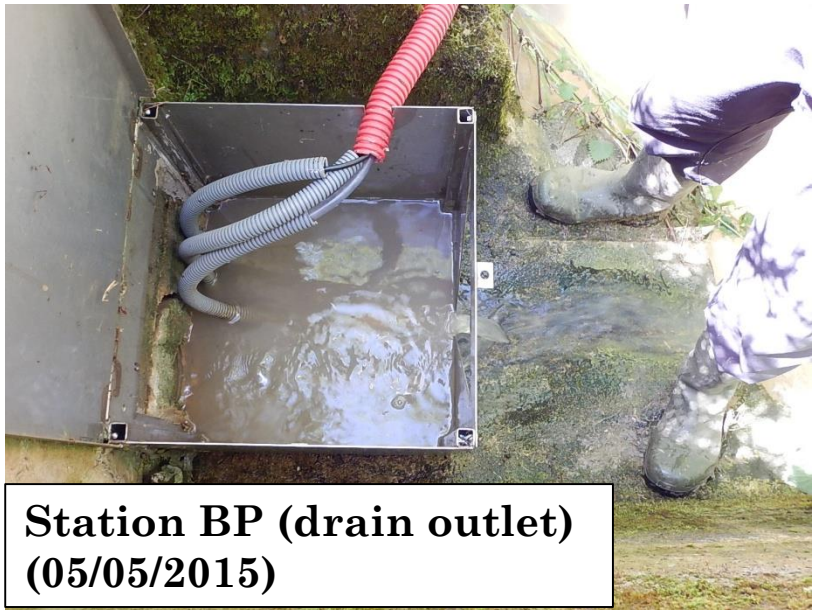
Monitoring and quantification of suspended-matter transfers in a drained plain agricultural catchment

Pierre VANHOOYDONCK, Louis MANIERE, Sébastien SALVADOR-BLANES, Anthony FOUCHER, Olivier CERDAN, Olivier EVRARD, Aurélia MATHIEU, Marc DESMET

CONTEXT

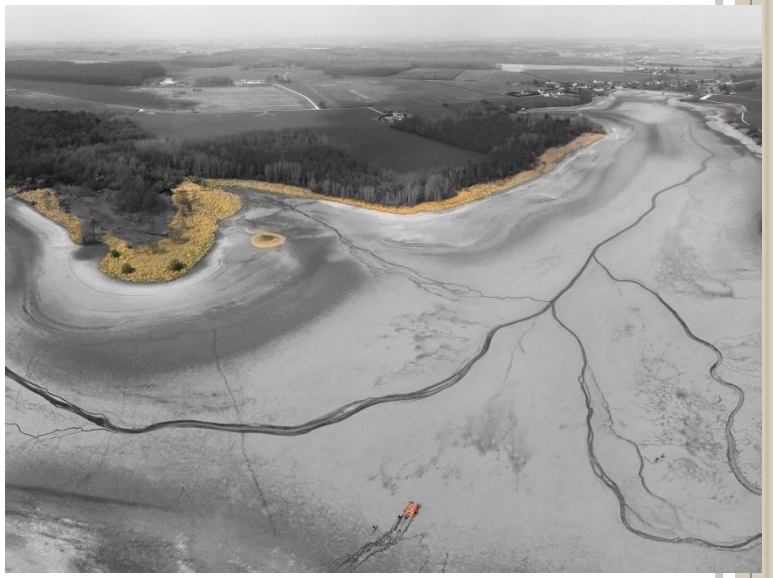
20th century : Agricultural transformations

Station CY (25/02/2015)



Station BP (drain outlet) (05/05/2015)

