ELABORATION DE CARTES D'EROSION/DEPOT LORS DES CRUES SOUDAINES

Development of potential erosion/deposition maps during flash floods

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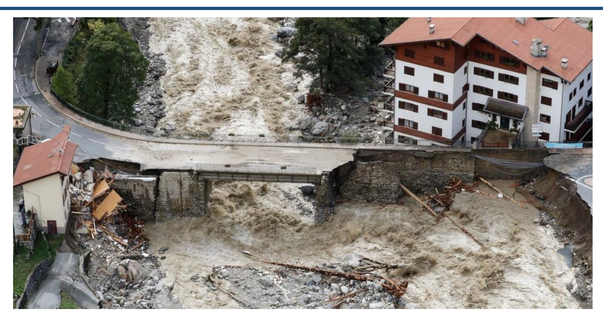
pôle de recherche et développement en **écohydraulique**

Context

Flash Flood :

- Soil erosion ⇨ Landslide
- Bank erosion ⇨ Infrastructure damage



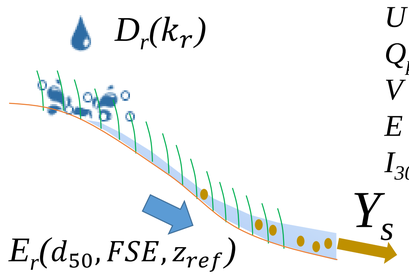
Need for modelling to evaluate protection solutions
Scientific aim: evaluate the benefits of physically based rainfall-runoff model

Methodology

1 . Hydrological modelling of flash flood event
- Modelling erosion processes at plot scale
- Comparison to other models
- Transfer to the entire catchment area

2. Risk maps for hillslope erosion or bank erosion

Erosion models



h = Water depth
U = Runoff velocity
Q_p= Peak discharge
V = Runoff volumetric factor
E = Rainfall energy
I_{30} = Maximum rainfall intensity

Y_s = Sediment yield
R = Erosivity
K = Erodability
LS = Slope factor
C = Land cover factor
P = Farming practices

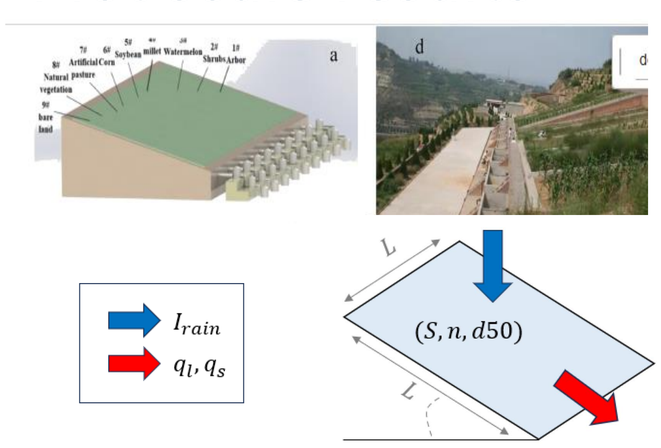
MARINE $Y_s = f(h, U, d_{50}, FSE, z_{ref}, k_r)$

