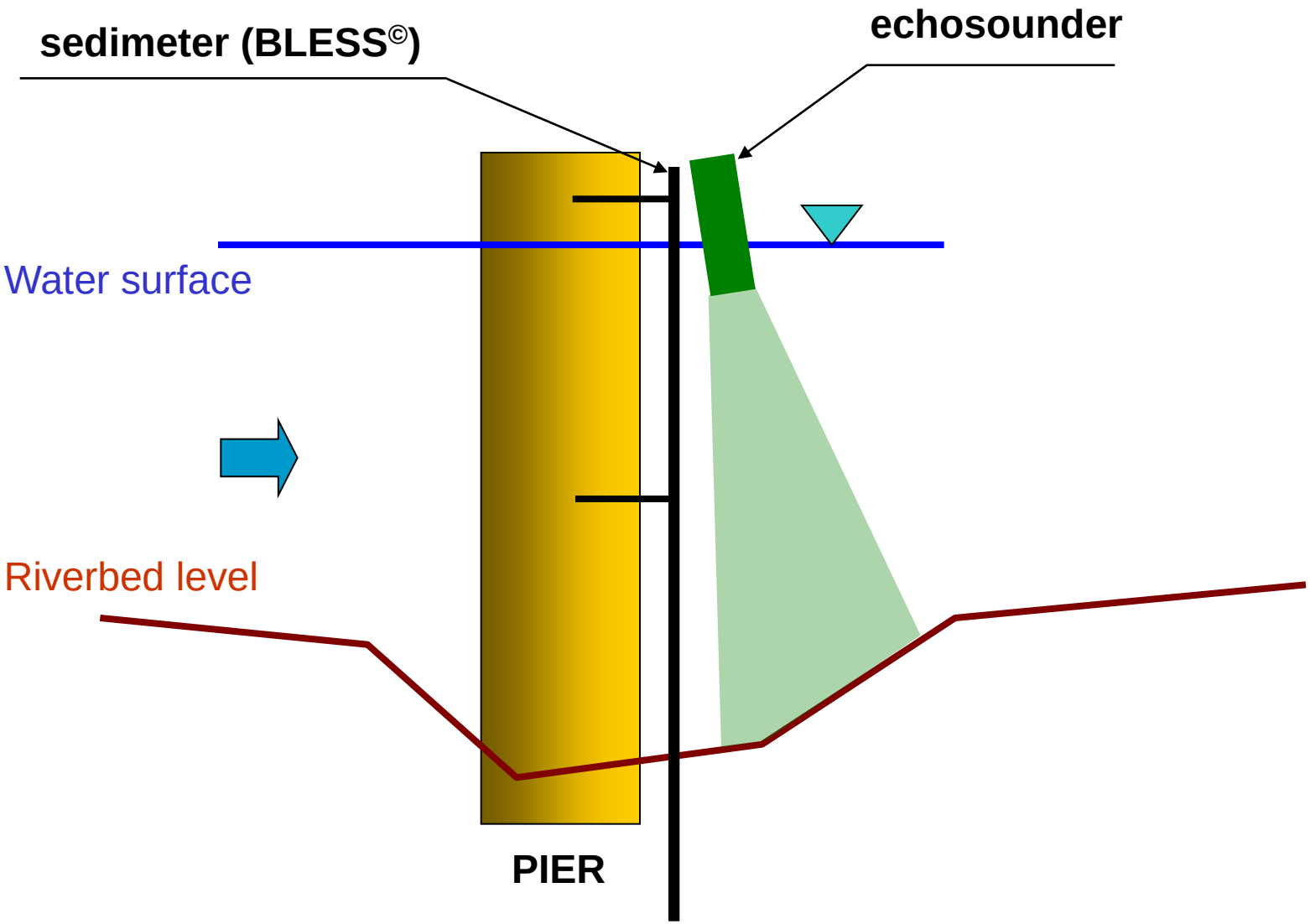
4) Define structural model of the pier

5) Evaluate the safety factor of the pier

6) Define the management plans