Aquatic environment degradation



Objectives

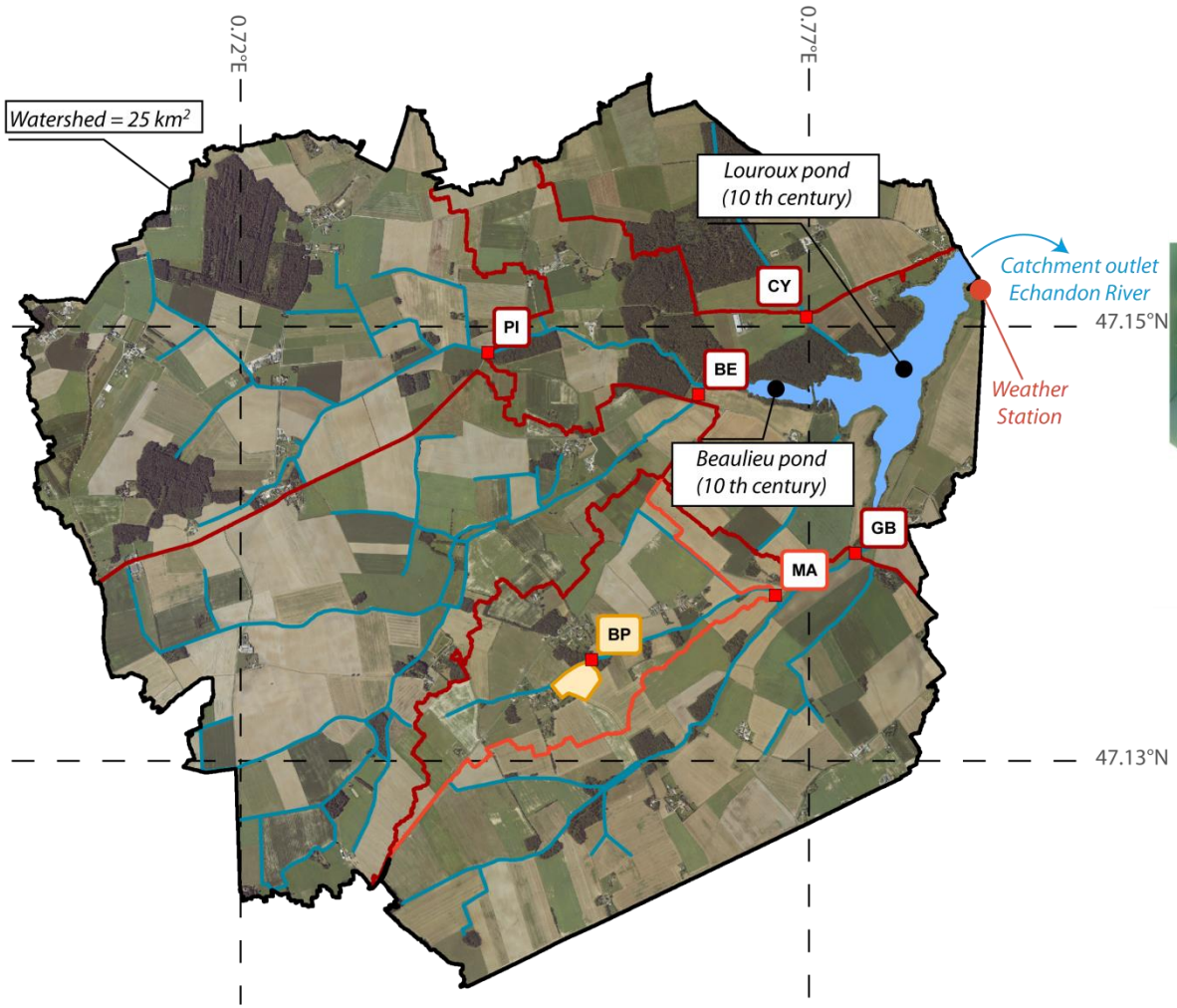
- Quantification of suspended-matter transported

