Detailed simulation of hazardous events for risk management & loss quantification

Part 2: Natural catastrophes

ADVANCED MODELLING & SIMULATION – AMS –

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JUNE 2018

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Today’s context

Catastrophe Modelling :

- Catastrophe models are and will be needed in a world where the intensity and frequency (the variance) of hazardous events is ever growing, increasing population in dense areas, combined with vulnerable exposure.
- Insurance and Re-insurance companies must rely on advanced predictive models for a better and coordinated anticipation of the risks with accurate prediction of potential financial losses and impact
- Traditional simple – macro scale- models can be inefficient compared to detailed –local scale- computerized tools (e.g. CFD) that can
  - simulate extreme events in the form of accurate space and time data
  - The data can be visualized as images or videos for a better insight of what might be the impact, and thus
  - sound measures of the damages and/or remedies propositions can be made.
- But the future is in using these advanced predictive models to generate ‘predictive data bases’. AFRY is working in this direction!

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Out Offer of services

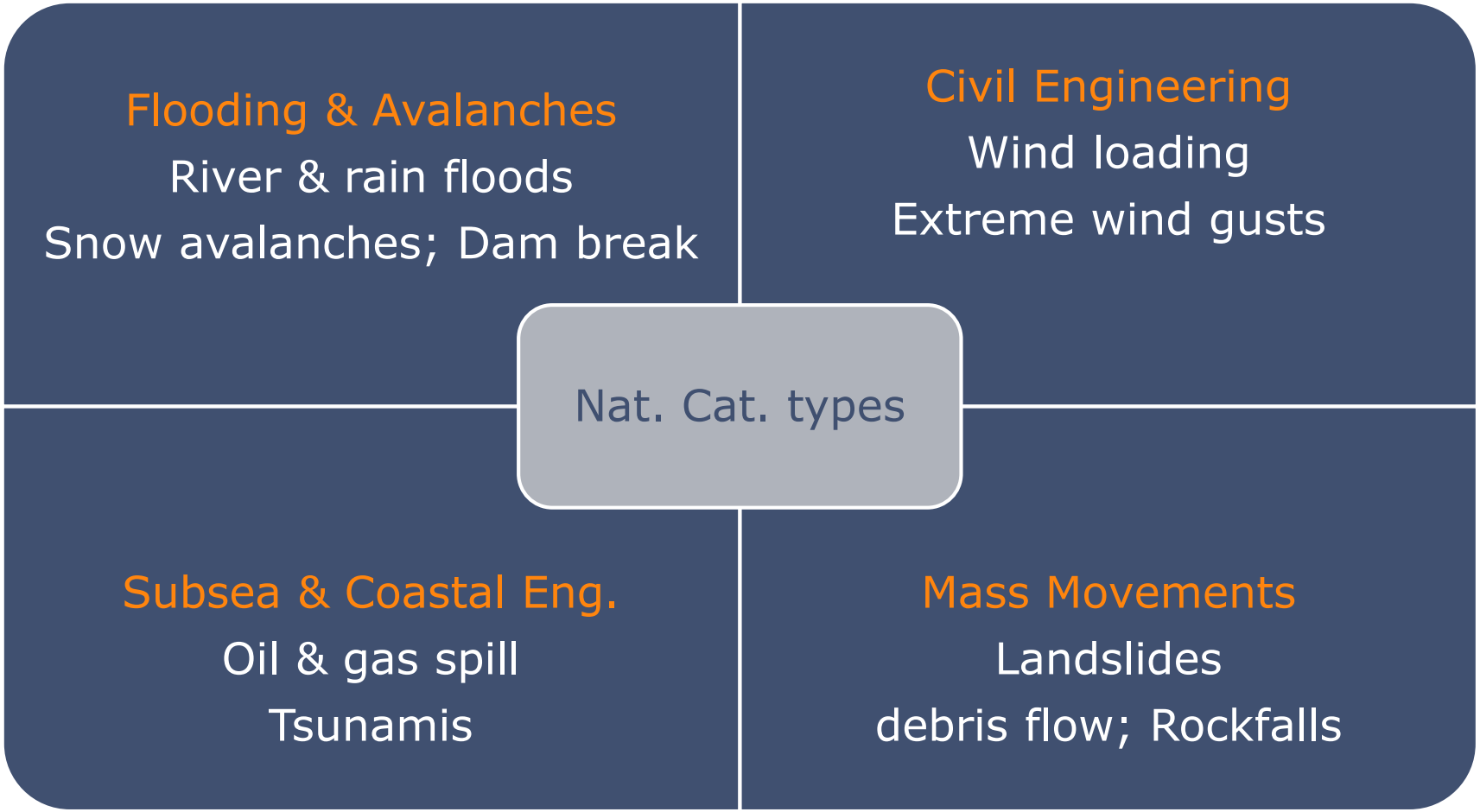
AFRY Advanced Modelling & Simulation (AMS) Section:

