



Hydrodynamics of flood impact on urban mobility: critical conditions for vehicles carry-off

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The street networks are a critical infrastructure during flood events in urban areas, on one hand because they allow the flood propagation in the urban environment, on the other hand because they ensure capillary rescue activities during and after the event. At present, the vehicle instability during an urban flood is recognized as being one of the most exacerbating factor for flood risk. In fact roads can be clogged by vehicles debris, which is also particularly dangerous for people's safety. In this work the incipient motion conditions of flooded vehicles are investigated and discussed. A mobility parameter θV is introduced as a function of the Froude number of the flow. The flow for different regimes past a specific vehicle geometry is modelled using a 3-dimensional numerical approach. The results of the numerical model clarify the contribution of drag and lift forces to the incipient motion conditions. The numerical results are compared with recent experimental data found in literature on partially submerged scale 1:18 vehicle models. The estimated force coefficients and instability conditions may provide a useful tool for flood risk assessment and management in urban areas.