GB station, 16/01/2014

GB station, 11/04/2014

- Understanding of the transfer dynamics at several spatial and temporal scales

INSTRUMENTATION

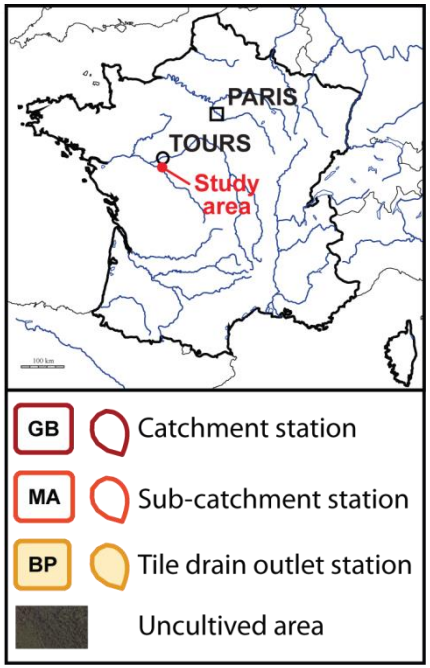


Datalogger

Automatic sampler

Turbidimeter

Water level sensor



- **6 stations :**
  - **5 river**
  - **1 drain outlet**

High frequency fluxes quantification

FLOW

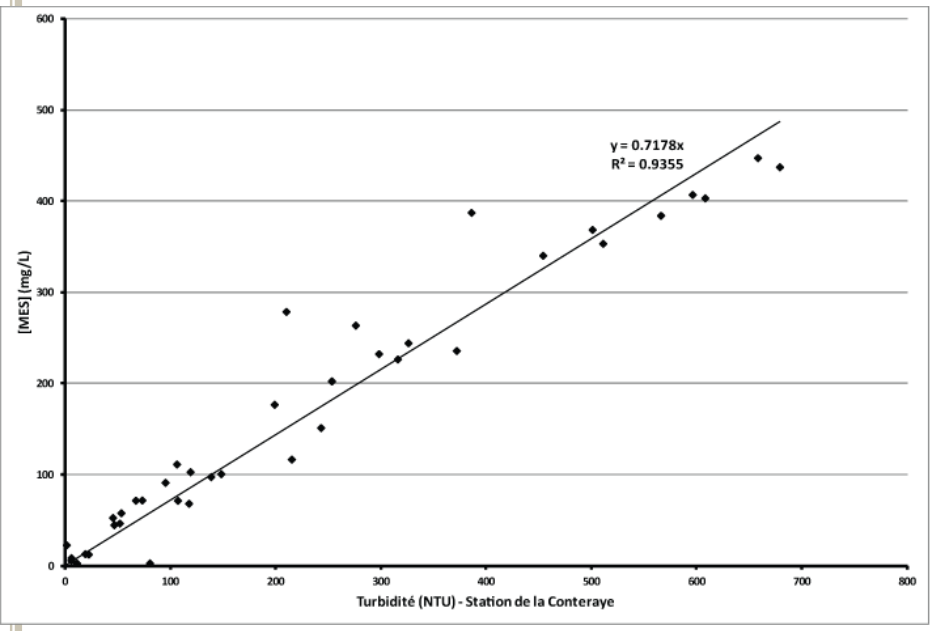
X