— AFRY's reputation in engineering services is worldwide acknowledged
— AFRY's AMS has expertise in the 3D simulation (CFD & CMFD) of industrial & environmental flows using their simulation platform TransAT
— The AMS group adapts and implements models required by the clients to meet their interests and solve their pressing problems
— New developments are ongoing, sustained by the DigitalAFRY Initiative.

Our Offering:

— In case of interest, AMS can prepare a project work and financial plan
— AMS can support you for all you simulation studies related to Risk Management, using other simulation tools, too, e.g. PHAST, FDS, etc.
— Alternatively, AFRY AMS can license its TransAT CFD tool under competitive conditions to the clients.

Typical nat. cat. Types requiring cfd



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1- Floods

RAIN-INDUCED CITY FLOODS

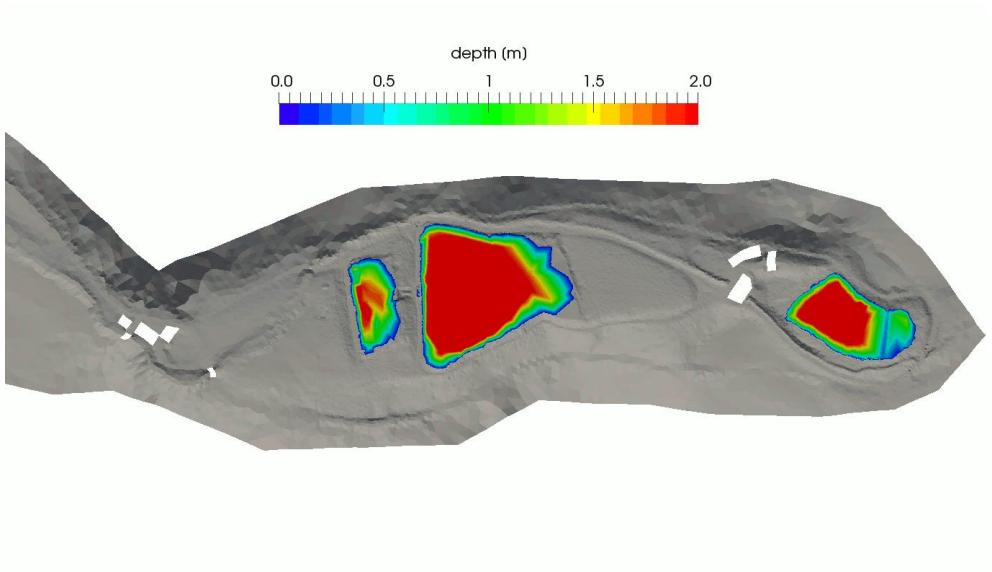
- Flooding's occurrence is more frequent, impacting negatively on the losses.

Why advanced CFD?

- To evaluate hazard zone maps for policy and decision makers.
- Risk analysis based on these maps determine flooding conditions and define the degree of risk.
- CFD is now used to develop sustainable, passive flood defense systems, requiring no further operational cost.

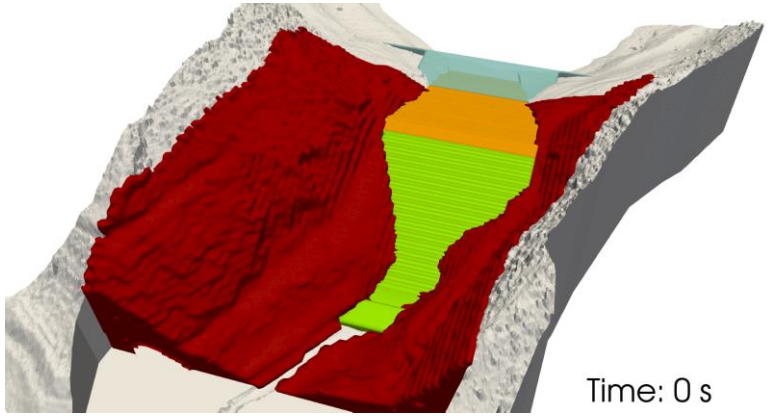
2- Floods (ii)