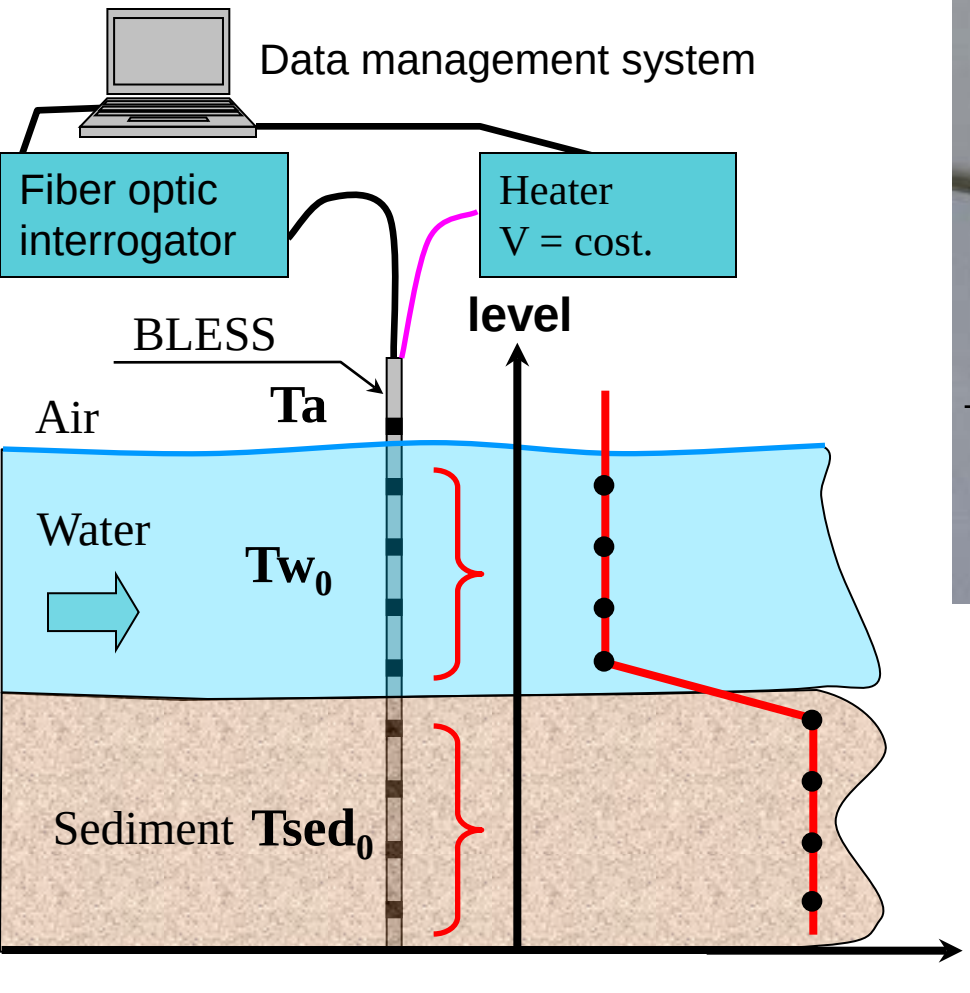


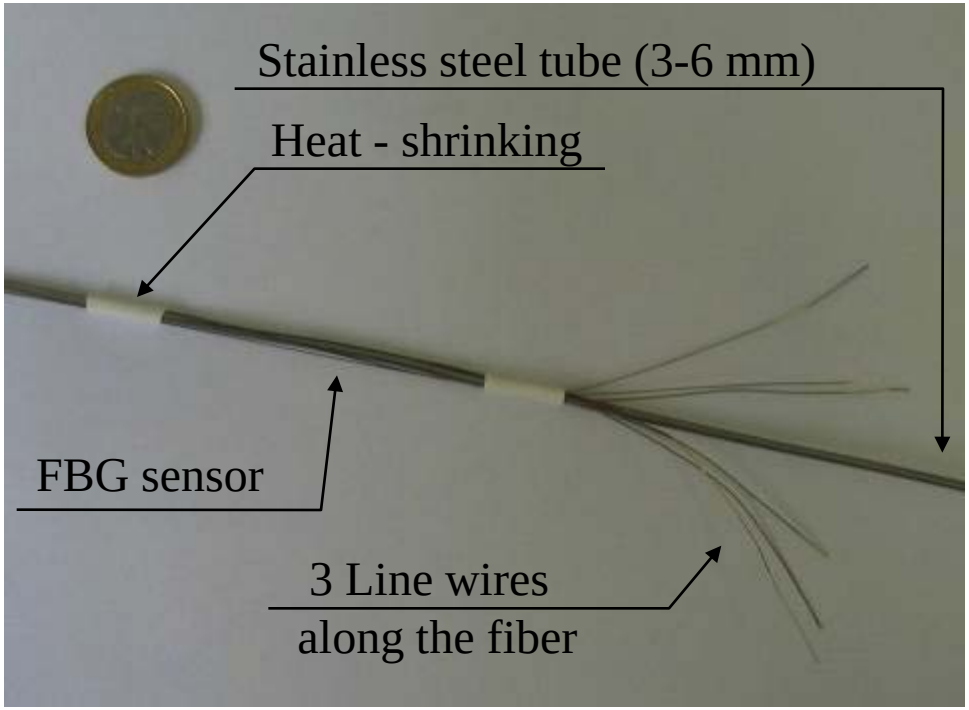
BLESS© (Bed LEvel Seeking System)



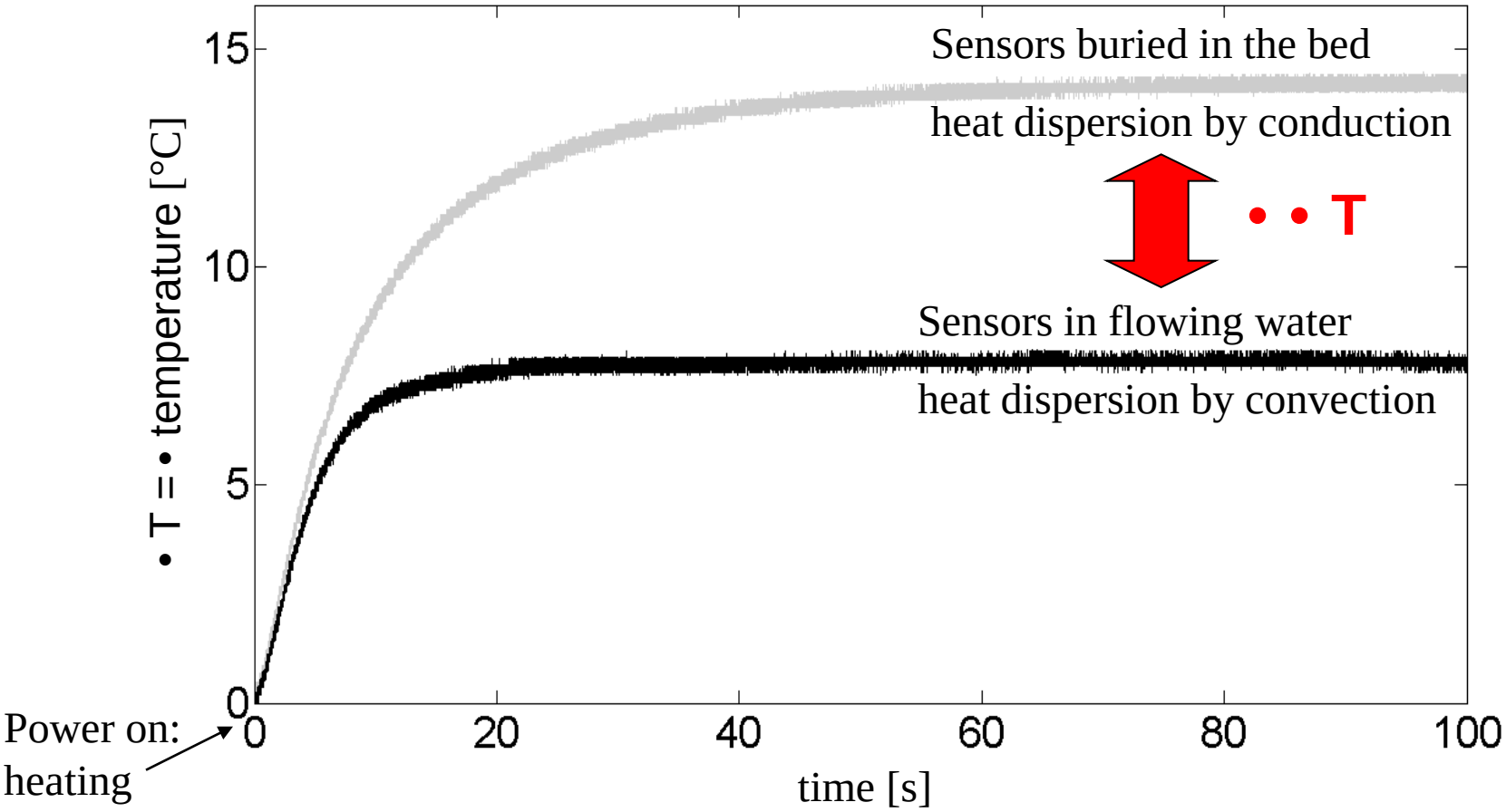
BLESS© → How does it works?