RUSLE $R = EI_{30}$

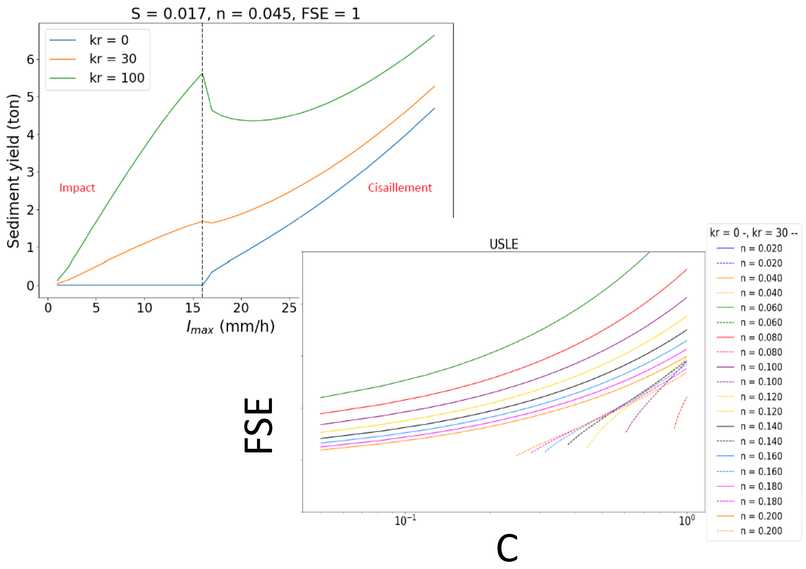
MUSLE $R = 11.2(Q_p V)^{0.56}$

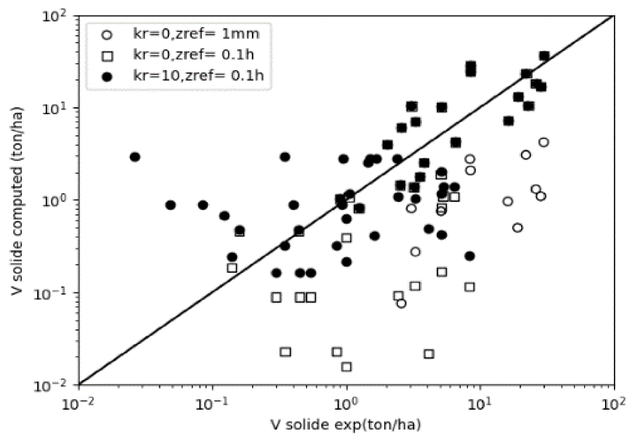
$Y_s = R.K.LS.C.P$

Plot scale results



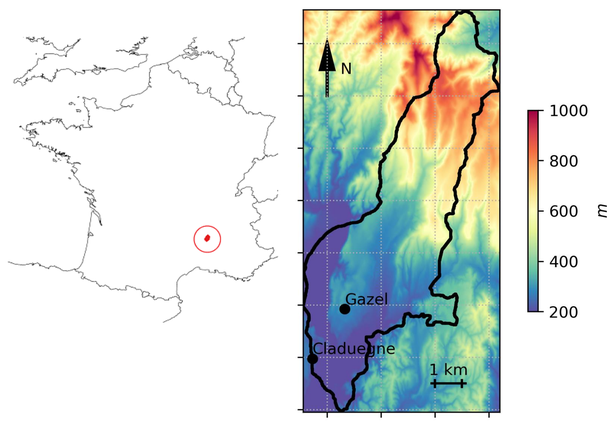
Experiments from Sun et al. (2021)





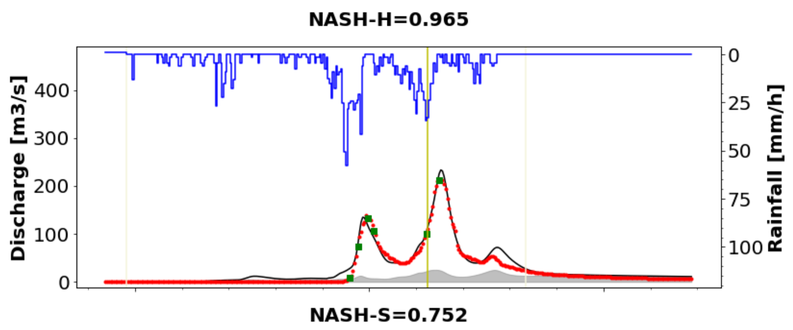
MARINE: experimental validation

Case Study: La Cladugne

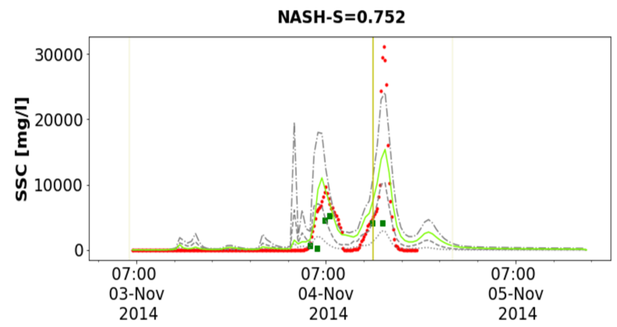


Data from Nord et al. (2017)

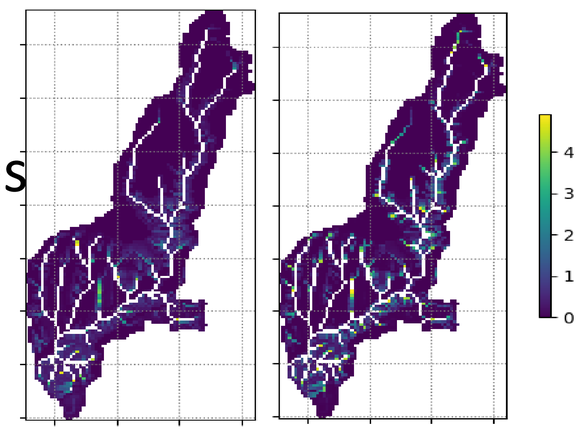
Hydrograph



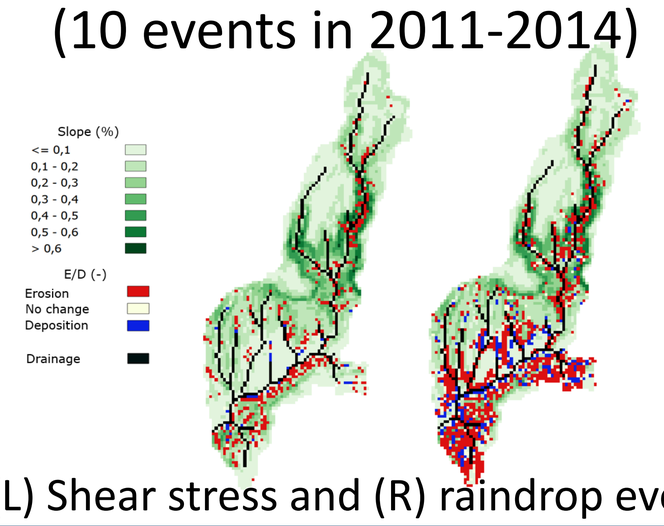
Sedigraph



Erosion map for 1 event



Frequent erosion map (10 events in 2011-2014)



Conclusion

- Comparable eroded volumes
- Shear stress vs raindrop erosion events
- Risk maps

(L) MARINE and (R) MUSLE in ton/ha (L) Shear stress and (R) raindrop events

References

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