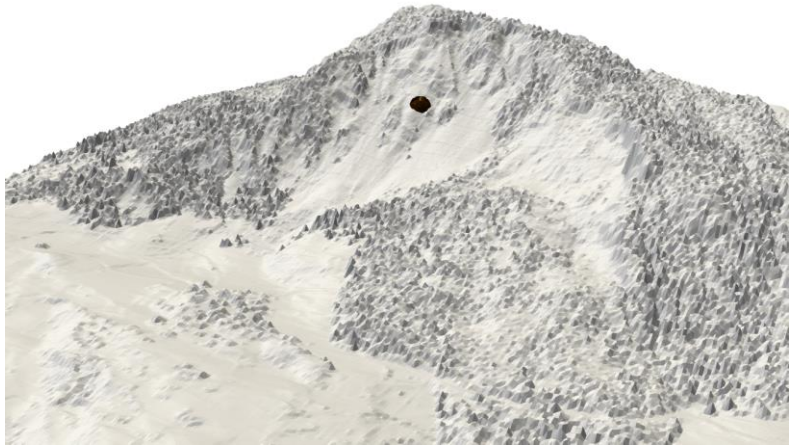
DAM BREAKS



3- Mass movement (debris flows)

DAM BREAKS (INCL. TAILINGS DAMS) / LANDSLIDES / DEBRIS FLOW





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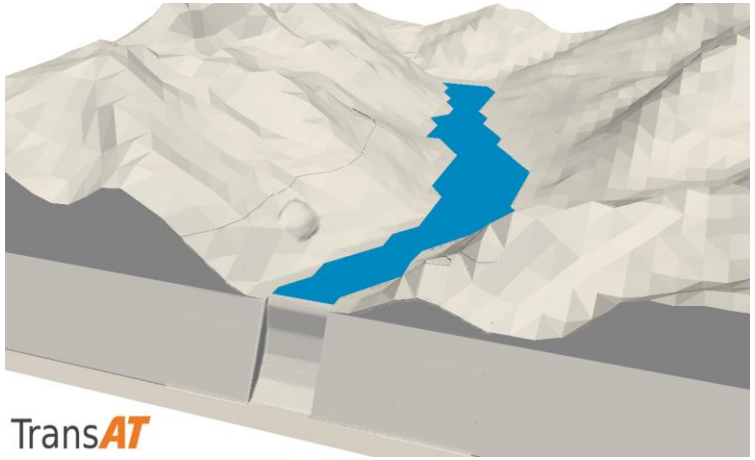
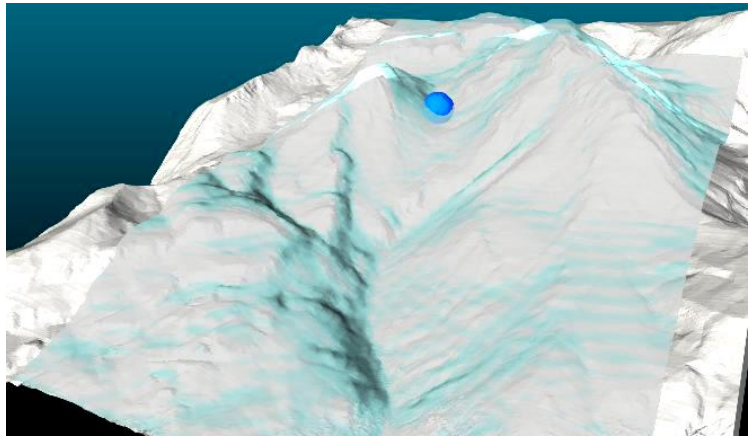
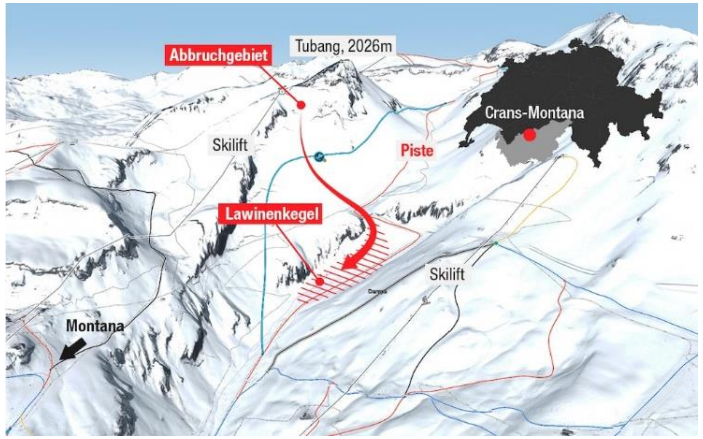
4- Mass movement (snow avalanches)

