3D Seismic Finite Element Analysis of Concrete Gravity and CFRD Dams

MIDAS

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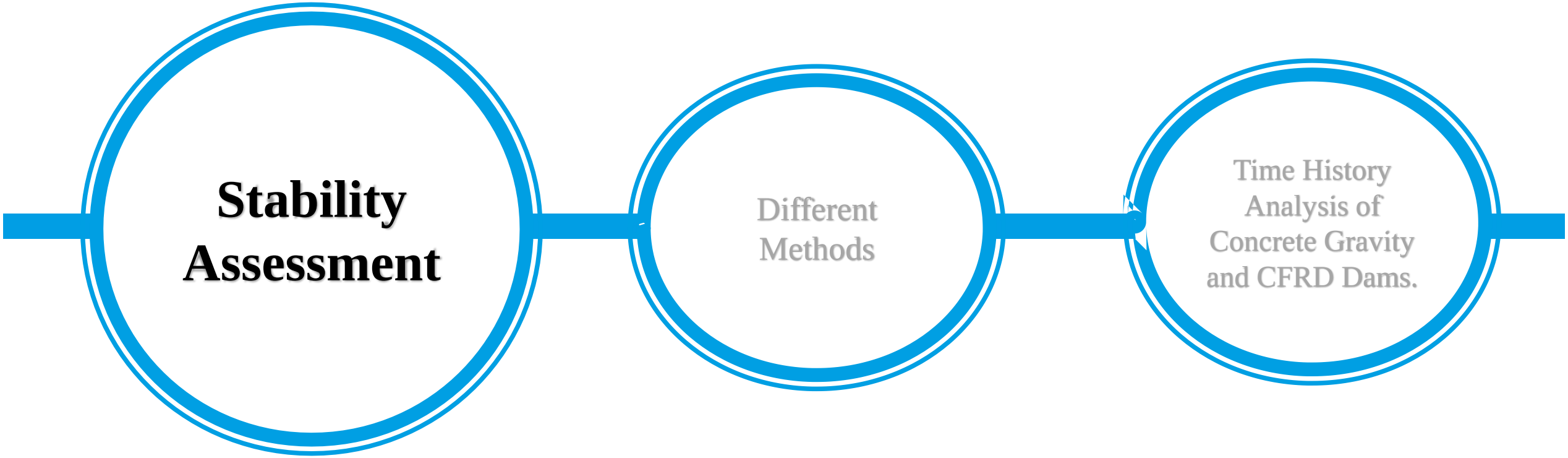
Contents

- Stability Assessment of the Dam
- Required Analyses for the Dam Design
- Seismic Analysis - (What Solutions does MIDAS provide?)
- Time History Analysis of a Concrete Gravity Dam
- Time History Analysis of a CFRD Dam
- Conclusion


Stability Assessment
Different Methods
Time History Analysis of Concrete Gravity and CFRD Dams.

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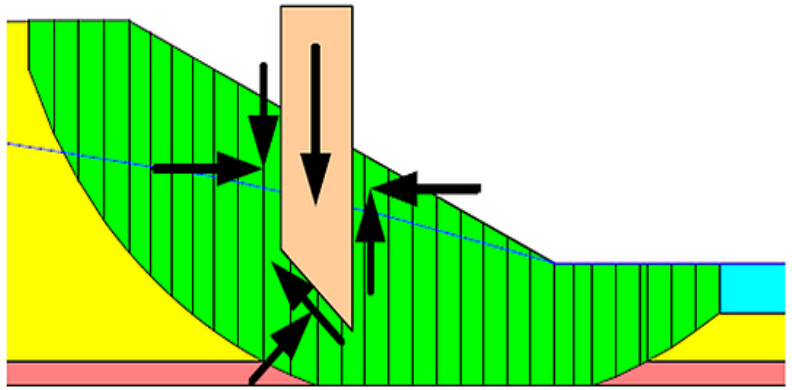
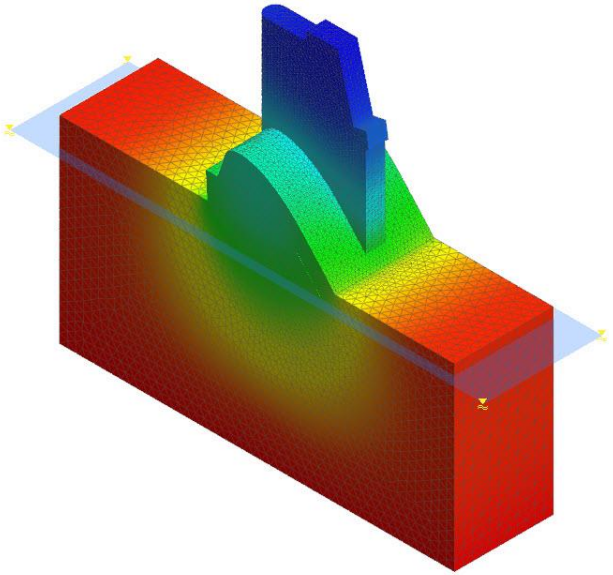
Physical Tests