example layout of the monitoring system



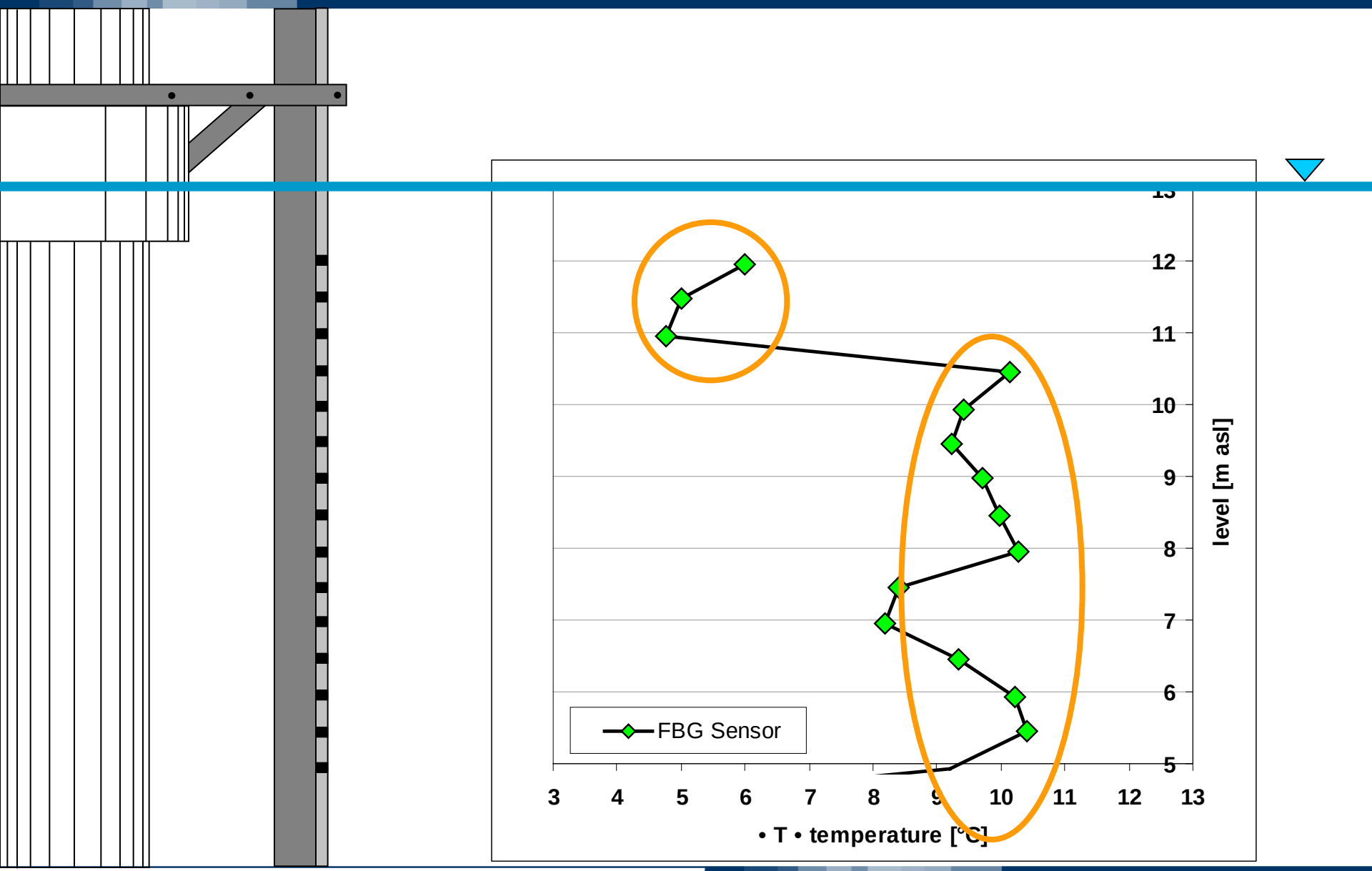


BLESS© → Sensor response

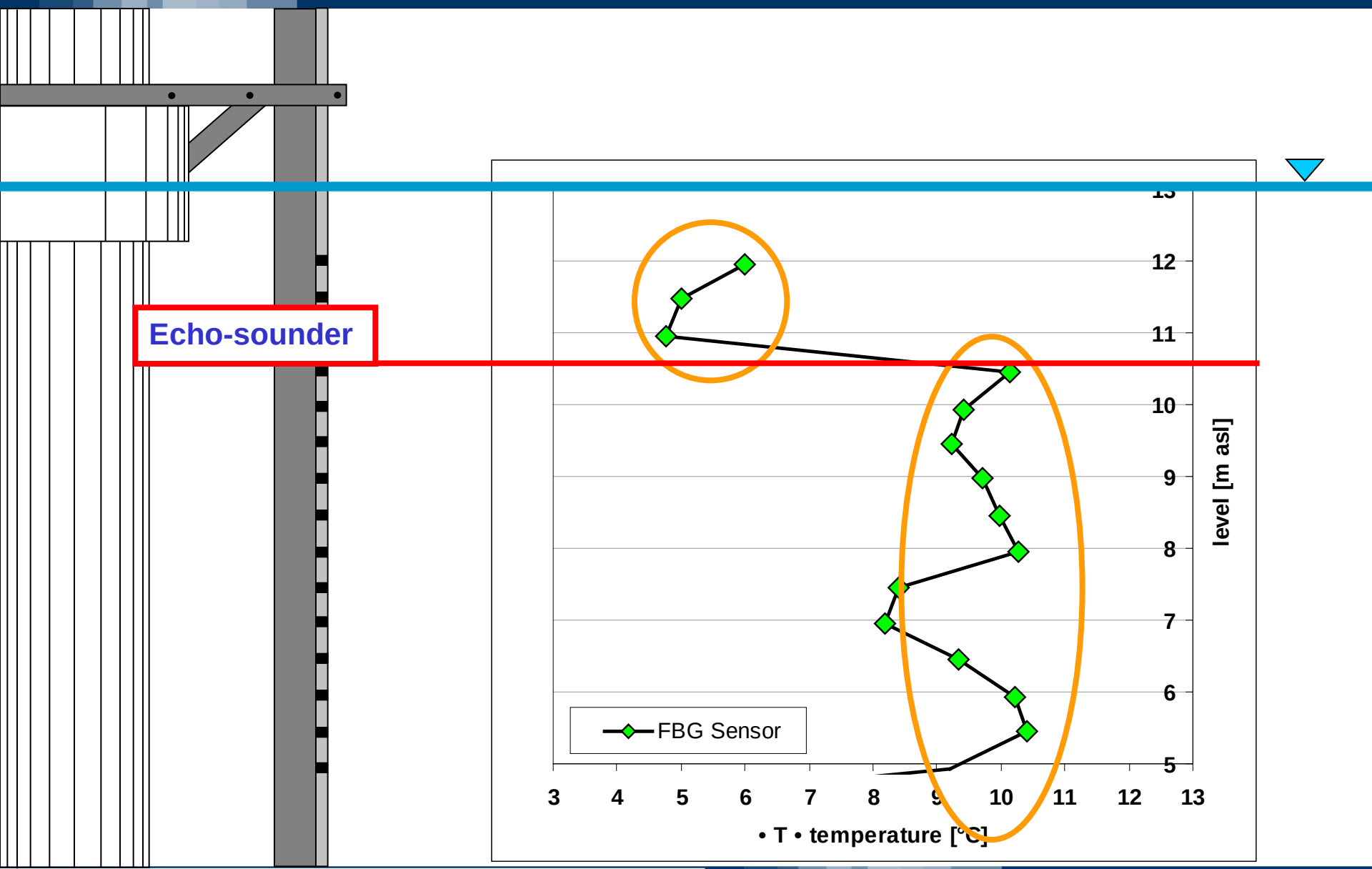


Laboratory results

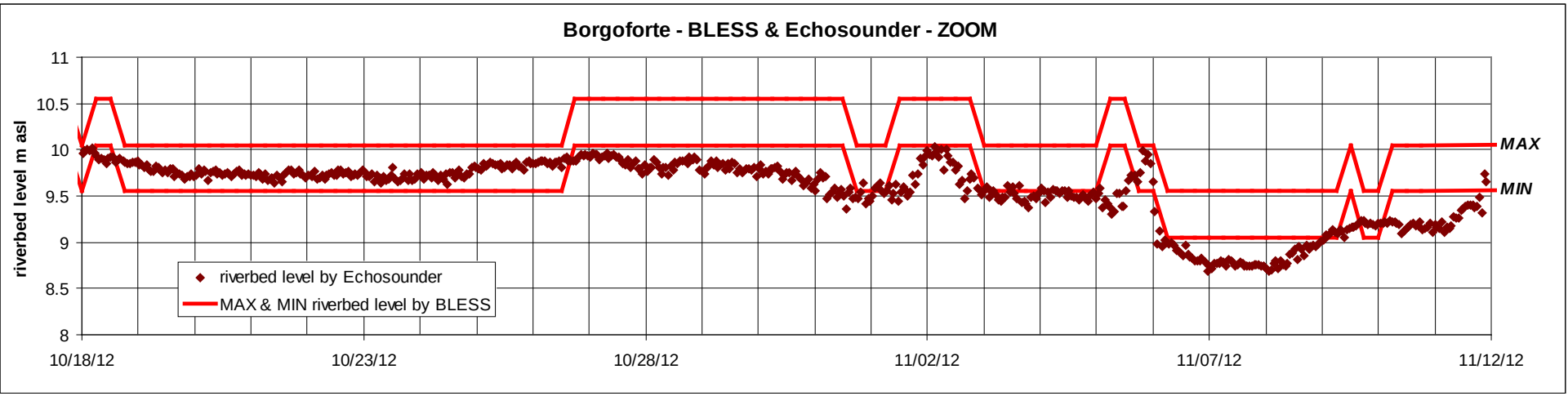
BLESS© → Sensor response



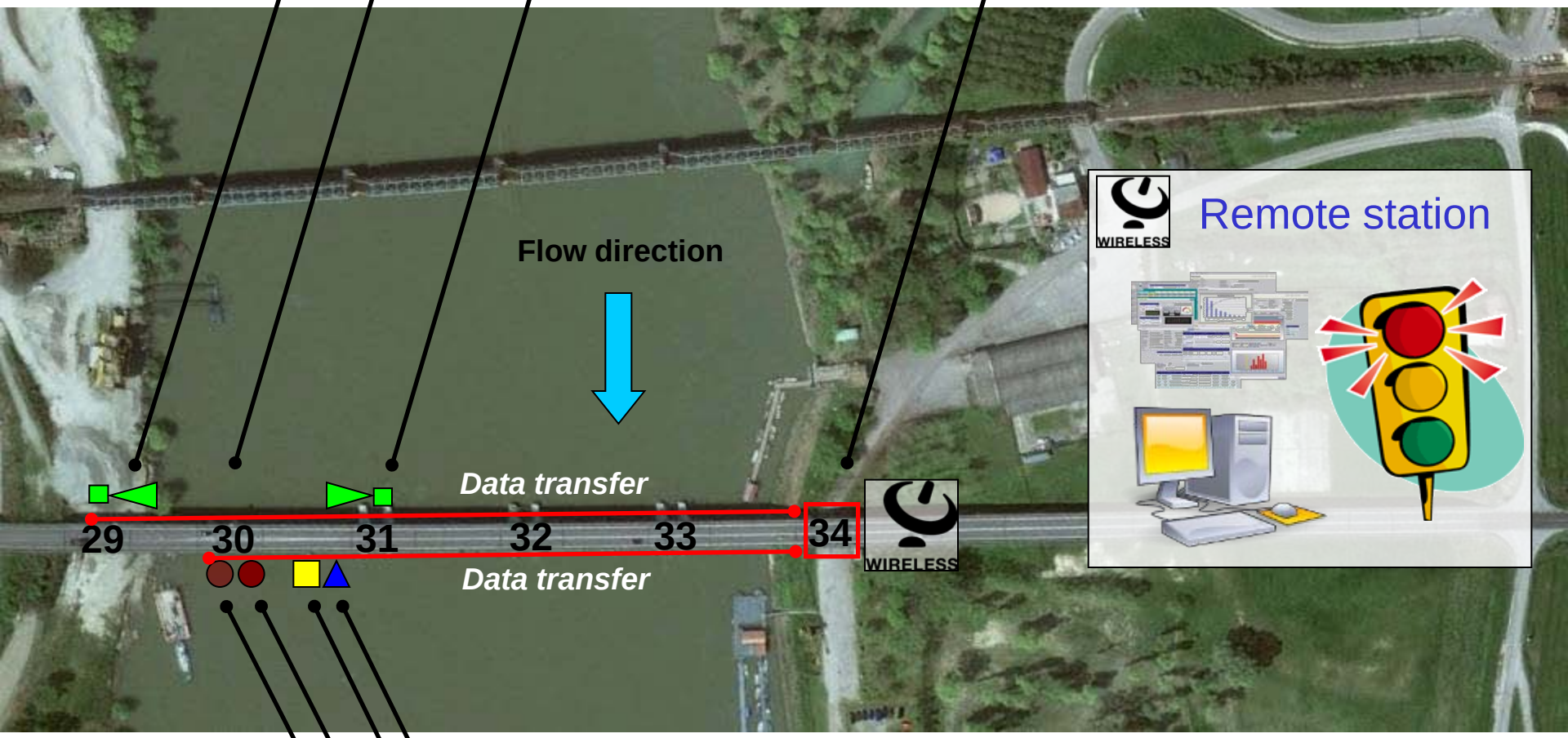
BLESS© → Sensor response