SNOW AVALANCHES / LANDSLIDES / DEBRIS FLOW / ROCK-FALLS







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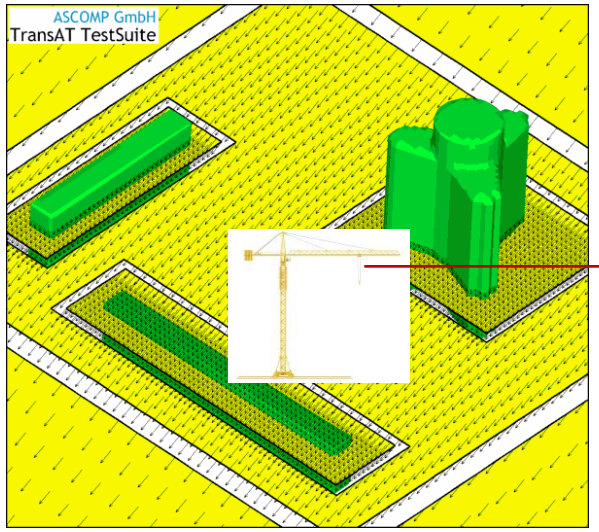
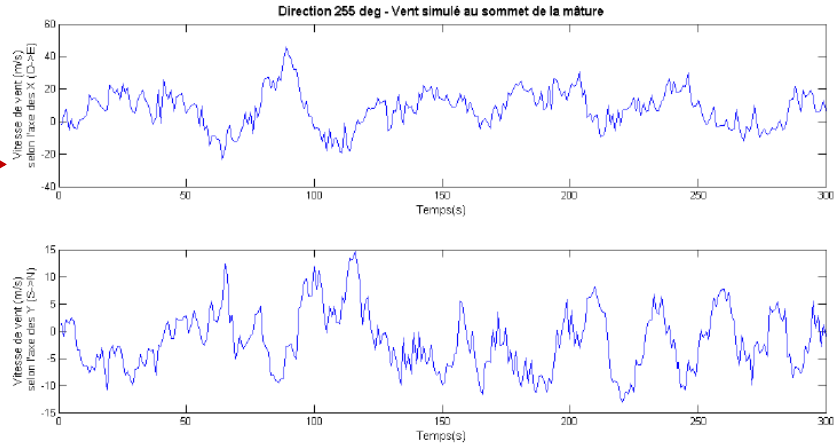
5- Civil engineering

