Estimating floods in small catchments

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29 January 2018

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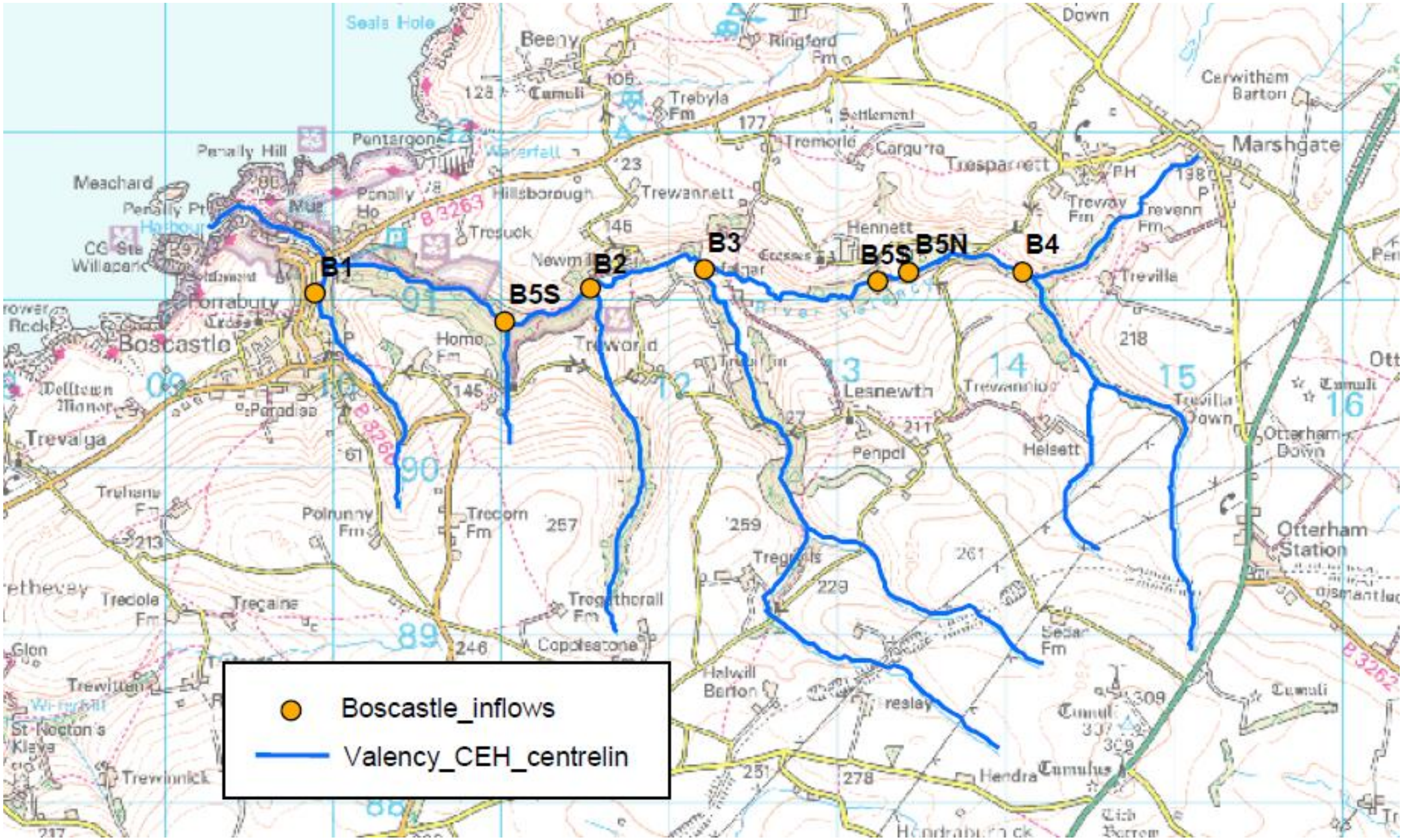
Boscastle catchment