Limit Equilibrium Methods



Numerical Analysis

- **FEM**
- **FVM/FDM**
- **DEM**
- **BEM**

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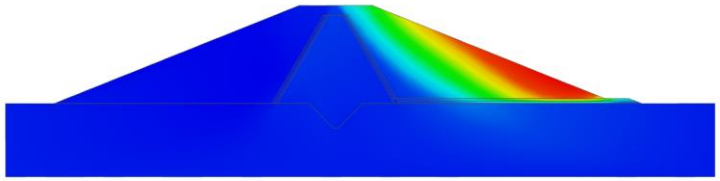

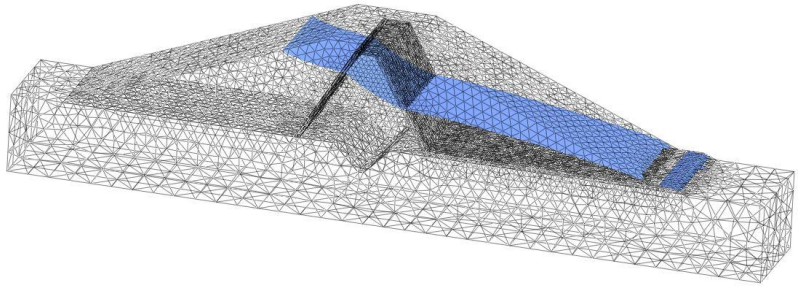

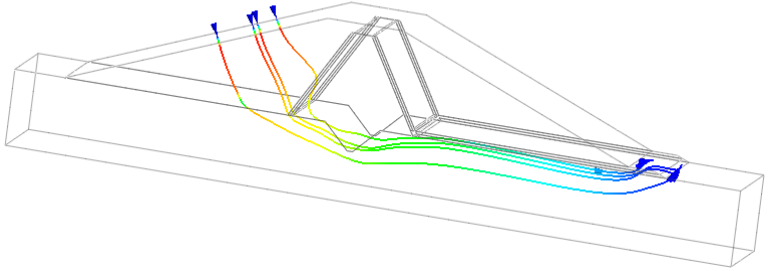

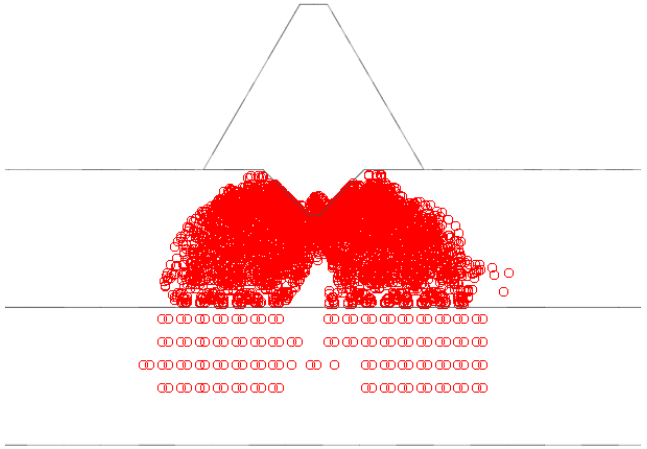

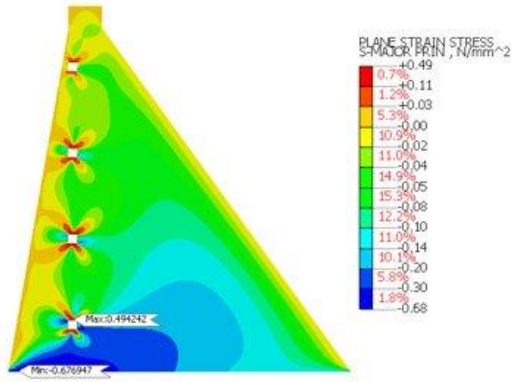

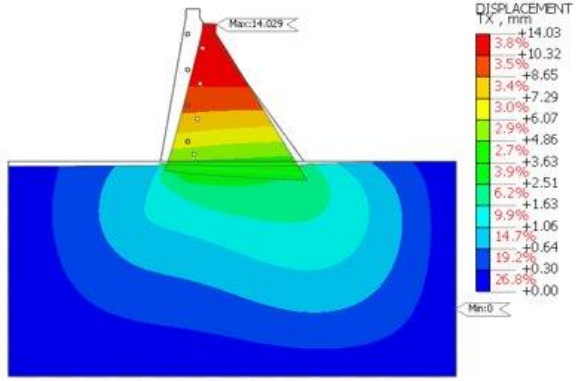

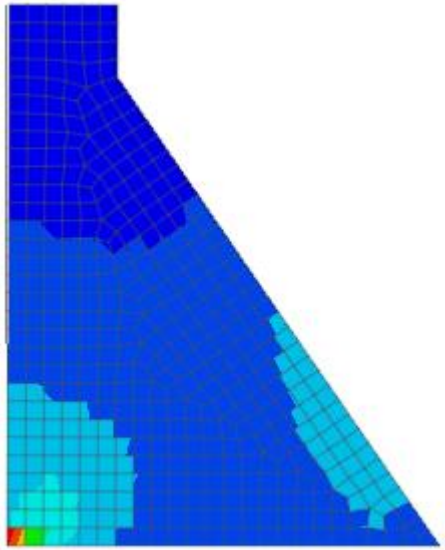

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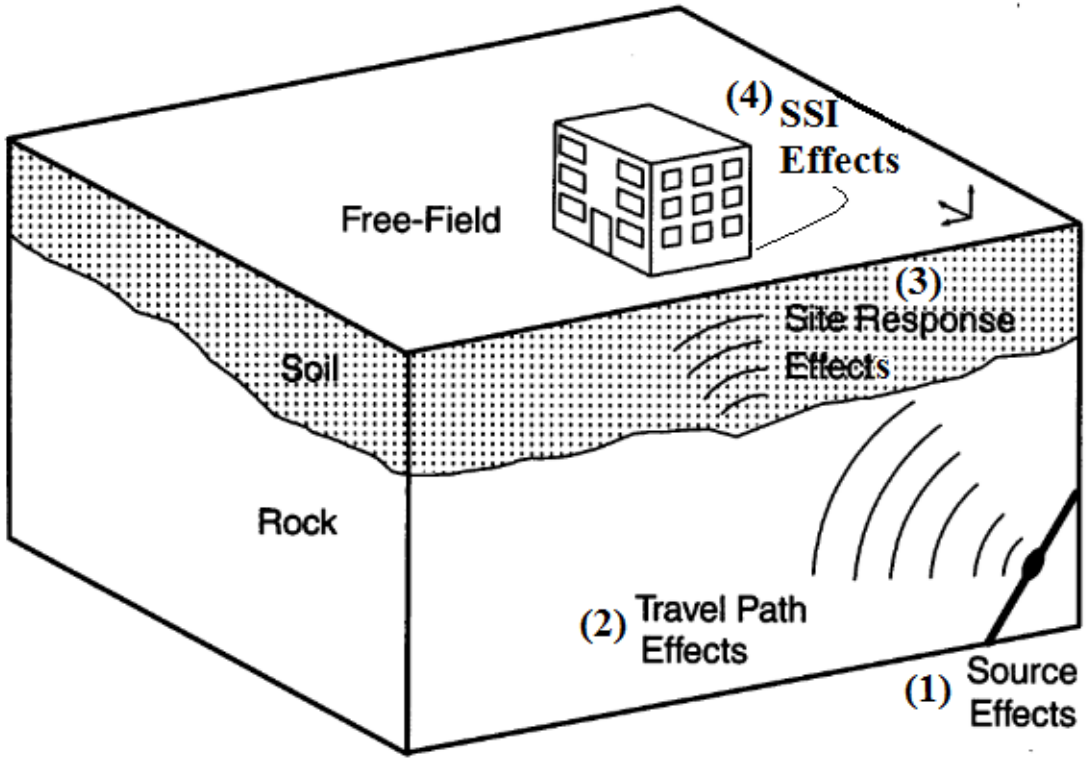
New Challenges



