

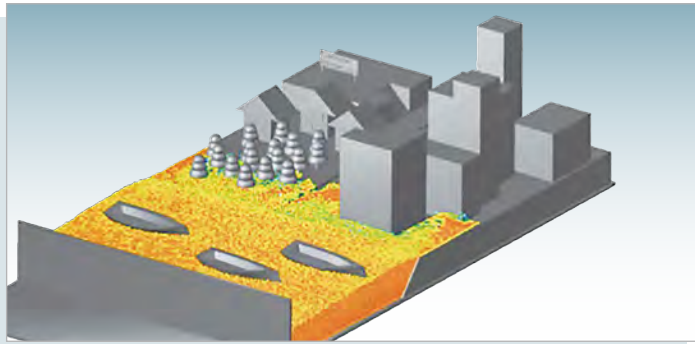
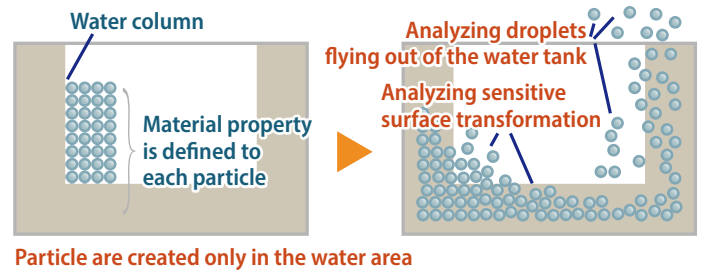
# MPS based Mesh-Free CFD Simulation Particleworks for Safety and Environmental Problems

PROMETECH.

## Benefits of MPS (Moving Particle Simulation Method)

- No need to set the analysis region in advance. The particles themselves represent the flow of fluid. This is optimal for tracking conditions where fluid droplets are widely scattered.
- Easily modeling of the fluid parts with CAD data of the walls, even for containers and piping of complex shapes. Only the initial particle spacing needs to be specified. Particles are evenly distributed according to the specified spacing.
- No abnormal termination and mesh collapsing issues.

## Water column collapse



## Simulation of Tsunami inundation in Urban Areas

Tsunami can cause serious damage when intruding densely populated areas. The prediction of its arrival time, intrusion routes, inundation depths along urban main and residential roads is crucial to predict safer evacuation routes and procedures for the residents. **MPS simulation is a powerful tool for exact modelling of real geographical feature and building layout, and accurate prediction of the tsunami flow path in wide area.**



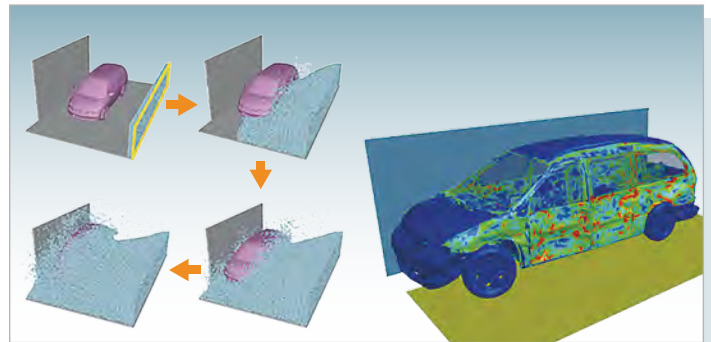
## Simulation of underground water intrusion

Global climate change is causing worldwide record-breaking rainfall-related disasters. The water inflow caused by rivers floods or heavy rainfall into underpasses or underground facilities have become a big issue. **MPS is a suitable way to track the flow path of water in wide areas and can be used to determine evacuation route for underpasses and safety procedures of important facilities.**



## Simulation of Debris Flow

Debris flow may cause serious damage to humans and objects. **MPS simulation has several solutions for rock modeling that can be used with standard CFD capability.** This feature can be applied to investigate dynamic loads on dams and buildings. The affected areas can be predicted by importing their topographic data. The simulation results can be used to design disaster prevention facilities like debris barriers.



## Simulation of Vehicle Damage caused by Tsunami

The tsunami following the 2011 Great East Japan Earthquake caused many casualties among the residents evacuating by vehicle. Human casualties could be reduced by allowing people to escape faster from the vehicles deformed by water pressure. **Coupling MPS and structural analysis simulation is effective to predict impact on vehicles.** The pressure is determined by Particleworks and then converted to the load data of LS-DYNA to evaluate the deformation of the vehicle.