River Valency

Boscastle flood, 2004

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Boscastle flood, 2004

Getty, http://www.independent.co.uk/news/uk/home-news/boscastle-flood-of-2004-the-tenth-anniversary-of-freak-weather-striking-a-cornish-town-9673334.html

Boscastle flood, 2004

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Boscastle flood, 2004

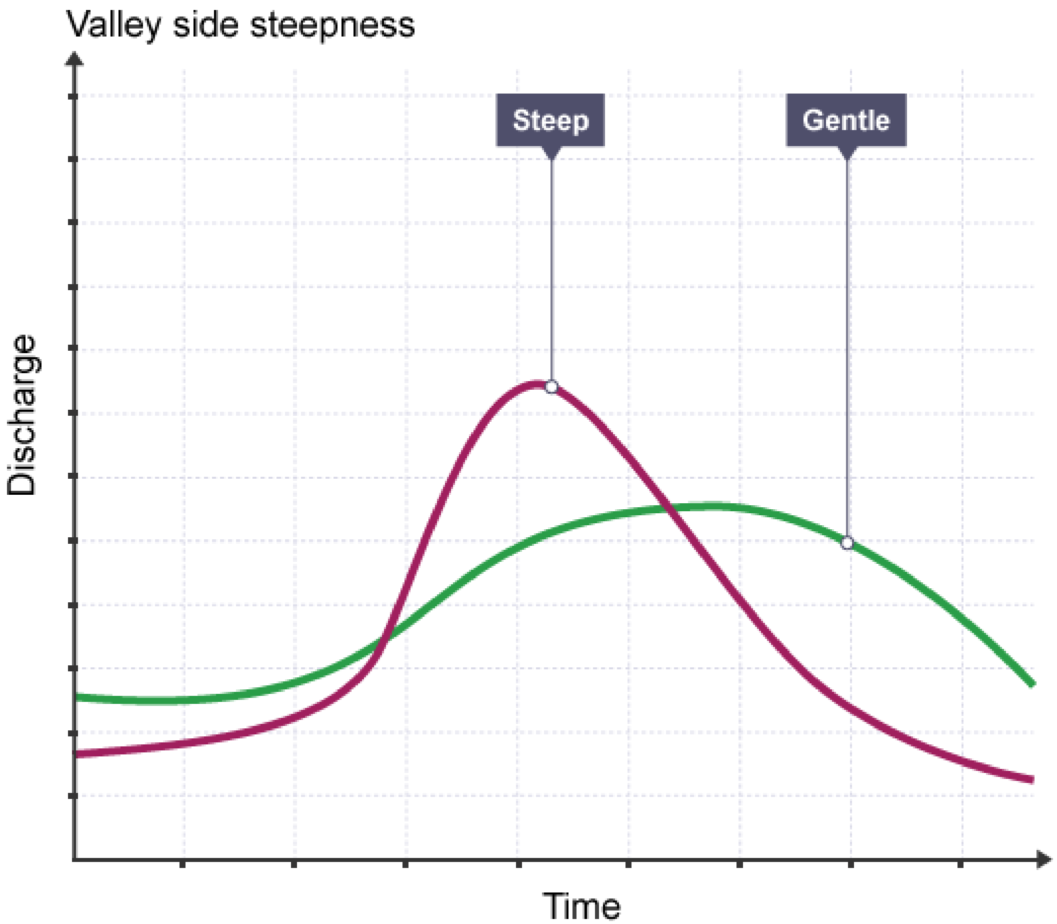
BBC, 2004a. *In Pictures: Dramatic Floods in Boscastle* [image online] Available at: <http://news.bbc.co.uk/cbbcnews/hi/newsid_3570000/newsid_3572400/3572488.stm> [Accessed 31 January 2012].

What is special about small catchments?

