The value of ultra-detailed survey data for an improved flood damage modelling with explicit input data uncertainty treatment: INSYDE 2.0

SUPPLEMENT

Di Bacco et al.

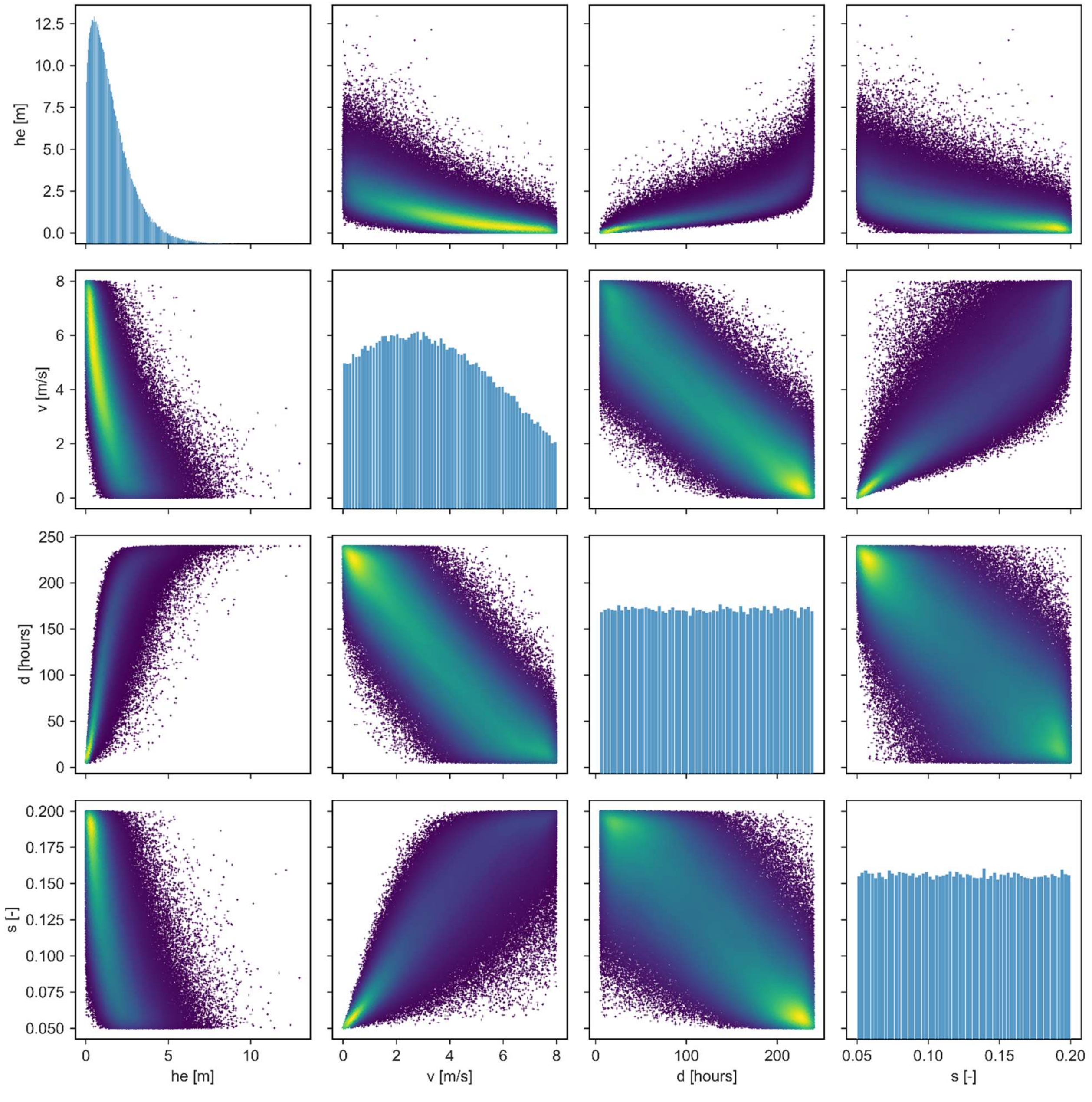

Figure S1. *Empirical pairwise relationships assumed for the generation of the "extended" distributions: hazard parameters (water depth (he), flow velocity (v), inundation duration (d) and sediment load (s)).*