Seismic Soil-Structure Interaction

Unexpected Events

Stability Assessment

Required Analysis to be Conducted for Dams

Time History Analysis of Concrete Gravity and CFRD Dams.

1. Stress Analysis
2. Steady state seepage Analysis
3. Transient seepage Analysis
4. Slope Stability Analysis
5. Stress-Seepage **Fully Coupled/Semi-Coupled** Analysis
6. Dynamic Analysis – Seismic

We may also require,

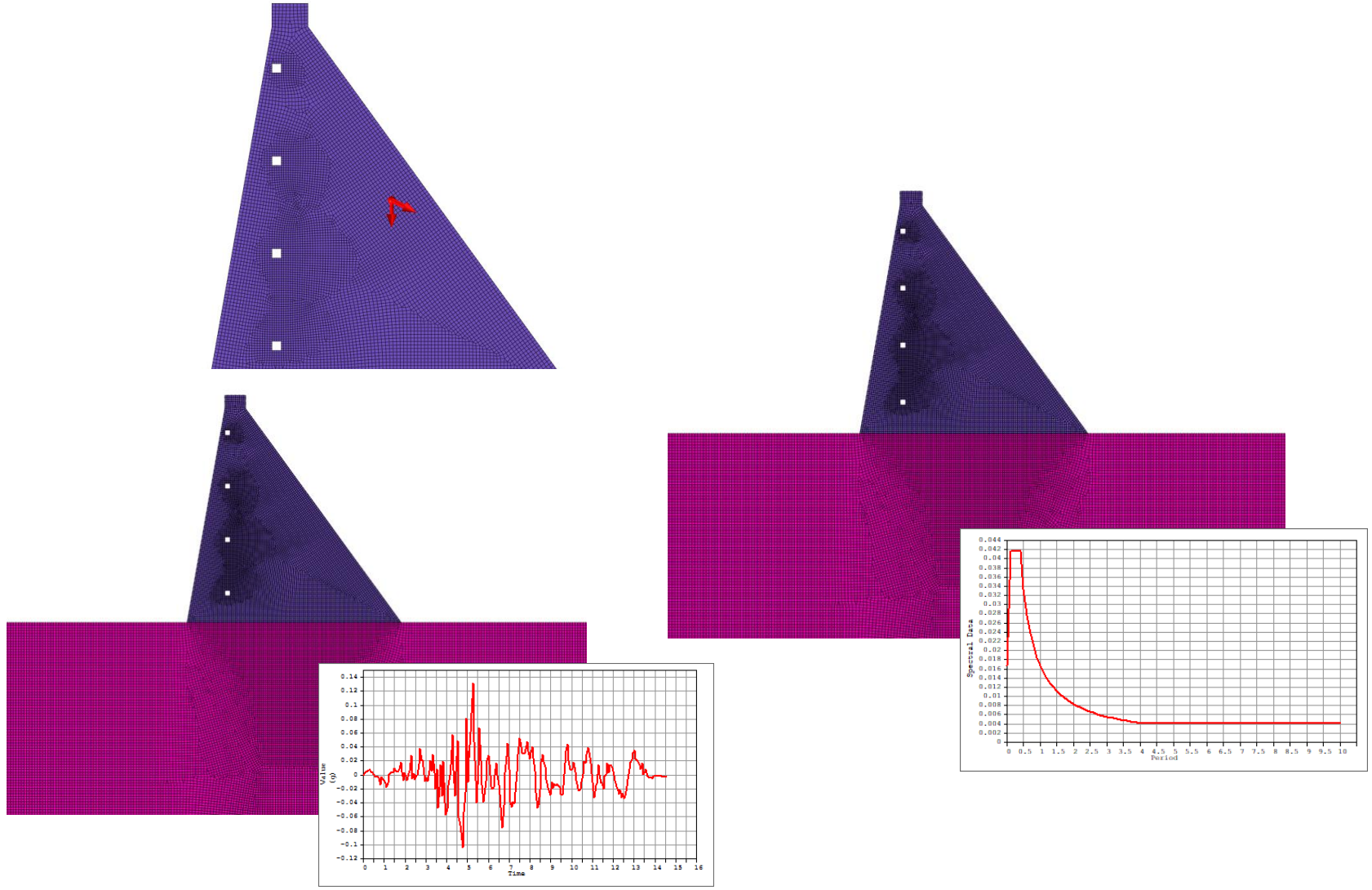
7. Heat of Hydration Analysis
8. Crack Propagation Analysis
9. Thermal Stress Analysis
10. Dam Breach Analysis
11. Particle Flow – Soil Erosion

