Modelling catchment scale implementation of green infrastructure in an urban catchment facing urbanisation and climate change

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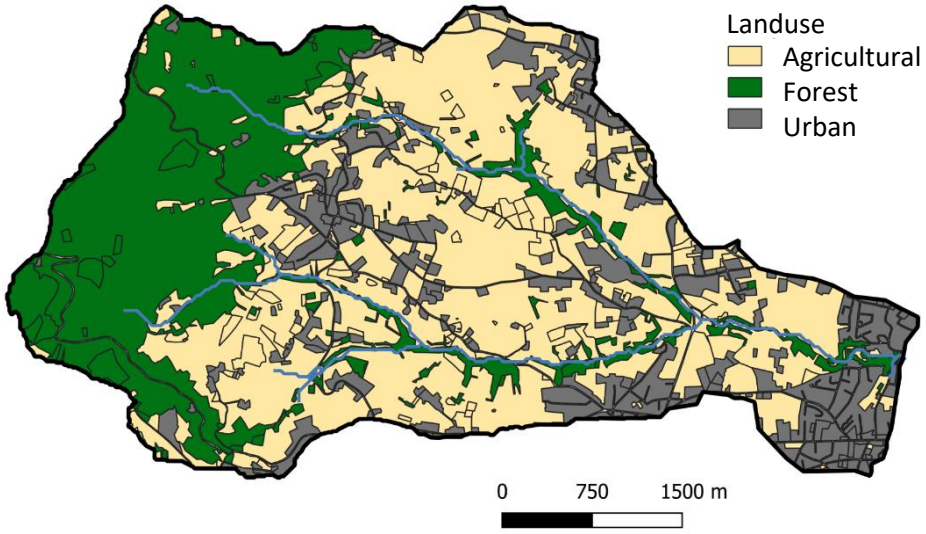
Catchment