BLESS© vs Echo-sounders



The Monitoring system configuration



From monitoring to safety factor

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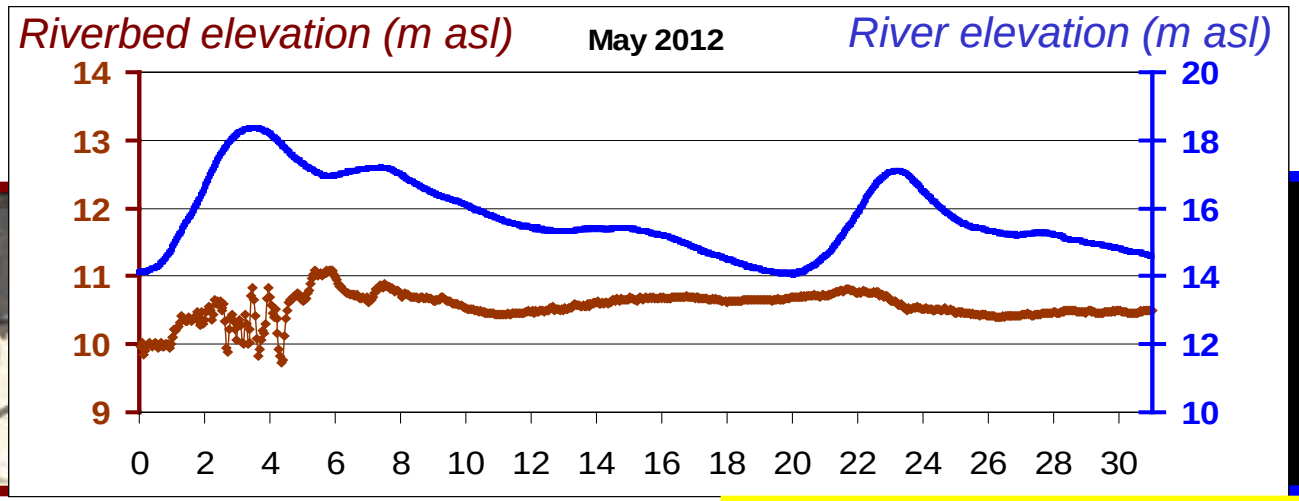
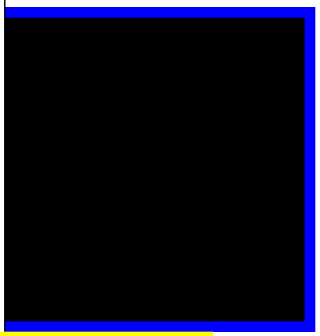
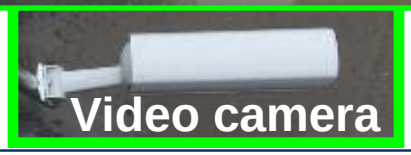
Monitoring → Loads → Structure → Safety factor