Seismic Analysis

1. Pseudo-Static Method
2. Response Spectrum Analysis
3. Time History Analysis

4. Eigenvalue Analysis
   (Frequency Analysis)

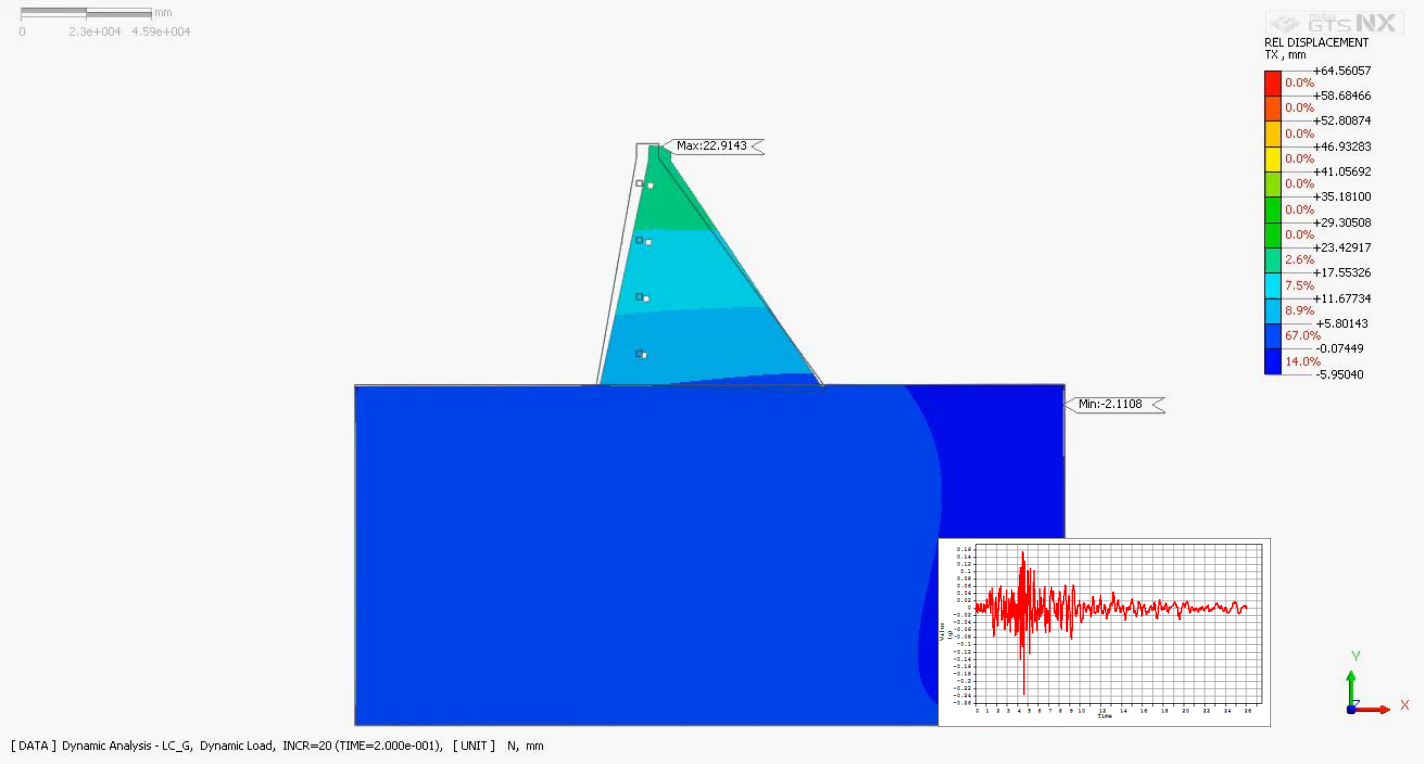
5. 1D Ground Response Analysis
6. 2D Equivalent Linear Analysis