1. There can be less time to respond so...

Flood estimation before events is even more critical

What are we trying to estimate?



- **Peak river flow** during a flood (m^3/s)

- Along with it's **likelihood** of occurrence (%)

We can then work out how to manage the flood

Changes in Boscastle village since the flood

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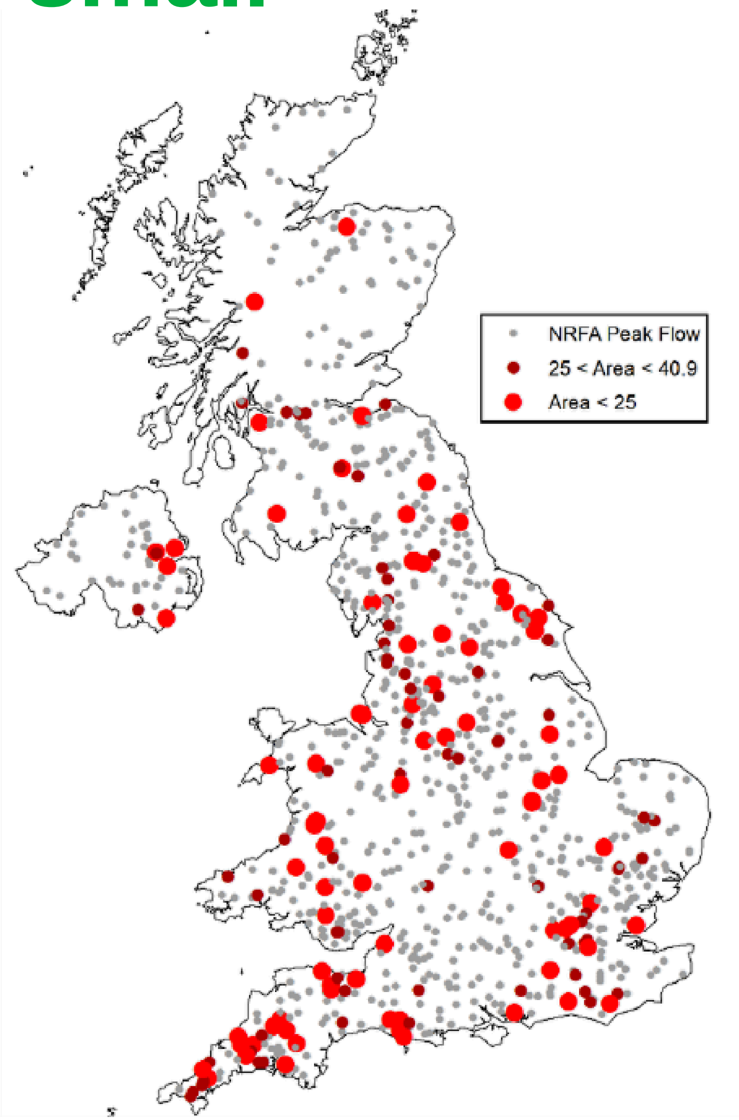
What is special about small catchments (<25km^2)?

What is special about small catchments?