GoogleMaps

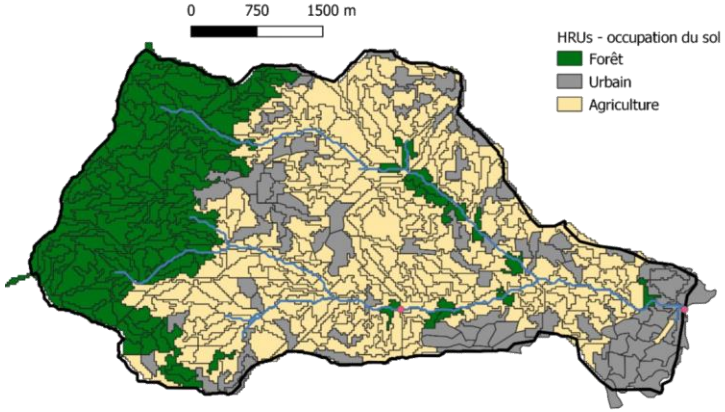
GoogleMaps

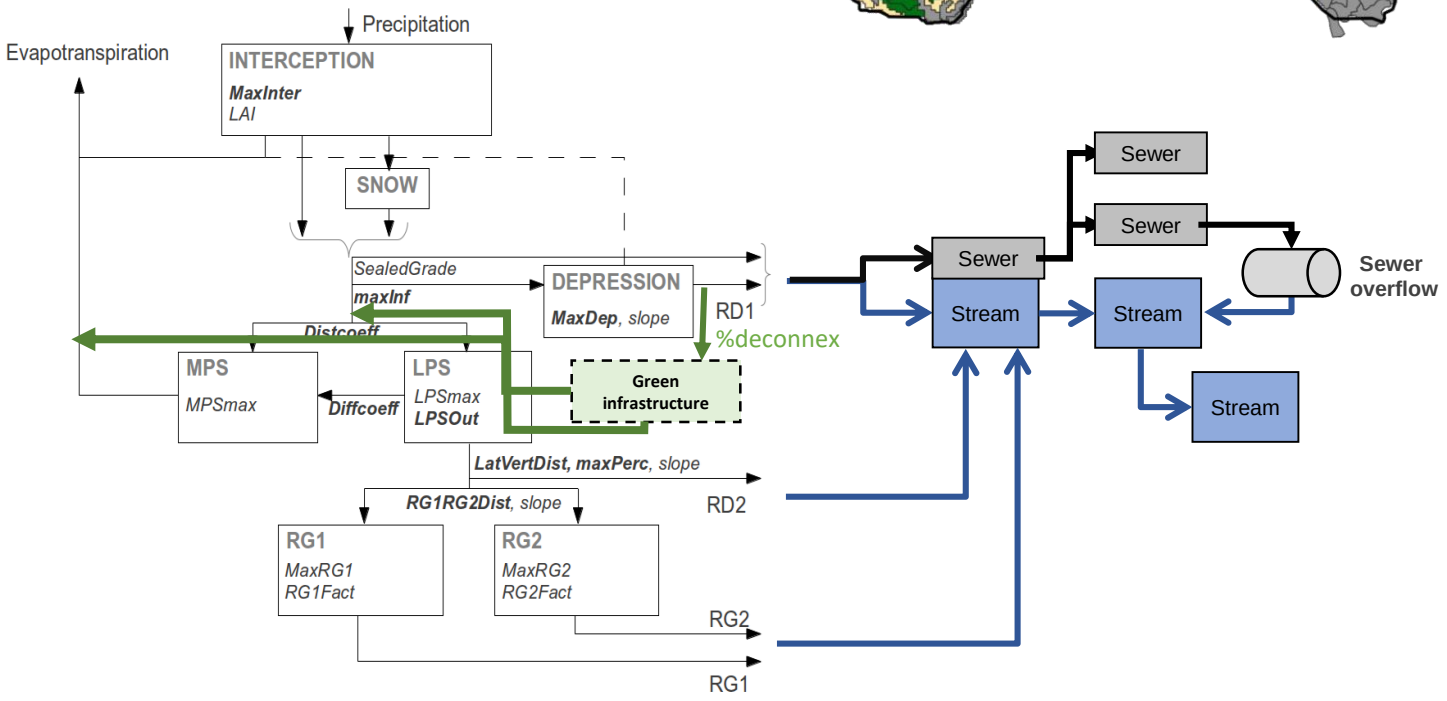
- Suburban
- 19 km^2
- Monitored since the 1990s
- Combined sewer network with sewer overflows