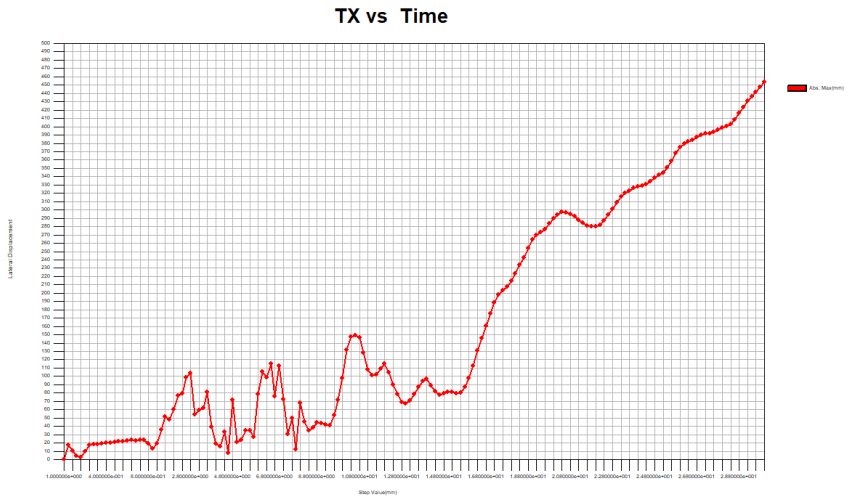


Stability Assessment

Required Analysis to be Conducted for Dams

Time History Analysis of Concrete Gravity and CFRD Dams





Lateral Displacement on the top of the DAM