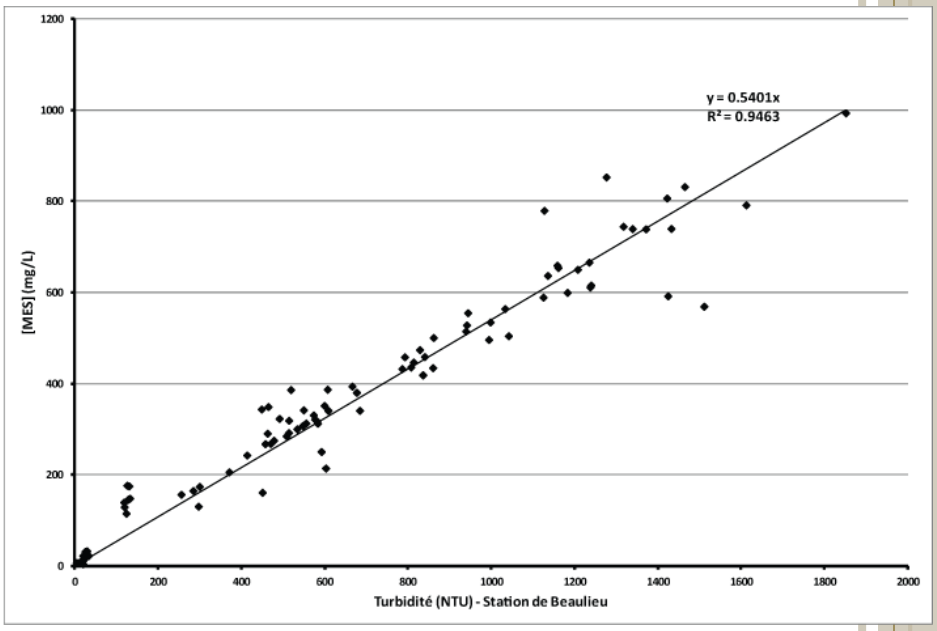
FLUX

Suspended sediment concentration

Filtration 0.45 µm

TURBIDITY – SUSPENDED SEDIMENTS CONCENTRATION CALIBRATION



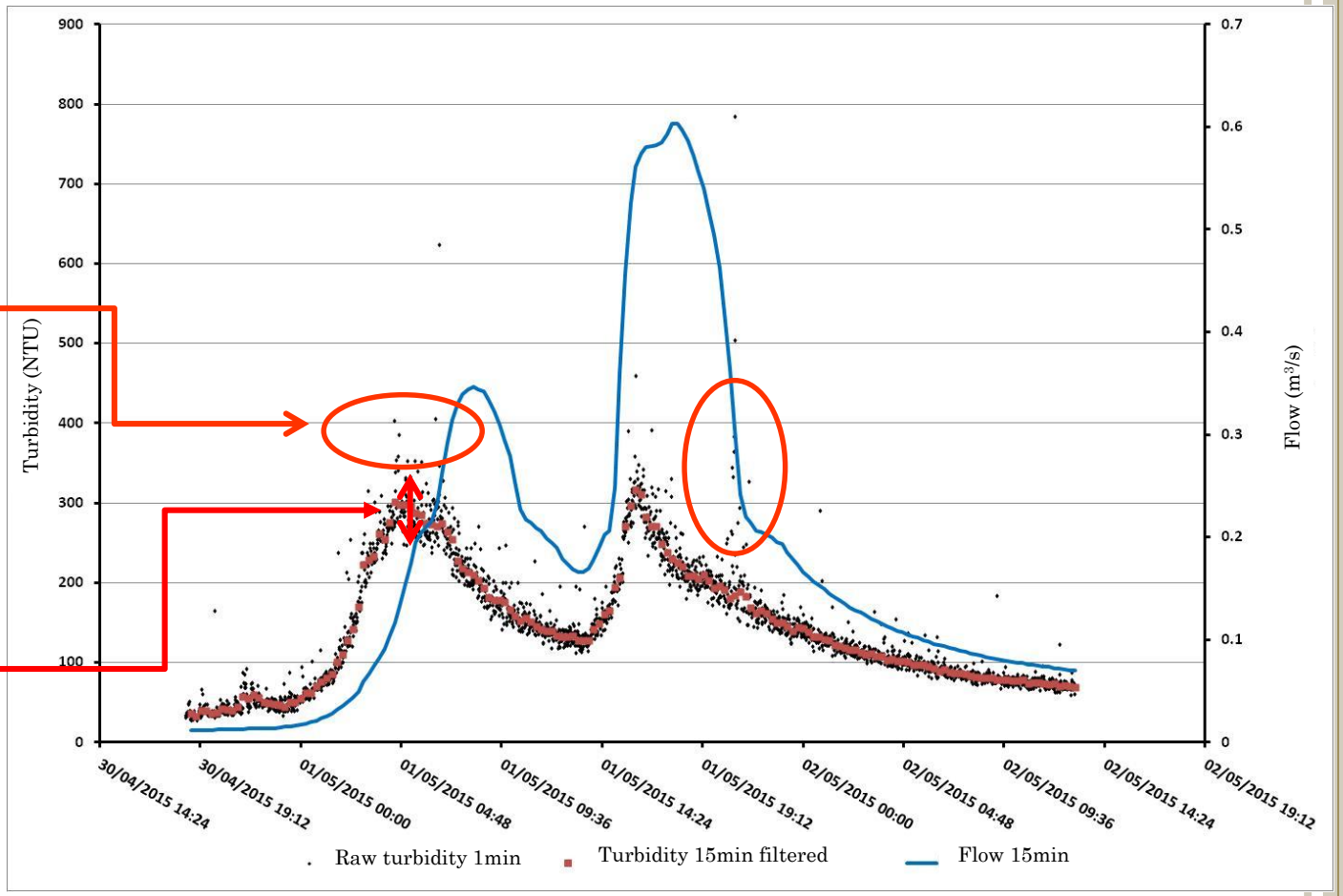


Measure and treatment of turbidity data for small headwater catchment

High and quick water level variations

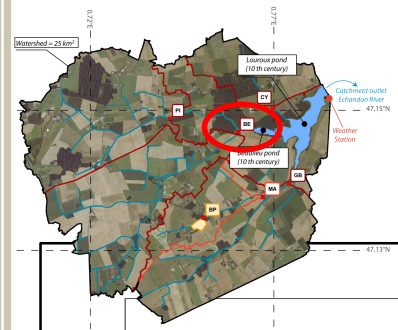
Artefacts :
-Plant residues
-Big particules
-Bubbles
=> remove