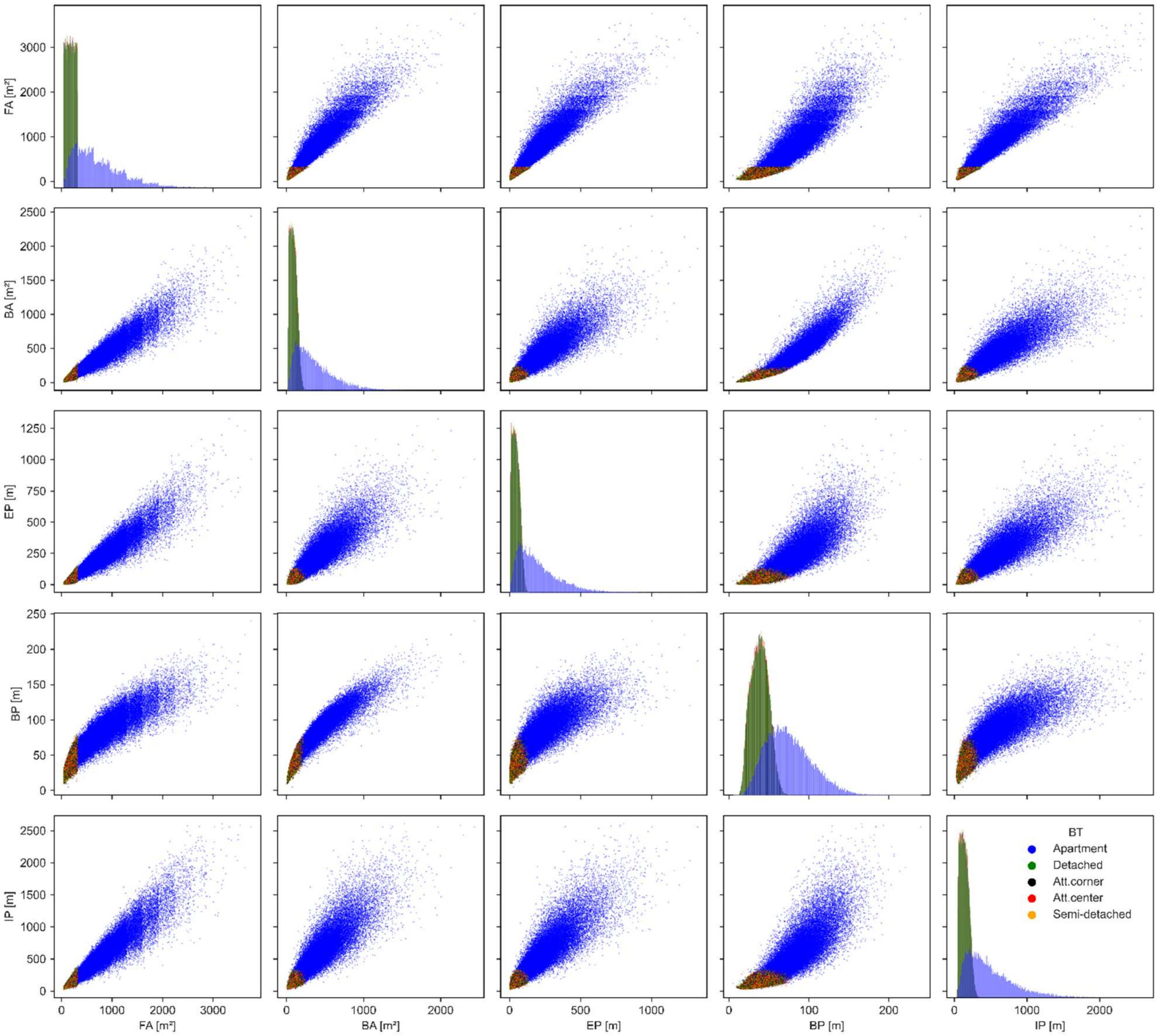

Figure S2. *Empirical pairwise relationships assumed for the generation of the "extended" distributions: extensive building parameters (footprint (FA) and basement (BA) area; external (EP), internal (IP) and basement perimeter (BP)). Uniform distributions are instead assumed for the other categorial variables in the extended dataset.*