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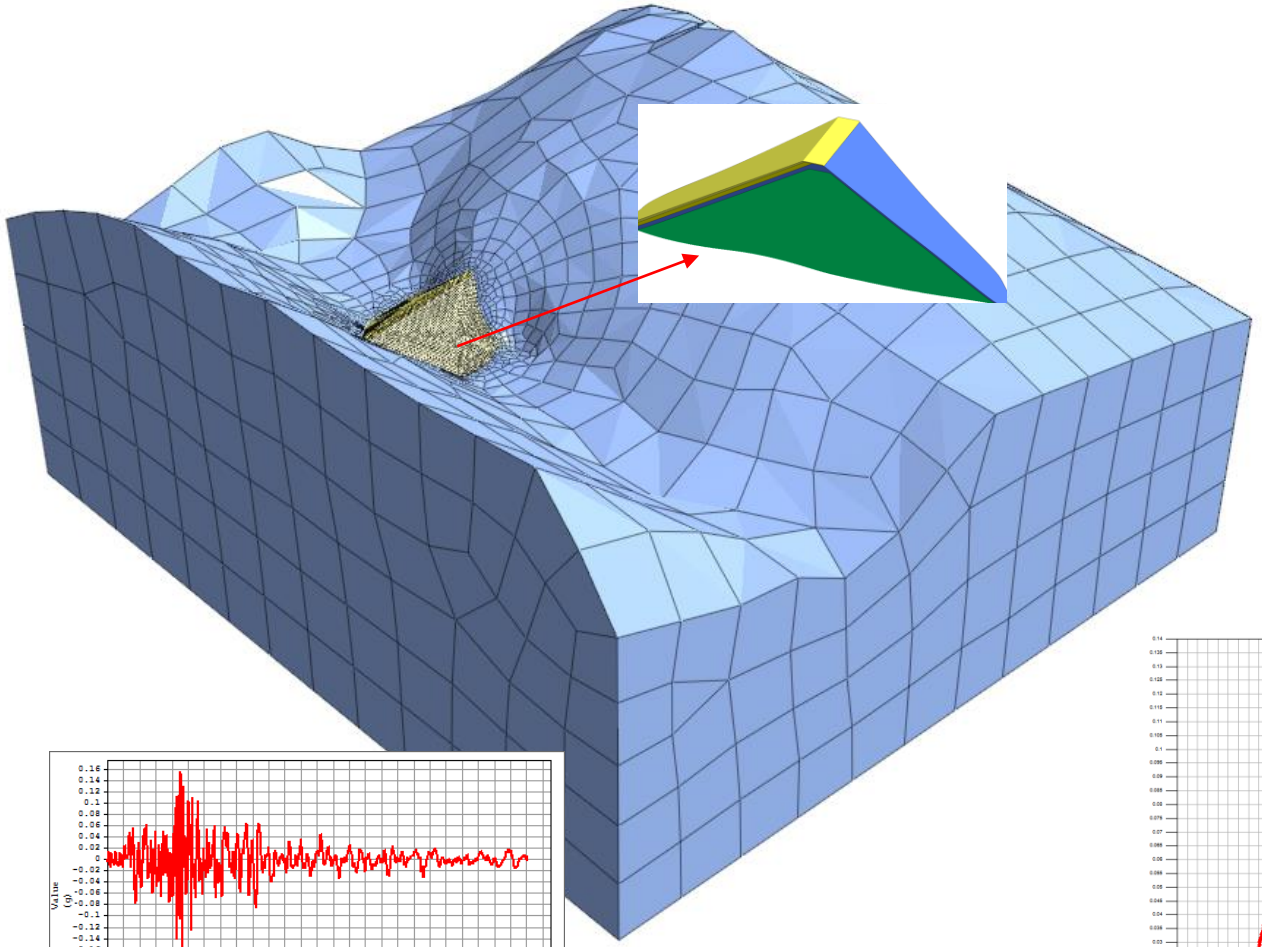
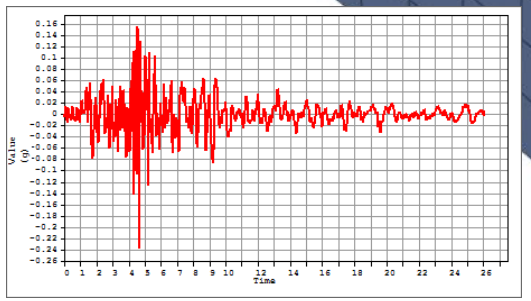
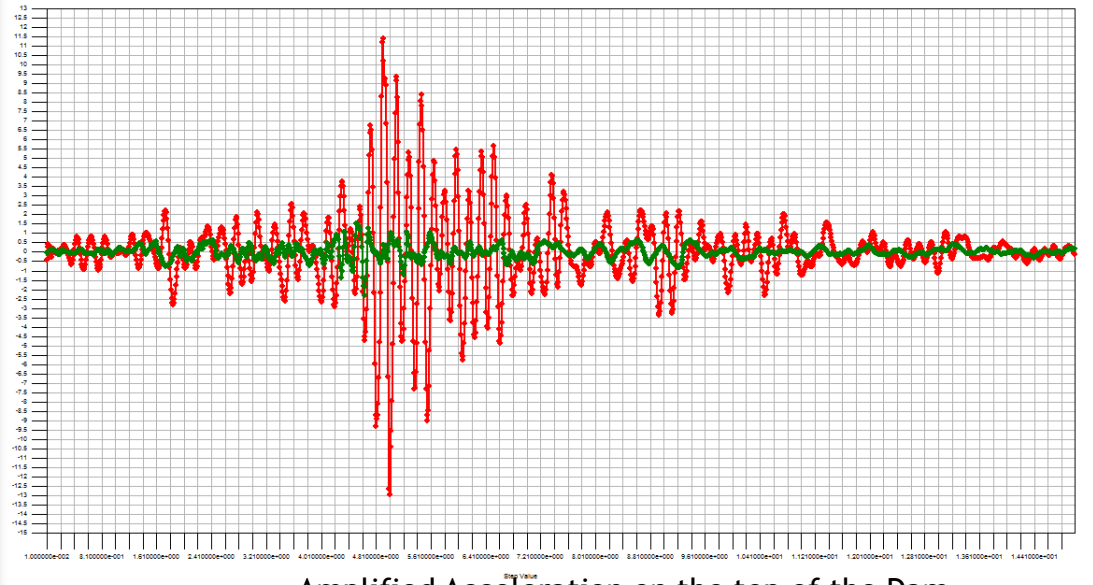
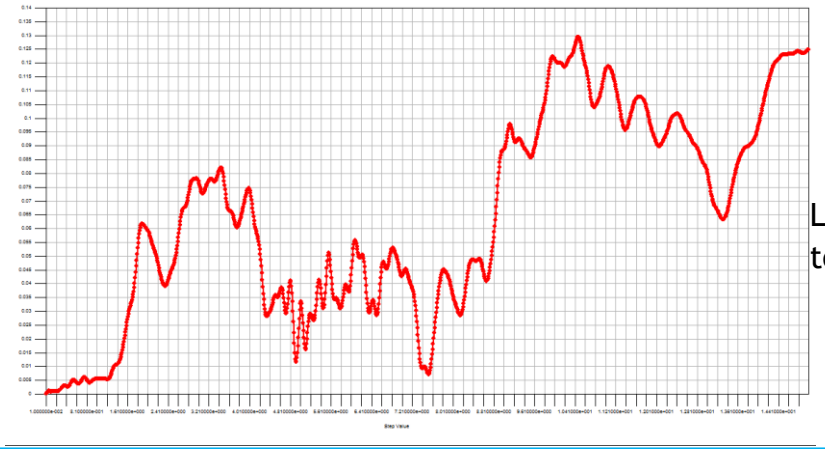