Echo-sounder

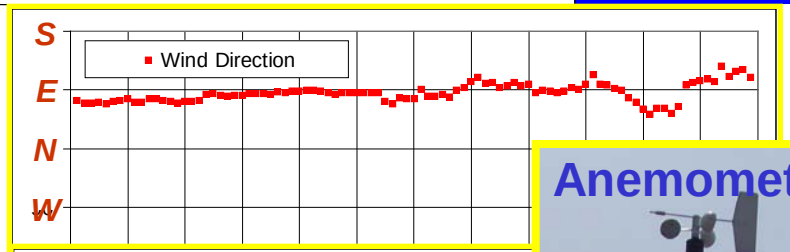


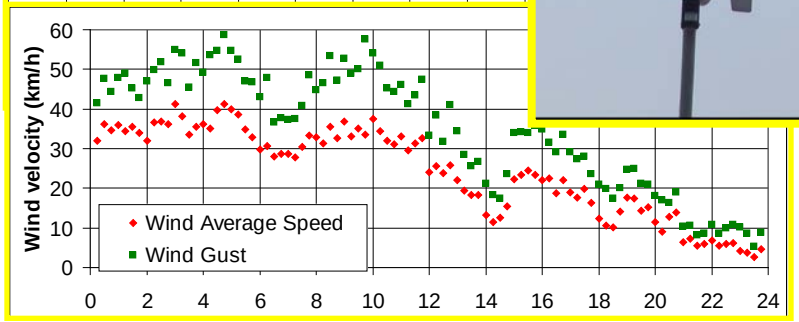
Hydrometer





Video camera





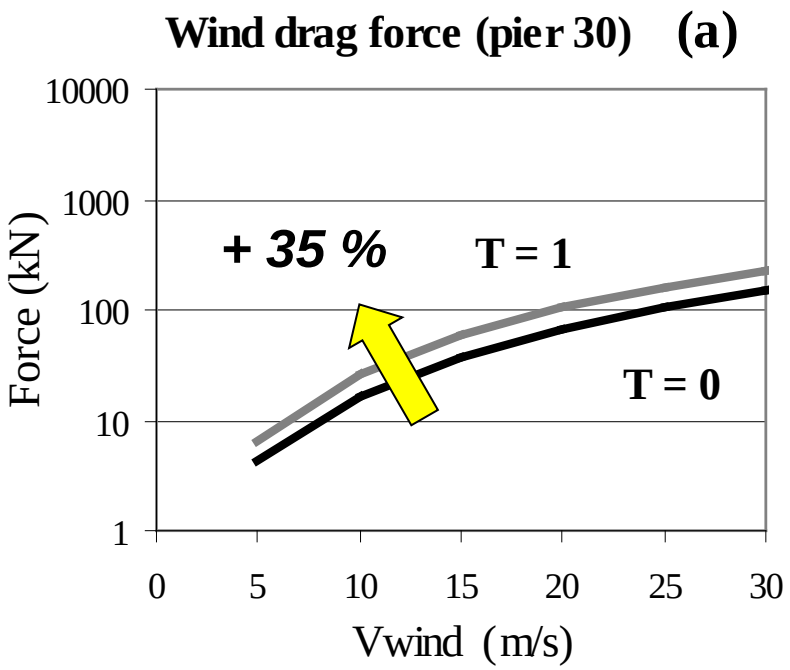
Anemometer

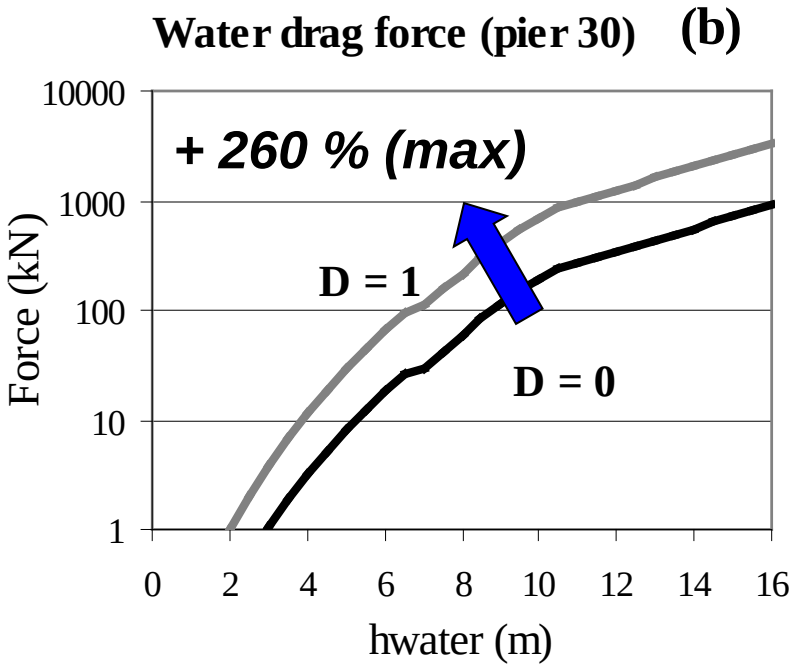
From monitoring to safety factor

Monitoring → **Loads** → Structure → Safety factor

Wind → $F_w=f(V_w,T)$

Water → $F_{wa}=f(h_{wa},D)$





From monitoring to safety factor

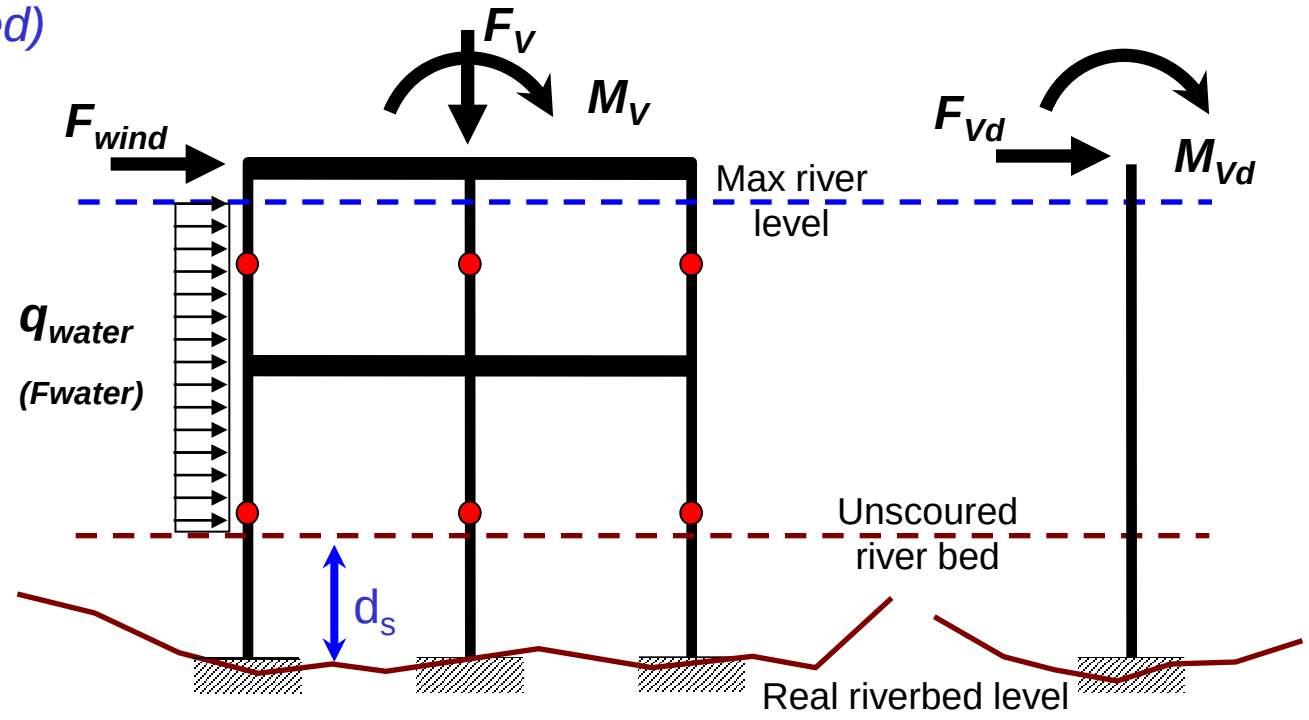
Monitoring → Loads → **Structure** → Safety factor