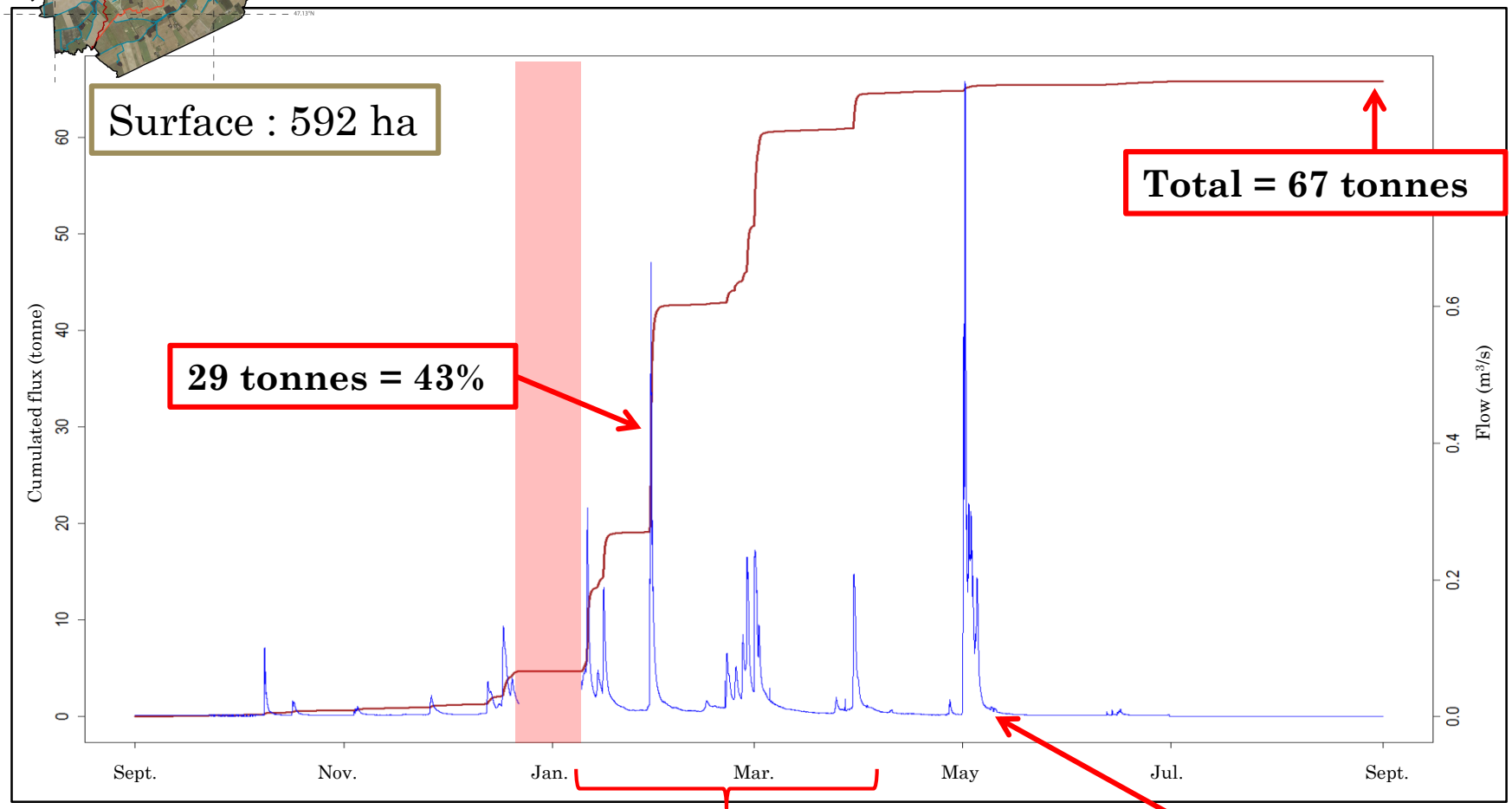
Sensor accuracy
=> mean



Filtering example of 1min instant turbidity data

BE STATION 2014-2015 : ANNUAL VARIABILITY





1 week => 74%
2 days 8 hours => 50%

Flux rate : 0.13 $t.ha^{-1}.yr^{-1}$

Annual flux dynamics (2014-2015)

Station	MS2% : flux transfered in one week (%)	TS50% : minimal time to export 50% of the total annual flux
CY	65	2 days 16 hours
BE	74	2 days et 8 hours
GB	72	1 day 15 hours
MA	64	2 days 13 hours
BP	65	2 days 14 hours

