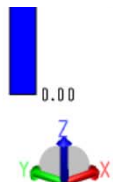


Time Domain VIV

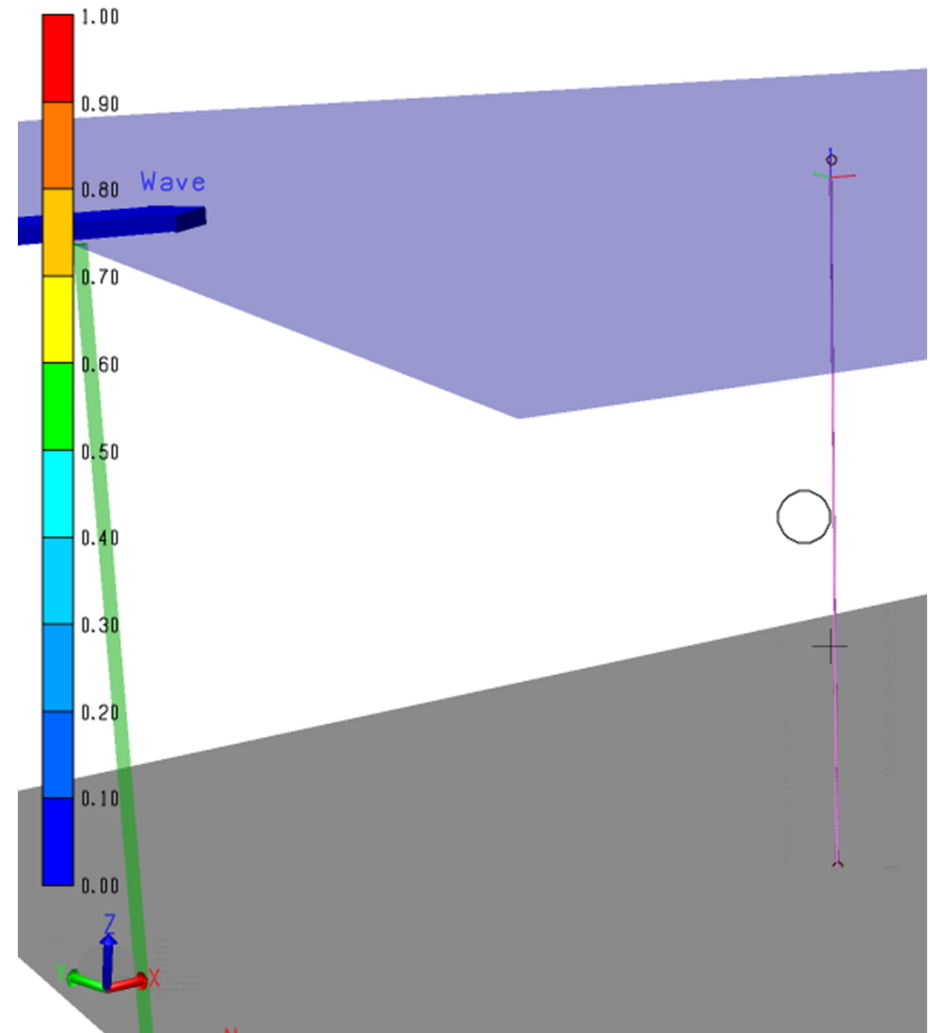
Model TTR500m - cross