Wind → $F_w=f(V_w,T)$

Water → $F_{wa}=f(h_{wa},D)$

(Pier weight is also included)

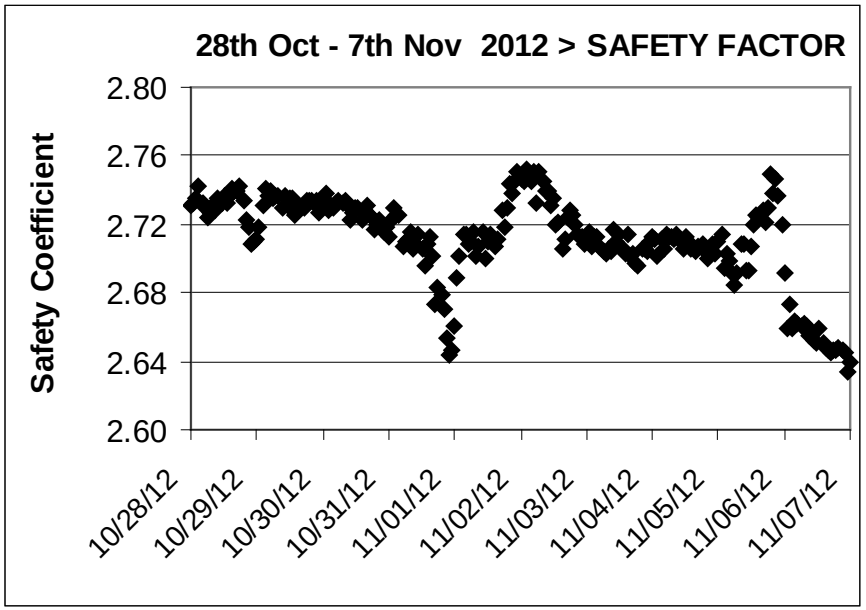
Vehicles
- Weight → $F_V=f(T)$, $M_V=f(T)$
- Deceleration → $F_{Vd}=f(T)$, $M_{Vd}=f(T)$



Total actions = f (V_w, h_{wa}, d_s, T, D)

From monitoring to safety factor

Monitoring → Loads → Structure → **Safety factor**



… conclusions and next steps

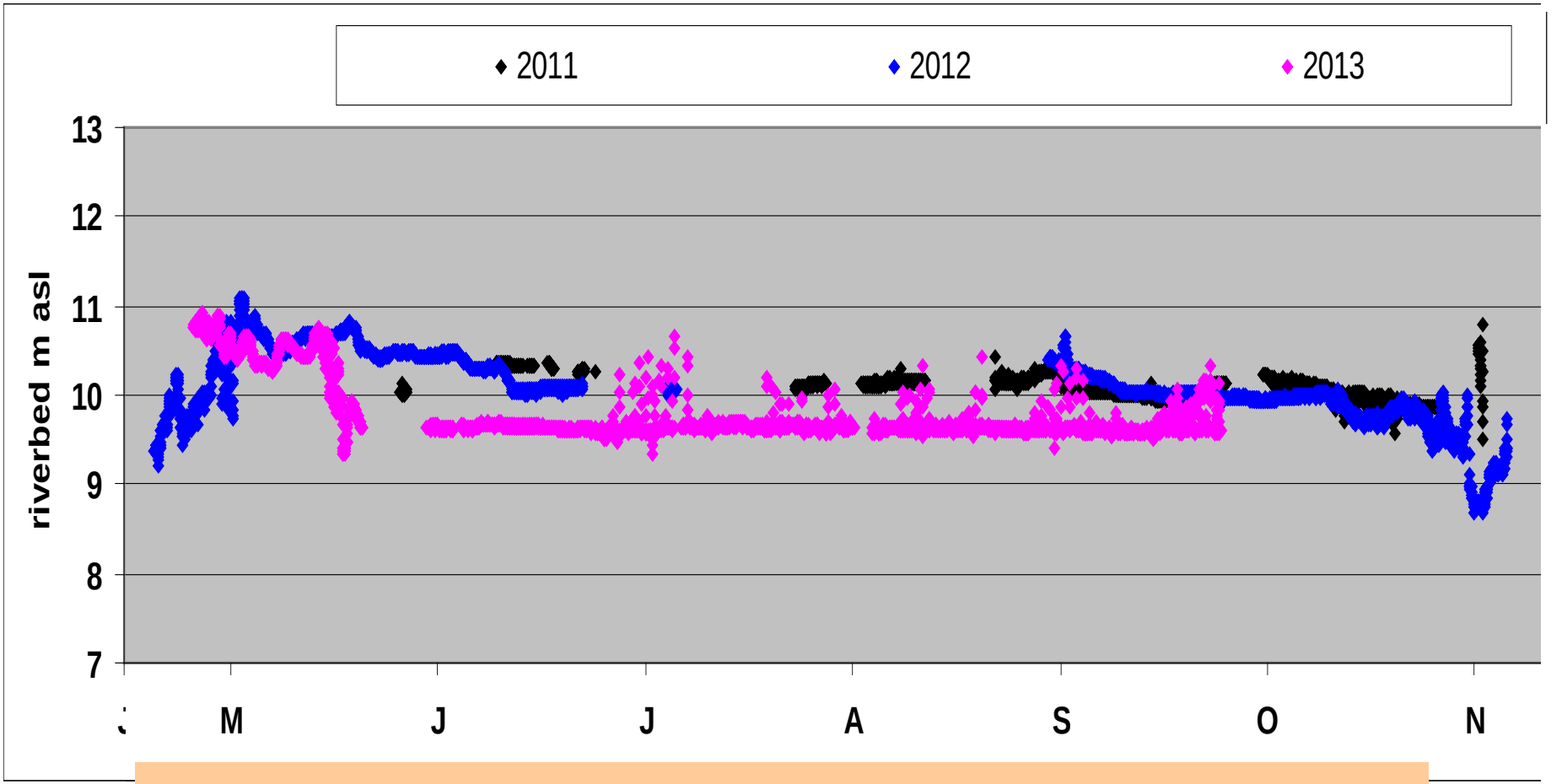
GLOBAL TARGET: ACHIEVED (system works!)