Transfers during short time periodes

- High frequency acquisition
- Uncertainties during floods

Spatial and Inter-annual variability

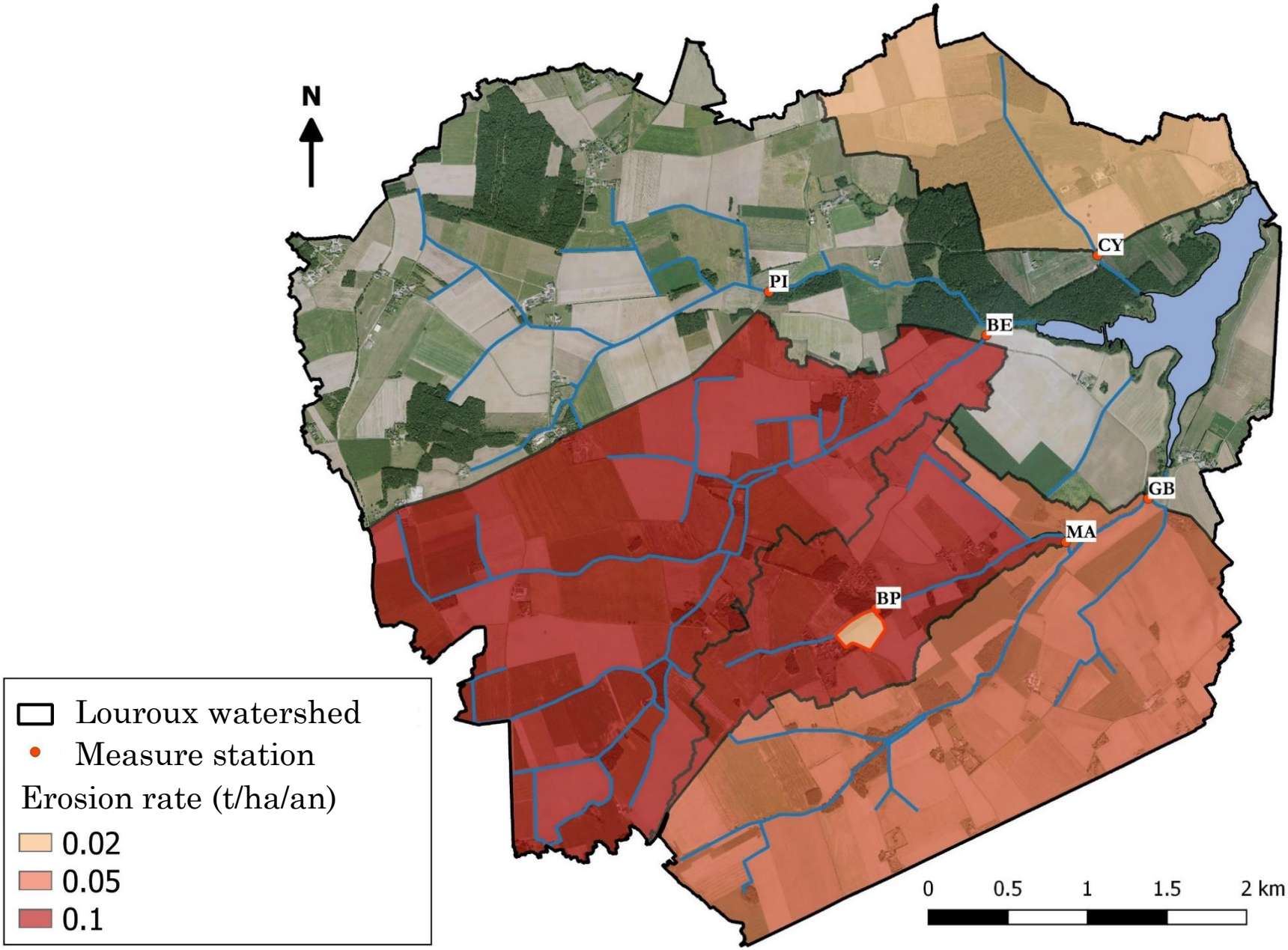
Annual flux rate ($t.ha^{-1}.y.^{-1}$)			
Station	**2013-2014**	**2014-2015**	**2015-2016**
CY	**-**	**0.015**	**0.065**
BE	**0.36**	**0.13**	**0.18**
GB	**0.38**	**0.07**	**0.16**
MA	**0.24**	**0.13**	**0.22**
BP	**0.03**	**0.02**	**0.07**