flow TVIV load





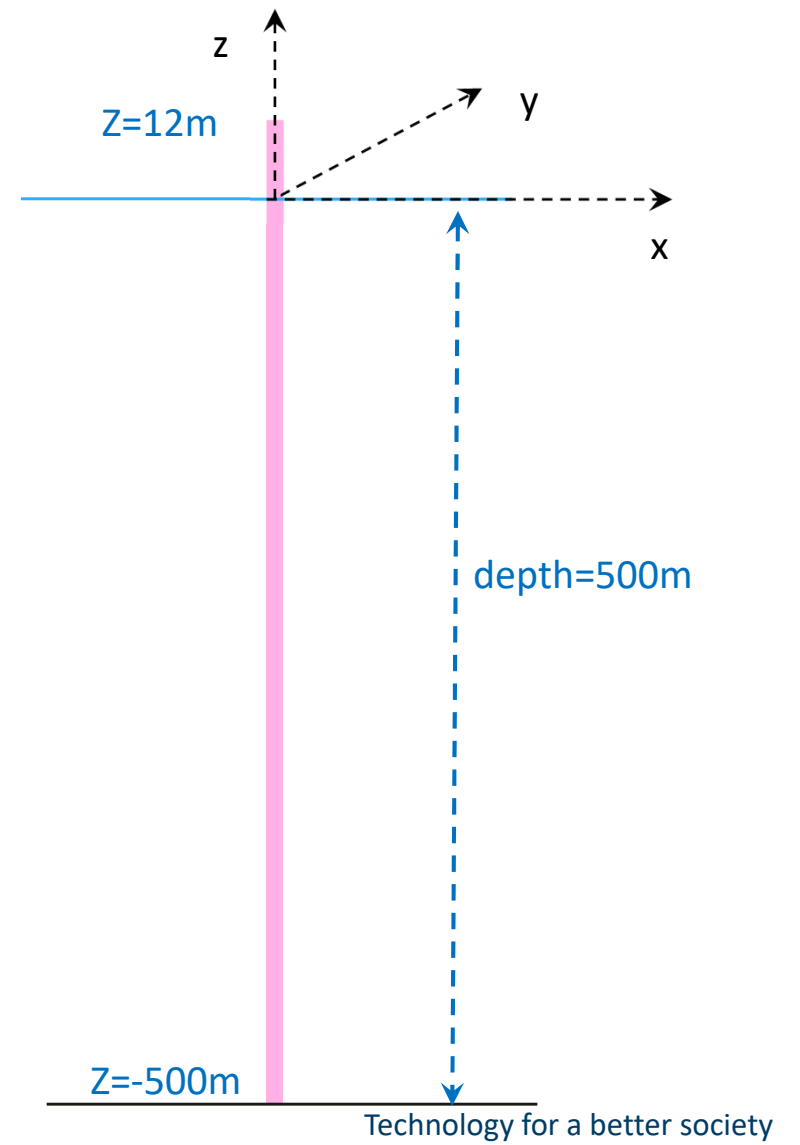
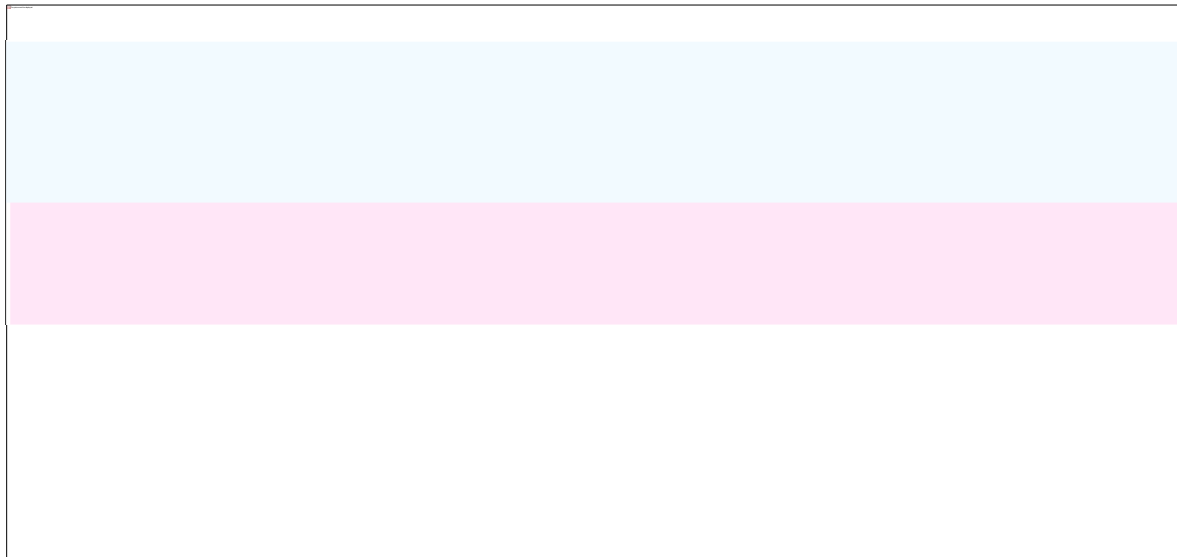
Example: TTR 500m