2. We have fewer flow records so…

We have to estimate floods without historic flow measurements at the site



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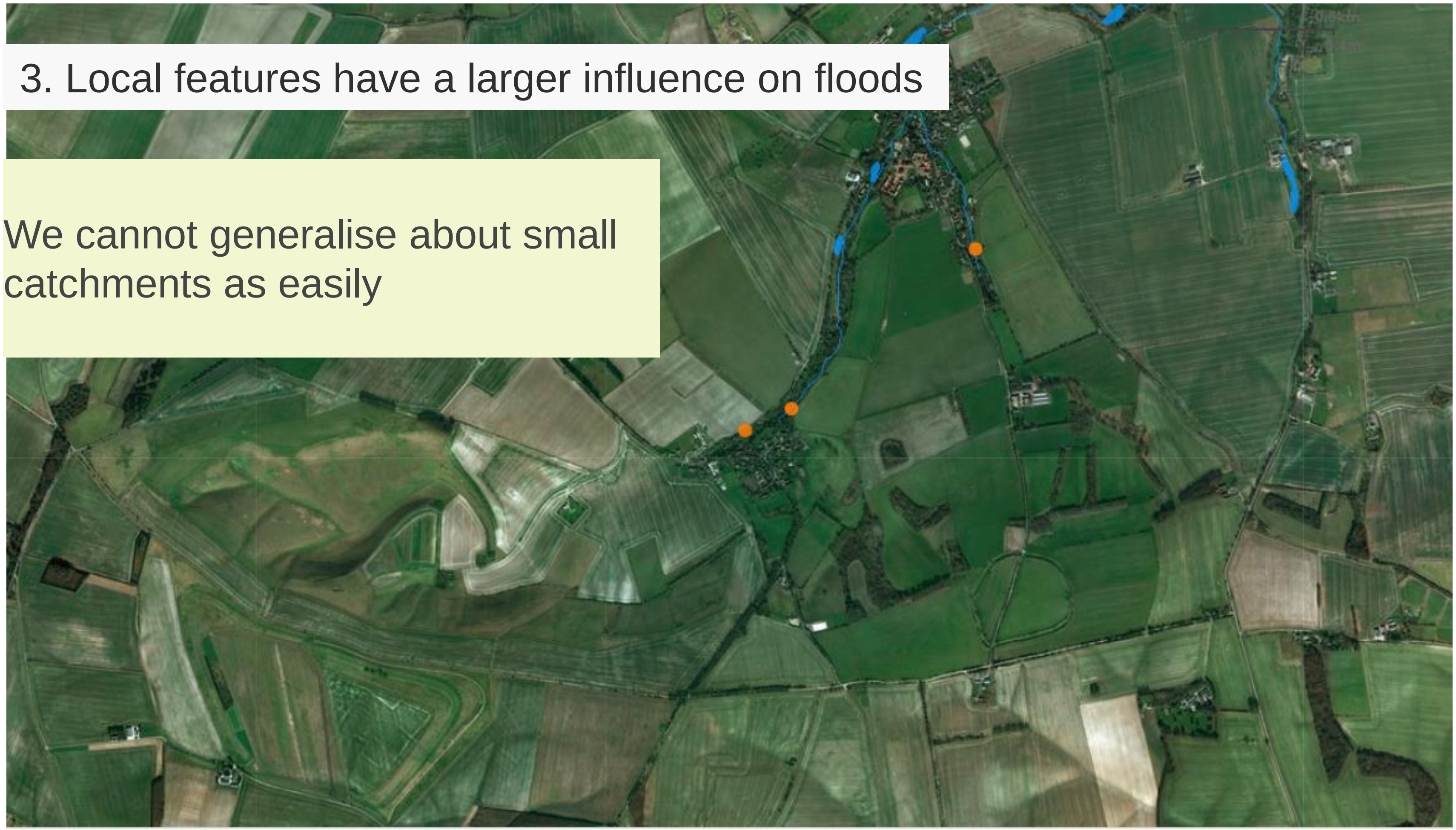
What is special about small catchments?



3. Local features have a larger influence on floods

We cannot generalise about small catchments as easily

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We are stuck

- Our current methodology is based on multiple regression analysis
- We cannot improve it
- We need a new approach

$$\mathbf{QMED = 8.3062}\,\boldsymbol{AREA}^{0.8510}\,\mathbf{0.1536}^{(1000/SAAR)}\,\boldsymbol{FARL}^{3.4451}\,\mathbf{0.0460}^{BFIHOST\text{^}2}$$