Important inter-annual variability

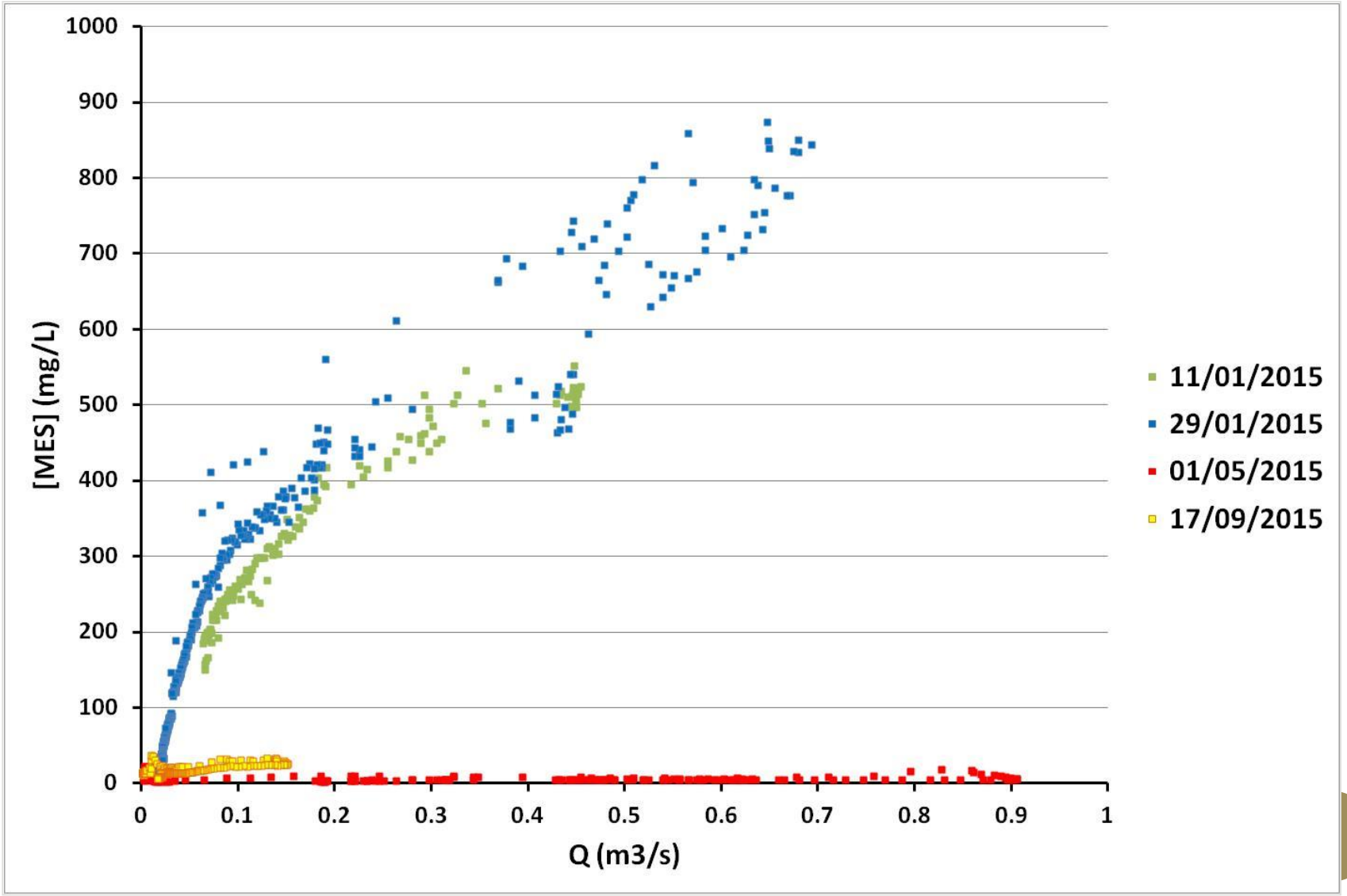
Spatial variability

- Land use
- Sources

Spatial variability (2014-2015)



SEASONAL VARIABILITY



Conclusion

- Long time monitoring
  - Important inter-annual and seasonal variability
  - Data quality needs time
    - Calibration improvement
    - Reduce uncertainties
    - Filtering signal

Thank you for your attention

Erosion vulnerability

February 2016

June 2016