- Simple, vertical top tensioned riser
- Shared to the JIP members



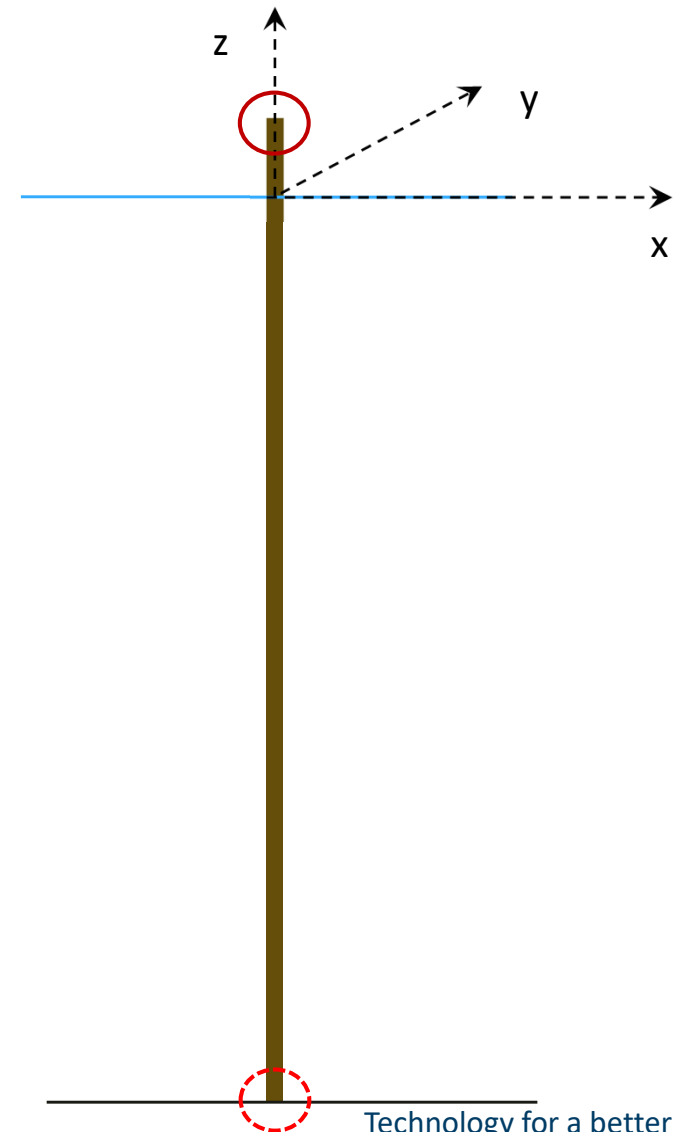
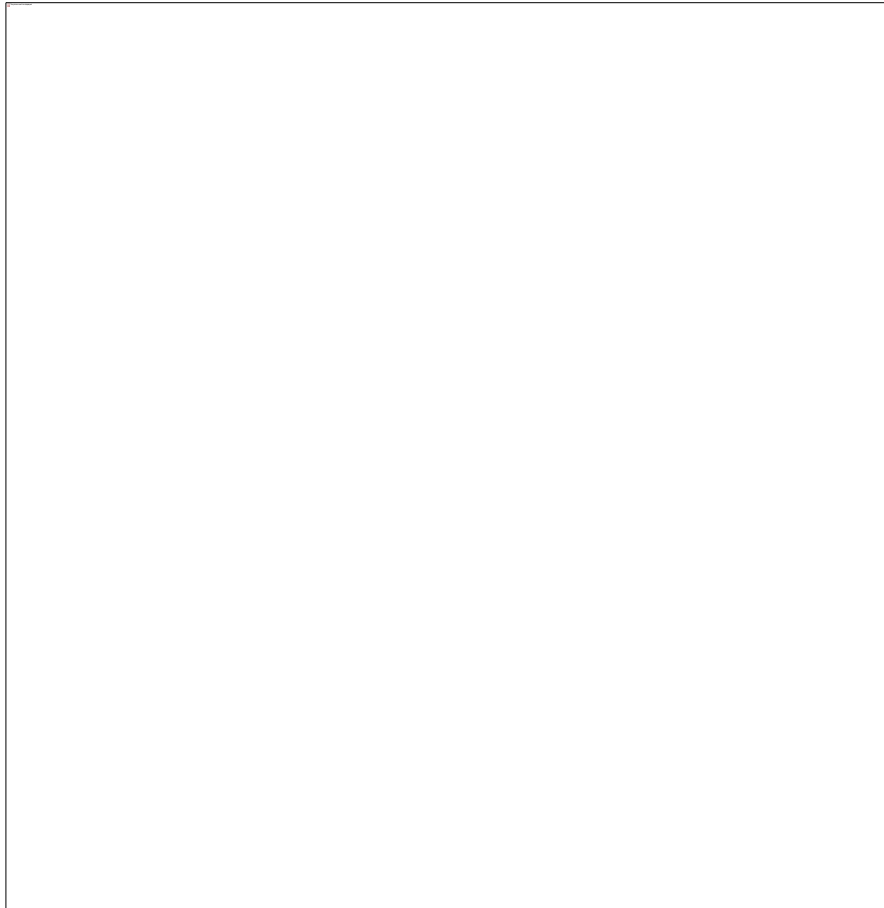