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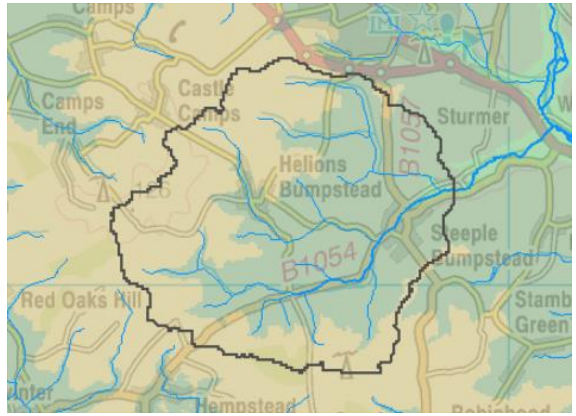
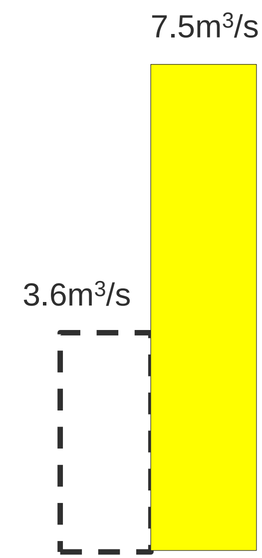
Bumpstead Brook

28.3 km^2

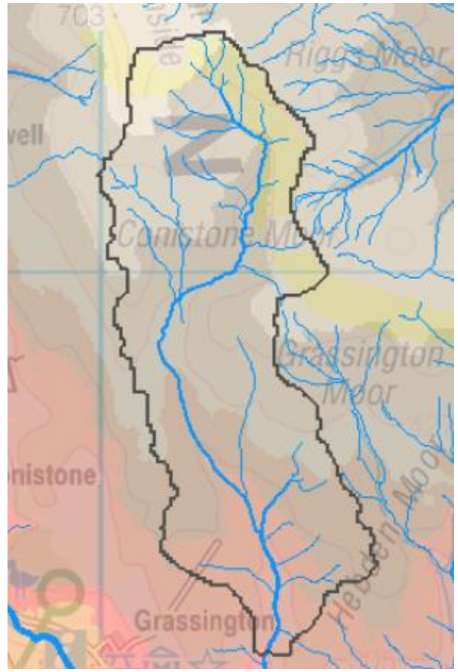




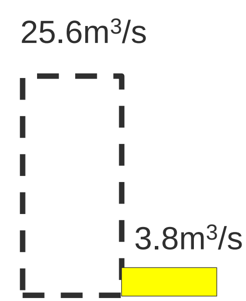
Our methodology estimates an average flood is	3.6m^3/s
48 years of gauging data say the answer is…	7.5m^3/s