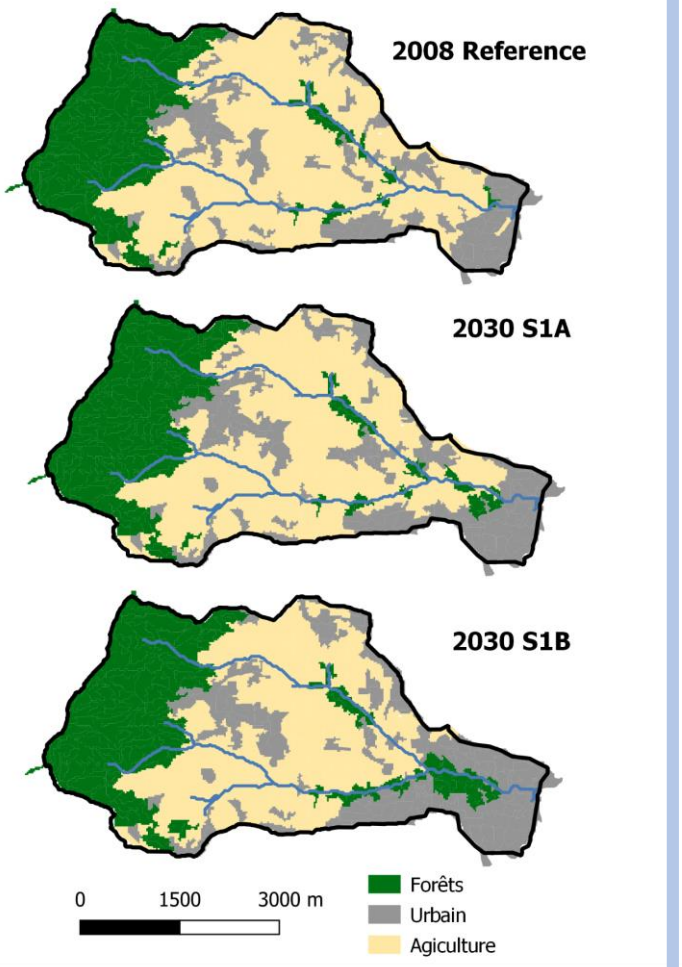
Model:J2000

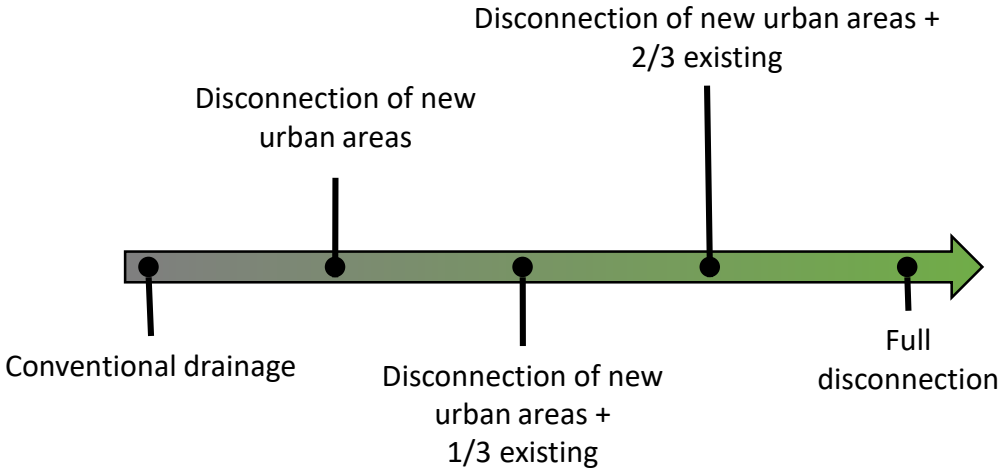
- Semi – distributed, physically based
- Irregular mesh of Hydrological Response Units





Scenarios



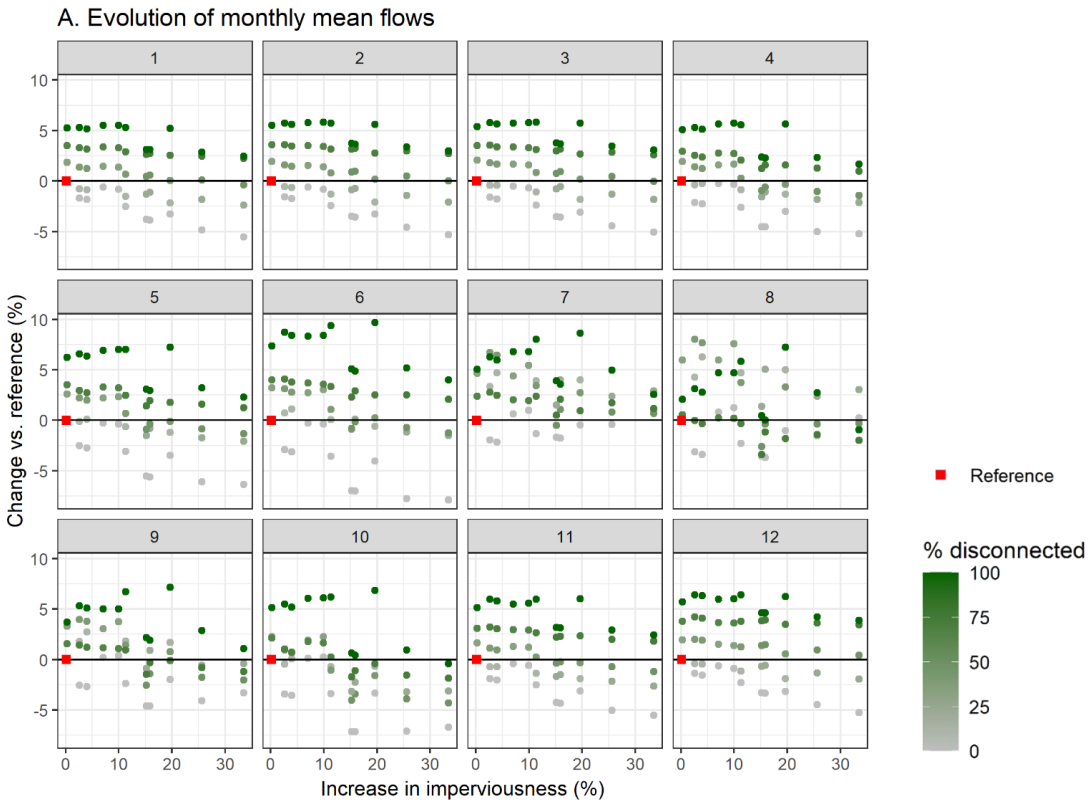


$$P^*_{hourly} = P_{hourly} * \frac{\overline{PM} + \Delta P_{monthly}}{\overline{PM}}$$

$$ETP^*_{hourly} = ETP_{hourly} + \frac{R_a}{28.5}\frac{\Delta T_{monthly}}{100}$$