Amplified Acceleration on the top of the Dam



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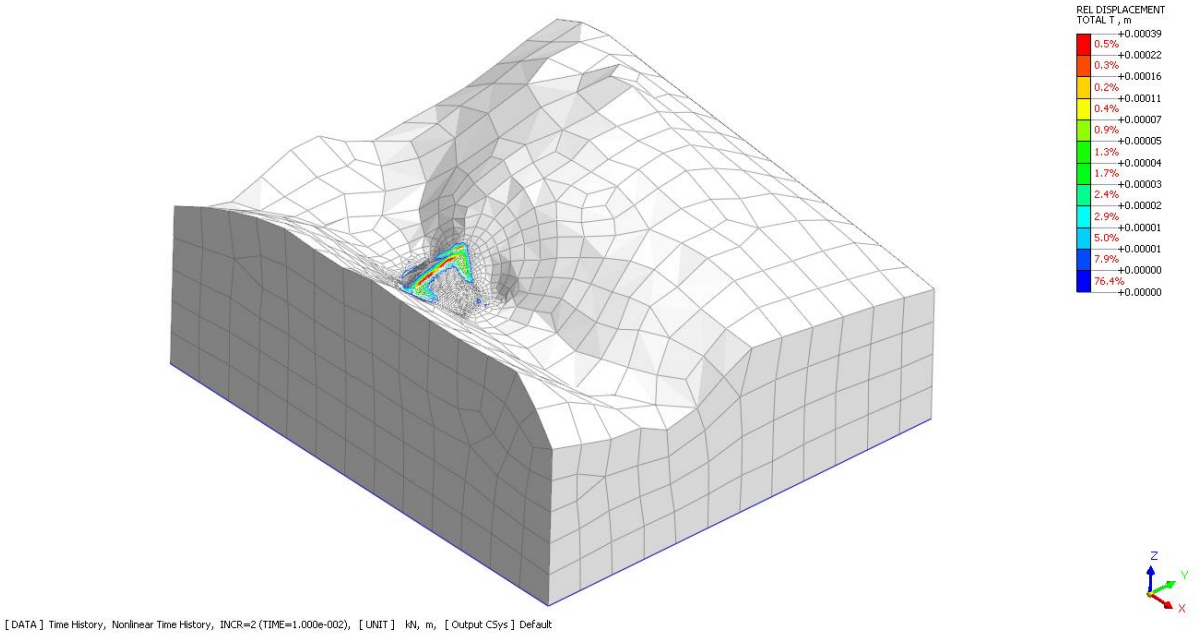