Hebden Beck

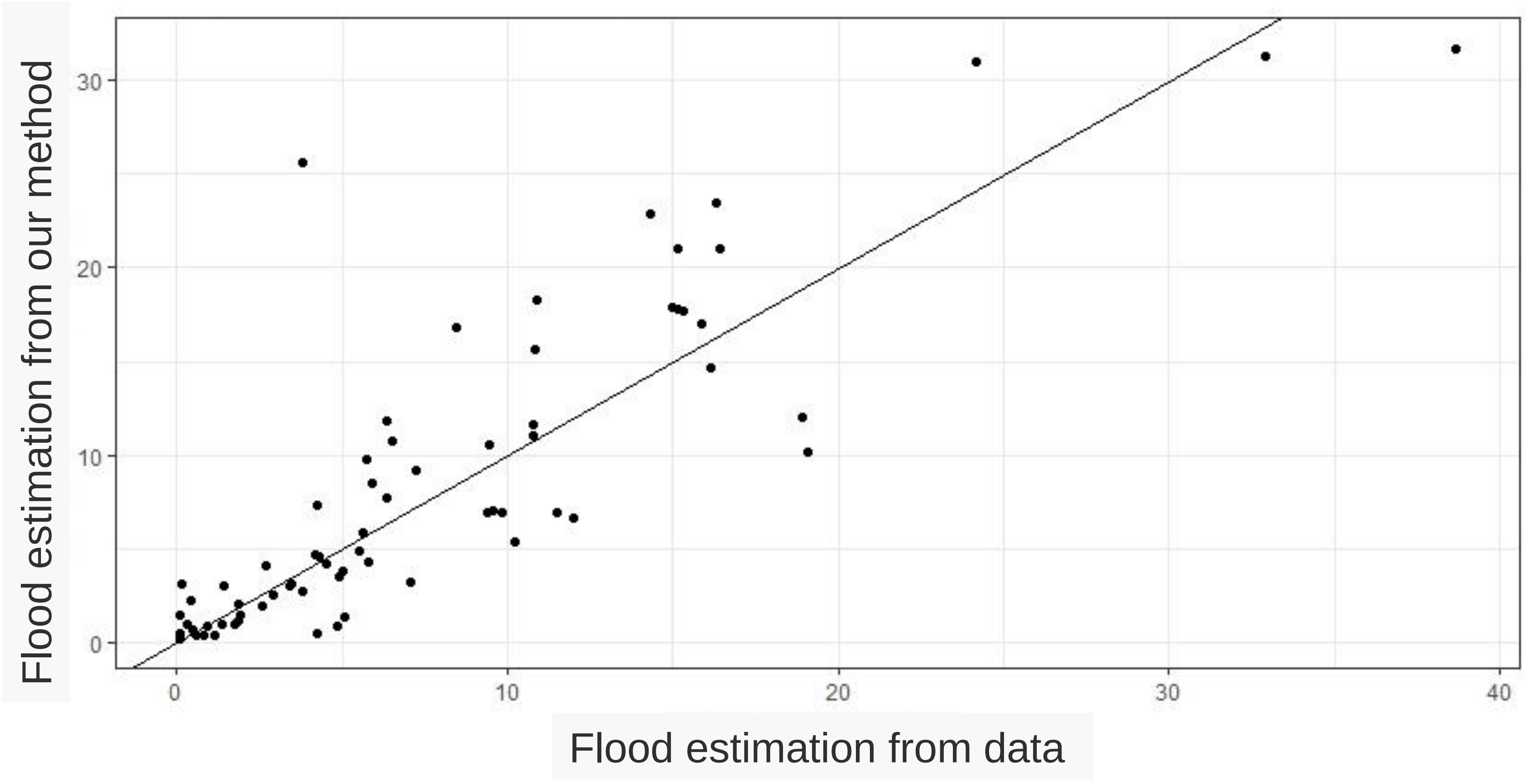
22.2 km^2



Our methodology estimates an average flood is	25.6m^3/s
49 years of gauging data say the answer is…	3.8m^3/s



70 other small catchments



The challenge…

- Could you devise a better way of estimating low probability flood flows (2% - 0.1% chance of occurring in a given year) in small catchments?
- Is there a better approach than regression analysis?
- What if we limit ourselves to using “open data”?