Example of assumed damage mechanism for internal plaster removal

Internal plaster is considered to be removed if one (or more) of these conditions occur:

- long duration flood: longer residence time enhances water penetration into the plaster; the fragility function is shown in Figure S3;
- contaminated water (q=1): plaster replacement is usually required in case of contaminated water; in such scenarios, the damage ratio is considered to be 1;
- level of maintenance is “average” or “poor” (i.e. LM≤1), which implies a more vulnerable plaster, even under short duration floods and/or absence of contaminants in the water. In these cases, the damage ratio is considered to be 1.

The function is probabilistic. If more than one of the conditions mentioned above occur, the damage ratio considered is the maximum among the three. The underlying assumption is that the most unfavourable condition dominates the damage mechanism, independently of the others.

The height considered in the calculations for plaster removal is equal to the internal water depth plus 1.0 m due to capillary rise.

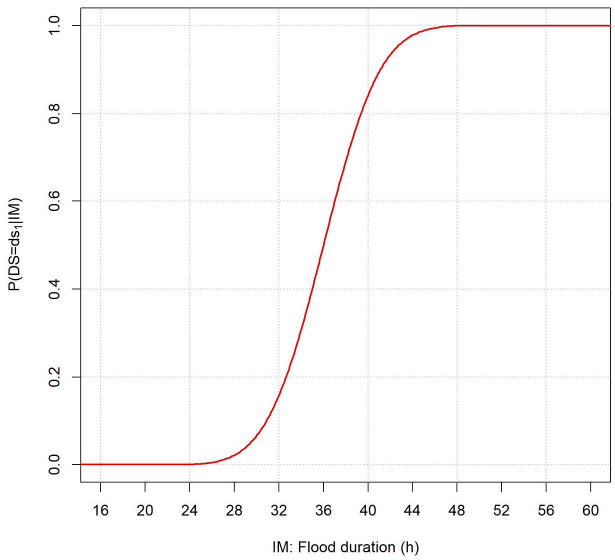

Figure S3. Fragility function for internal plaster relative to inundation duration.

Example of assumed damage mechanism for external plaster removal

External plaster is considered to be removed if one (or more) of these conditions occur:

- long duration flood: longer residence time enhances water penetration into the plaster; the fragility function is shown in Figure S3;
- high velocity flow: higher flow velocities cause more serious damage to exterior plaster; the fragility function is shown in Figure S4;
- contaminated water (q=1): plaster replacement is usually required in case of contaminated water; in such scenarios, the damage ratio is considered to be 1;
- level of maintenance is “average” or “poor” (i.e. LM≤1), which implies a more vulnerable plaster, even under short duration floods and/or absence of contaminants in the water. In these cases, the damage ratio is considered to be 1.

The function is probabilistic. If more than one of the conditions mentioned above occur, the damage ratio considered is the maximum among the four. The underlying assumption is that the most unfavourable condition dominates the damage mechanism, independently of the others.

The height considered in the calculations for plaster removal is equal to the internal water depth plus 1.0 m due to capillary rise.

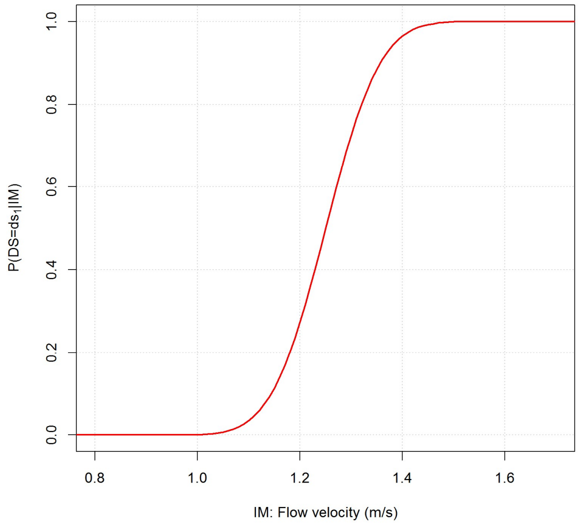

Figure S4. Fragility function for external plaster relative to flow velocity.