CRITICALITIES: BED LEVEL

- we cannot robustly forecast it
- measurements not standard

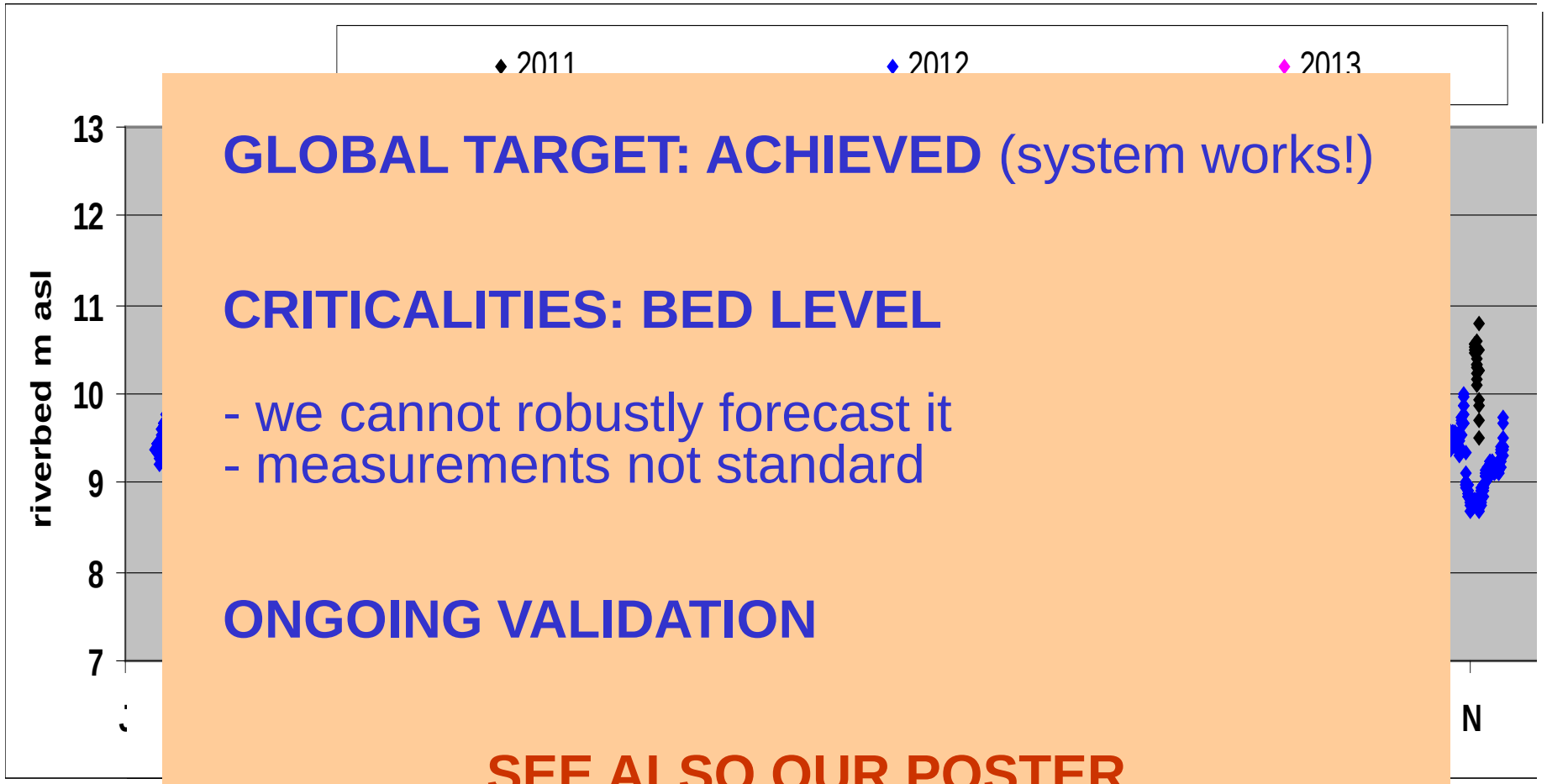
ONGOING VALIDATION

From 2011 to 2013: bed level



ONGOING VALIDATION

… conclusions and next steps



GLOBAL TARGET: ACHIEVED (system works!)