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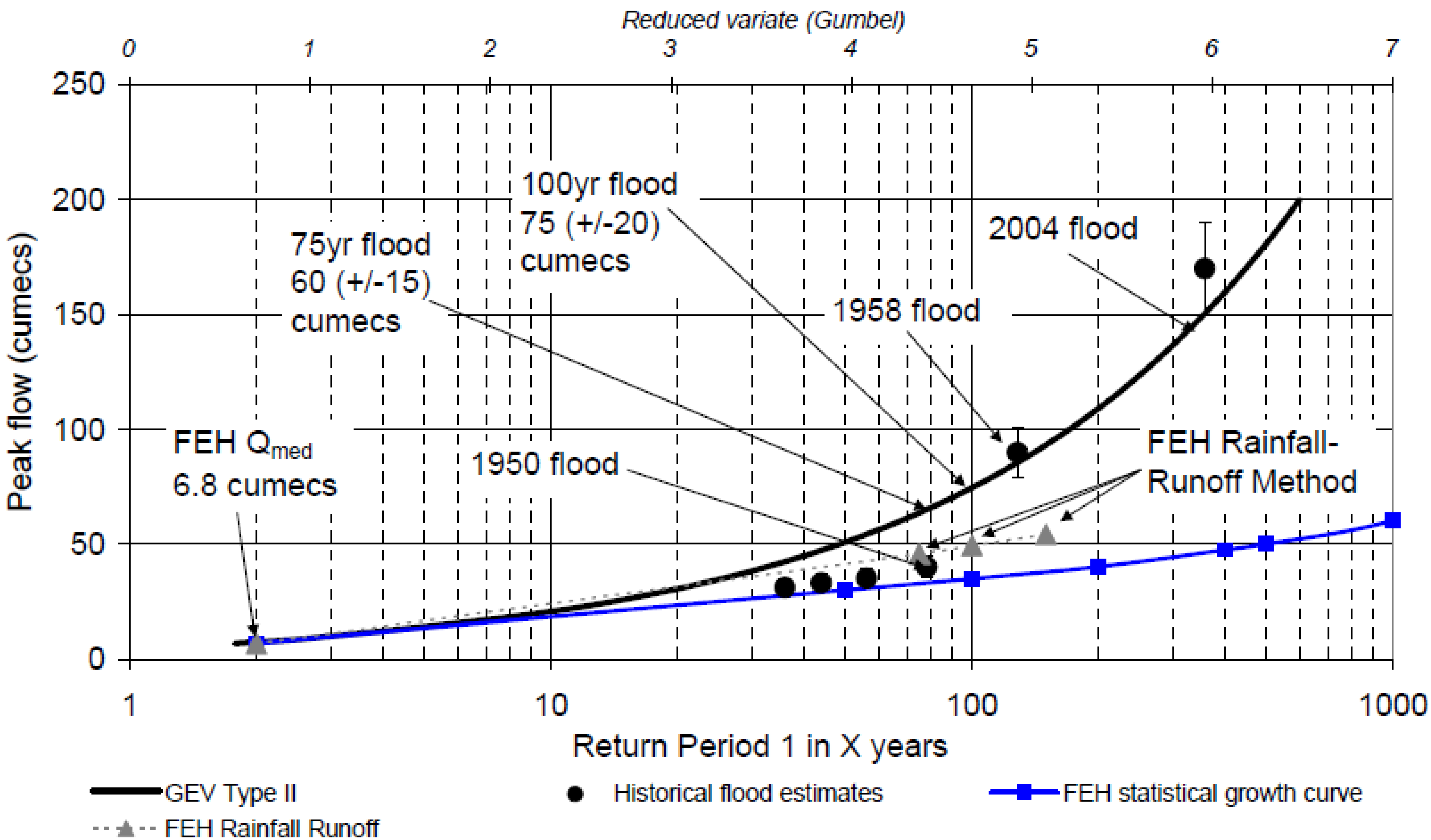

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$$\mathbf{QMED = 8.3062}\boldsymbol{AREA}^{\mathbf{0.8510}}\mathbf{0.1536}^{(\mathbf{1000}/\boldsymbol{SAAR})}\boldsymbol{FARL}^{\mathbf{3.4451}}\mathbf{0.0460}^{\boldsymbol{BFIHOST}\hat{}\mathbf{2}}$$

$$QMED = 4.8123 AREA^{0.8338} 0.2654^{\left(\frac{1000}{SAAR}\right)} FARL^{2.4369} 0.0403^{BFIHOST^2}$$

$$QMED_{NEW} = 9.1768 AREA^{0.8250} 0.4039^{\frac{100}{RMED13-1D}} FARL^{2.3407} 0.0437^{BFIHOST^2} 4.5$$

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