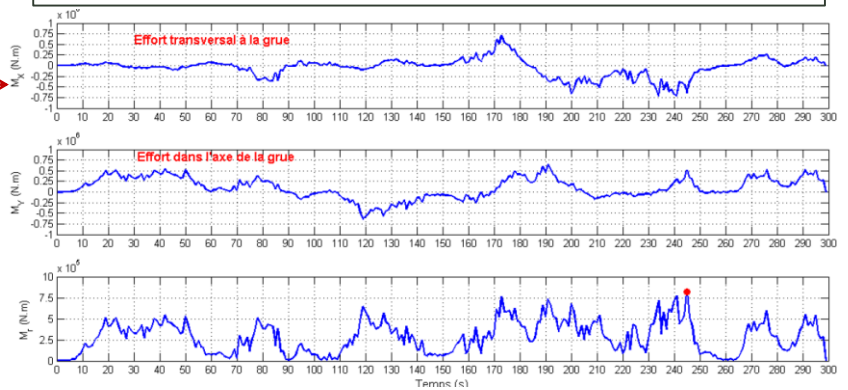
EXTREME WIND FORCES ON URBAN STRUCTURES



Wind Signals obtained by 3D CFD



Gust forces on crane using CFD data



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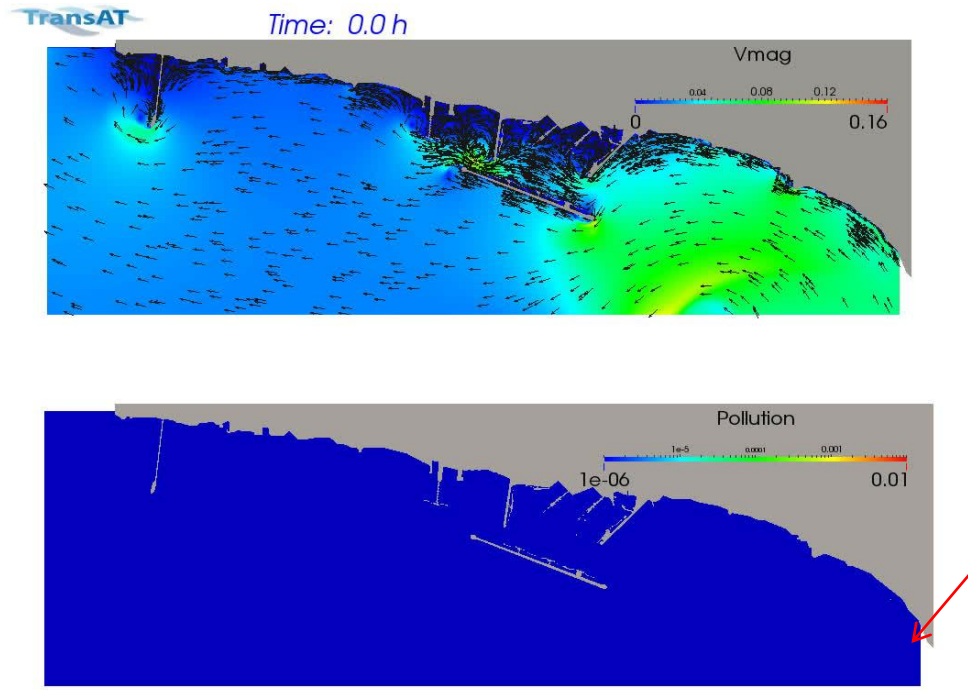
6- Coastal Engineering

COASTAL POLLUTION MAY STOP PRODUCTION OF WATER TREATMENT PLANTS FOR DAYS/MONTHS



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- Desalination is a multi-million business.
- CFD plays a decisive role in evaluating the risk of ‘Process Assurance’ of water plants. Help select the construction site.

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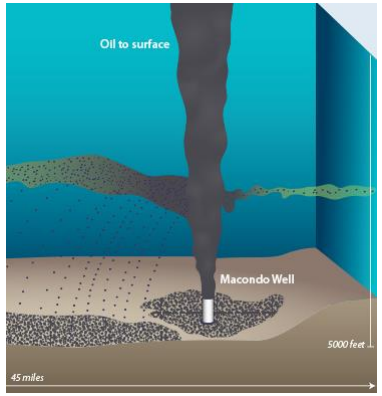
7- Subsea Oil Spills

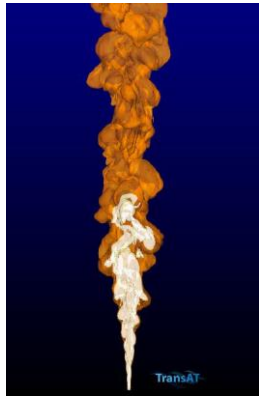
OIL SPILL CONTINGENCY MEASURES (WELL CAPPING)

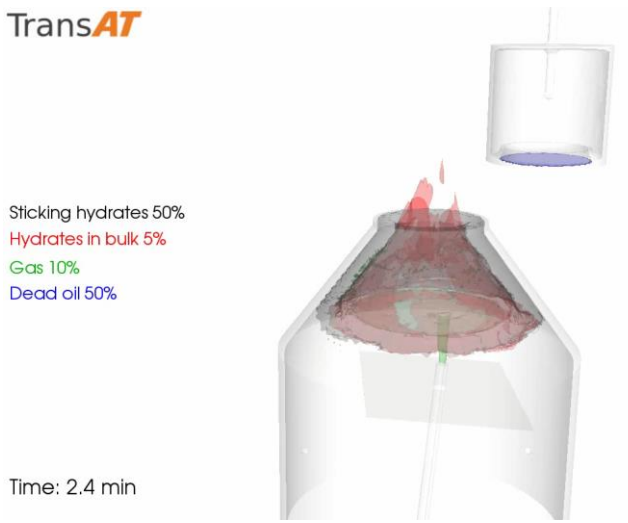
- A subsea oil spill can cause irreversible environmental damages, with high costs ($ billions) and litigation issues.

Why advanced CFD?

- Lesson learnt from BP spill → efforts to create a safety passive containment system
- Understand the complex subsea flow behaviour near spill
- Screen simple passive safety containment systems
- Optimize the design (incl. chem. Inhibitors injection) and robot deployment of containment.







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