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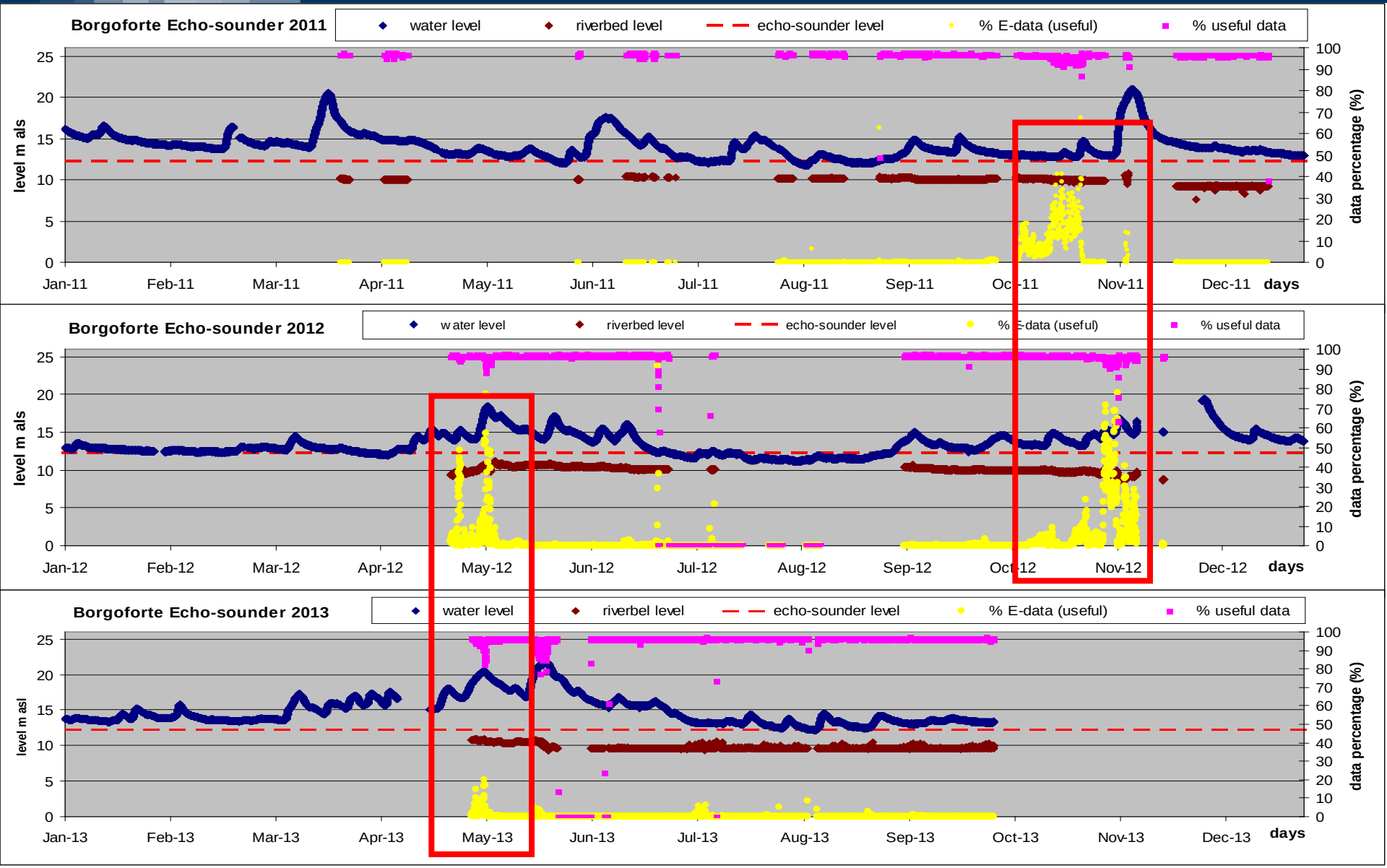
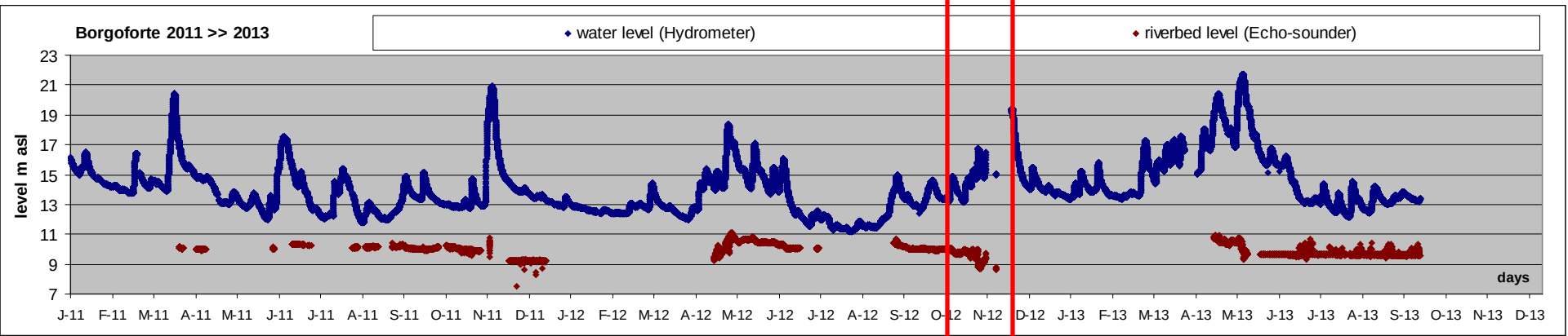
ONGOING VALIDATION

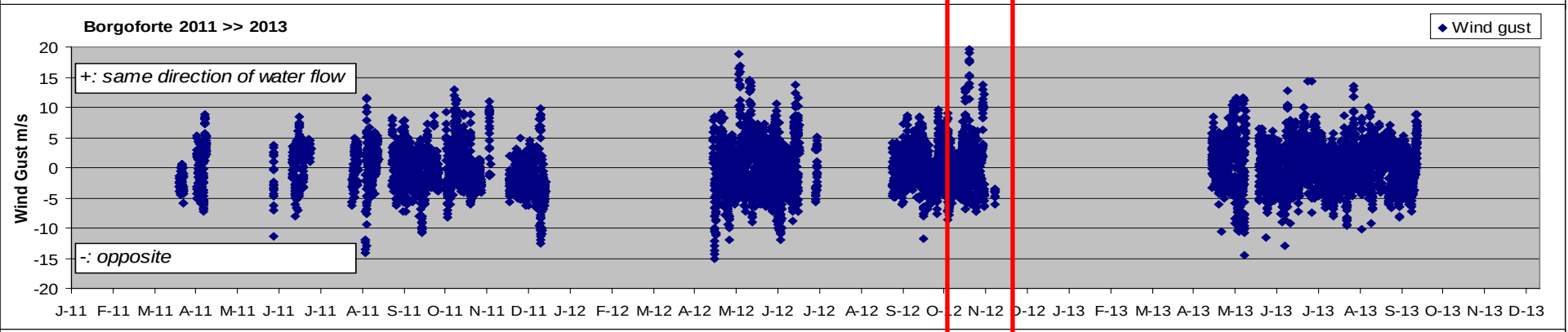
SEE ALSO OUR POSTER

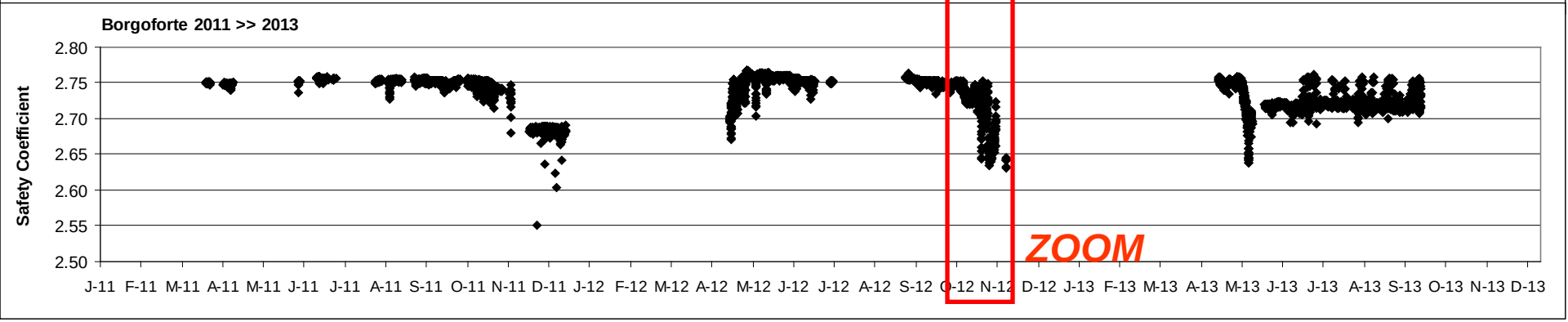
From 2011 to 2013: focus on Echo-sounder



From 2011 to 2013: parameters → safety factor







From 2011 to 2013: parameters → safety factor