Results: Impact of urbanisation

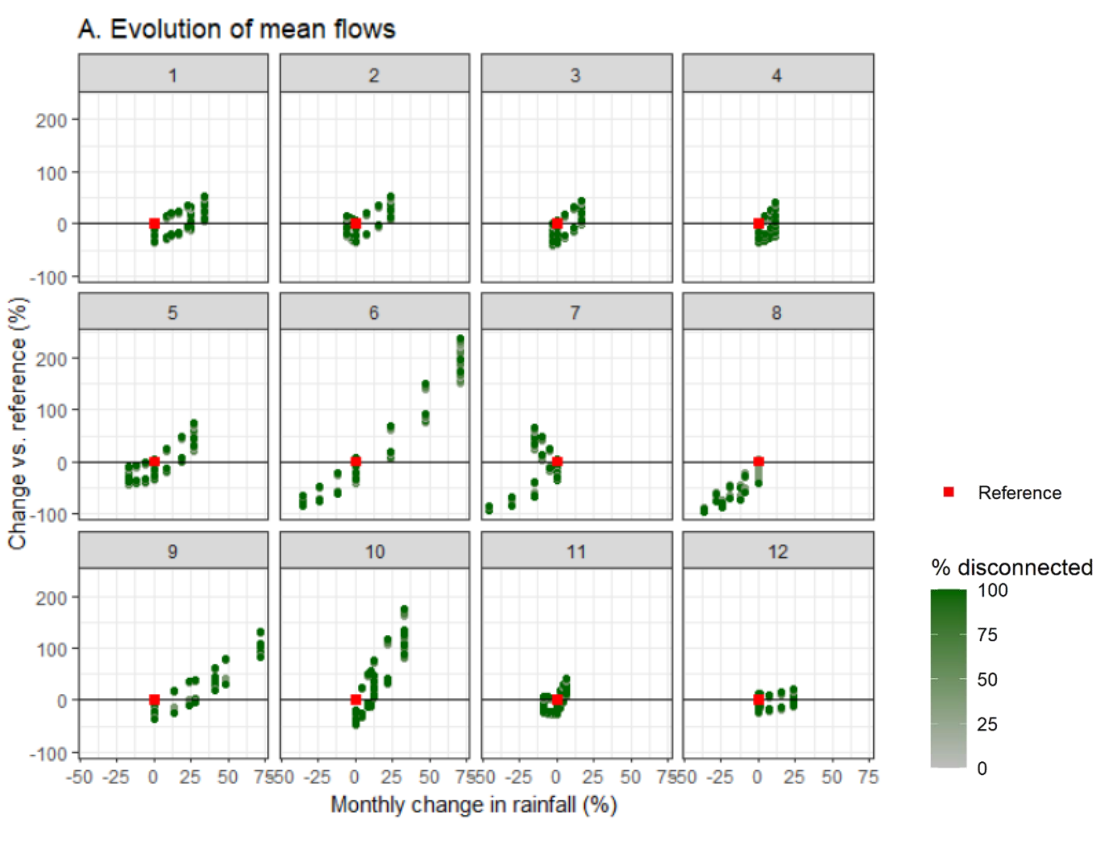
Evolution of monthly mean flows vs. increase in imperviousness



- Small changes overall (a few %)
- Mean flows decrease with imperviousness(blocked recharge and infiltration).
- Implementation of green infrastructure can offset this reduction
- How much is enough: here, threshold of 1/3 impervious areas disconnected

Results: Impact of climate

Evolution of monthly mean flows vs. change in rainfall



- Very high sensitivity to change in climate
  - Shallow, quickly responding soils, little storage
- Stormwater management scenarios cannot offset climate change
  - Catchment 'not urban enough'.

Results

- Distributed hydrological models to look into processes
- One catchment, two worlds :
  - Dominated by urban features (sewer networks, urban runoff in stream) -> sensitive to increase in imperviousness and stormwater management
  - Dominated by non urban contributions: baseflow, interflow, mean flows -> very senstivite to change in climate, little by stormwater management (catchment ‘not urban enough’)

- Thanks for your attention

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