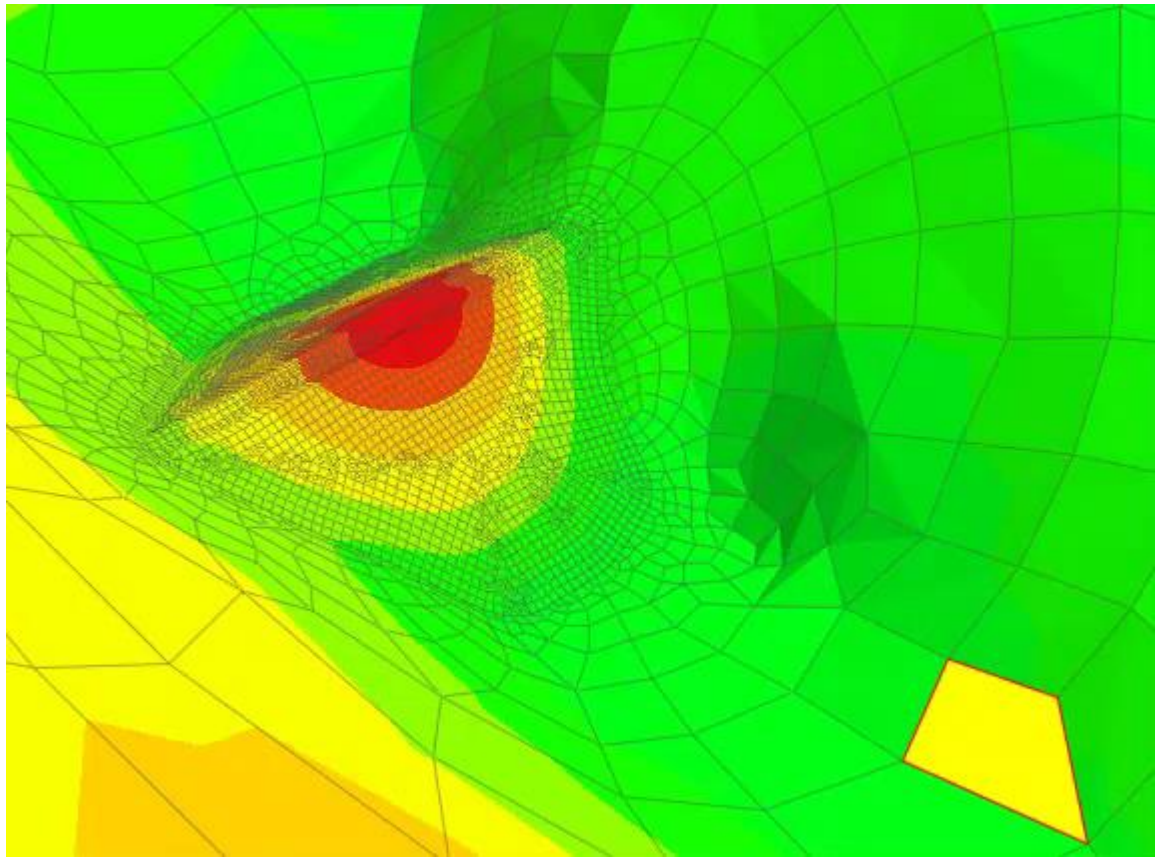

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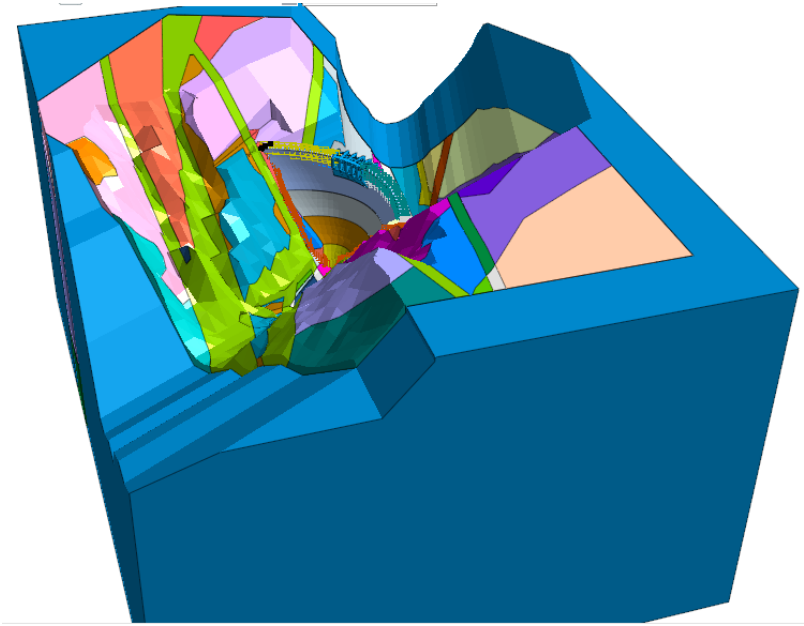

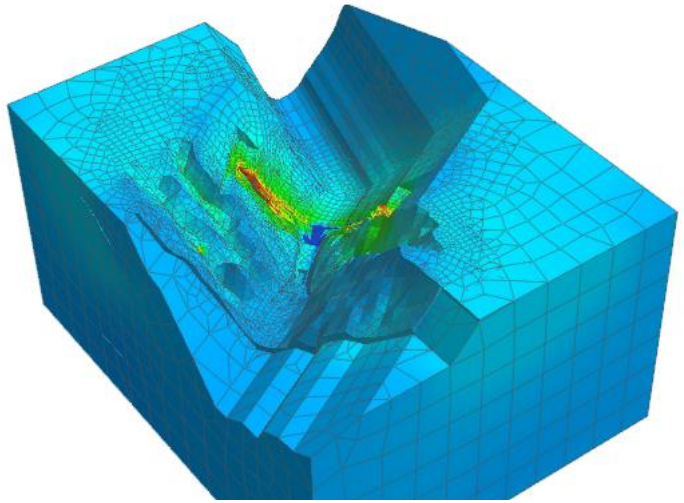

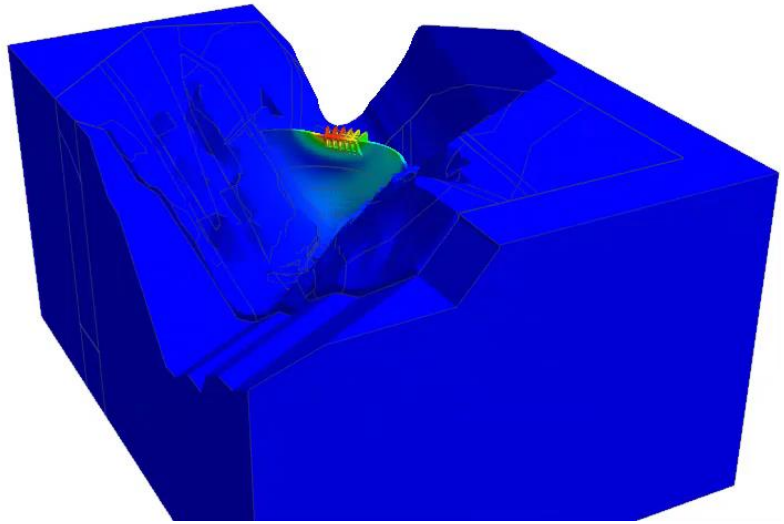

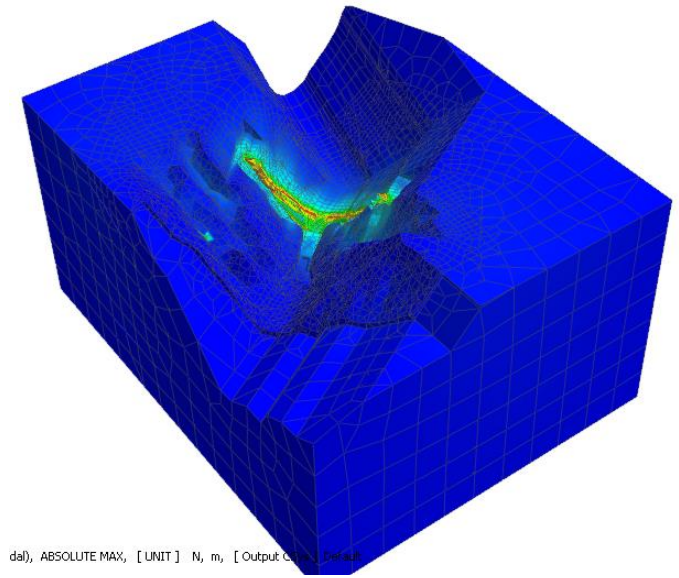

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Conclusion

In conclusion,

- A preliminary analysis with Elastic/Mohr-Coulomb should be carried out and check whether the expected behavior is achieved or not.
- For detailed analysis as per requirements, we can proceed with 3D modeling as well as Time History Analysis.
- With a lot of available online content and advanced computing hardware, 3D modeling can be carried out **with no difficulties**!!

MIDAS products can perform most of the analyses mentioned in the presentation.