TTR 500m



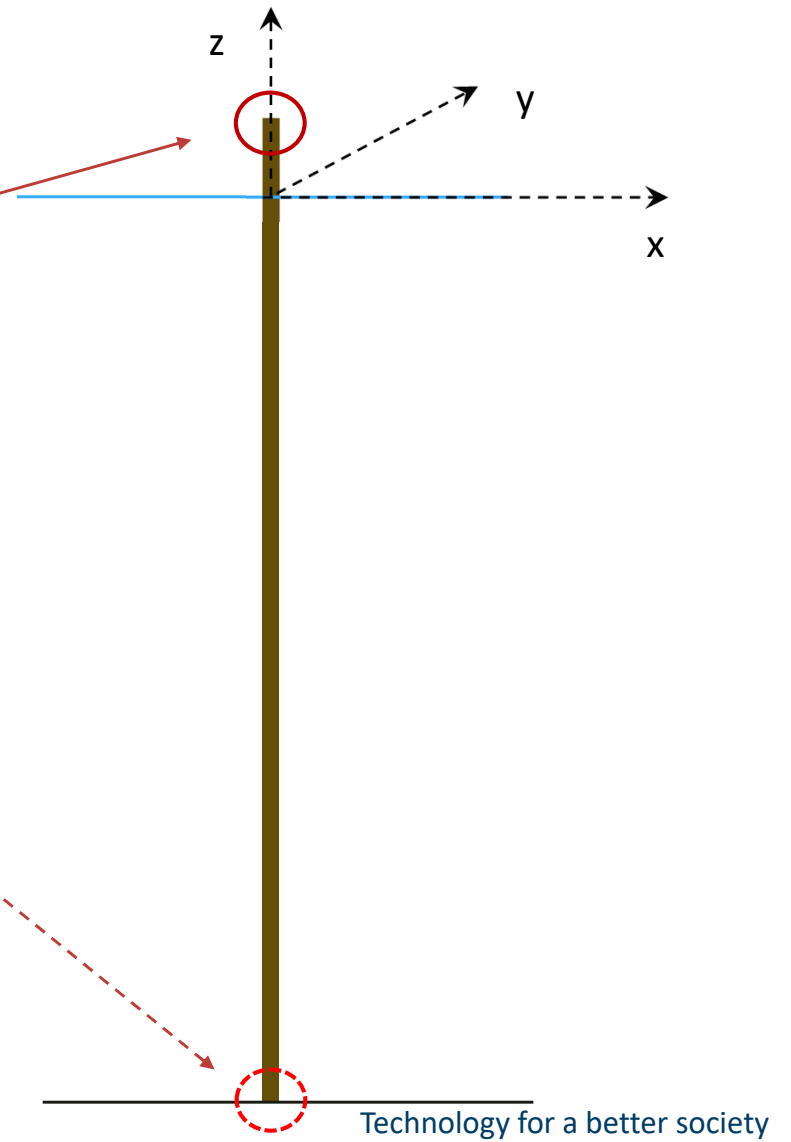
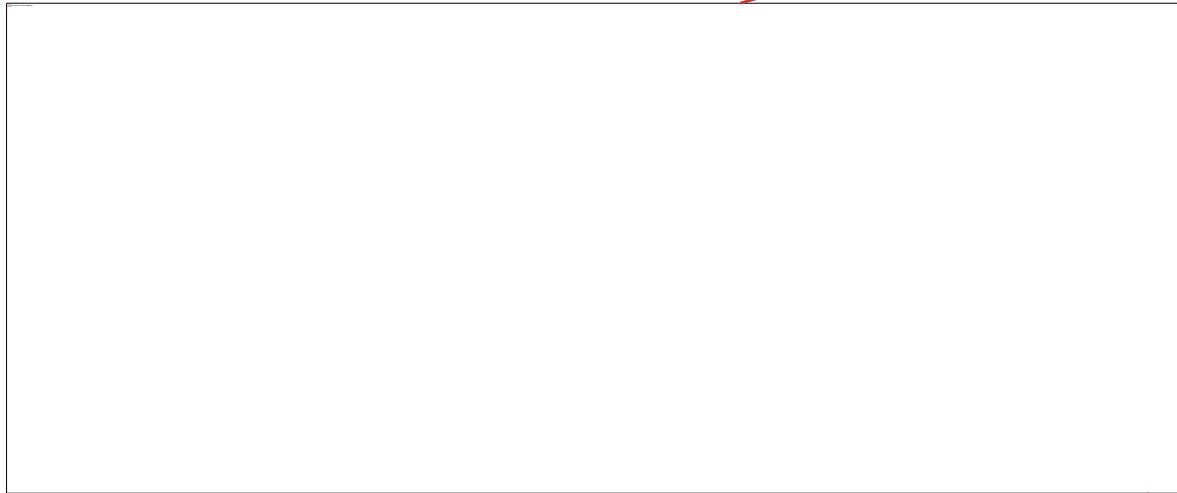


Structural properties – cross section



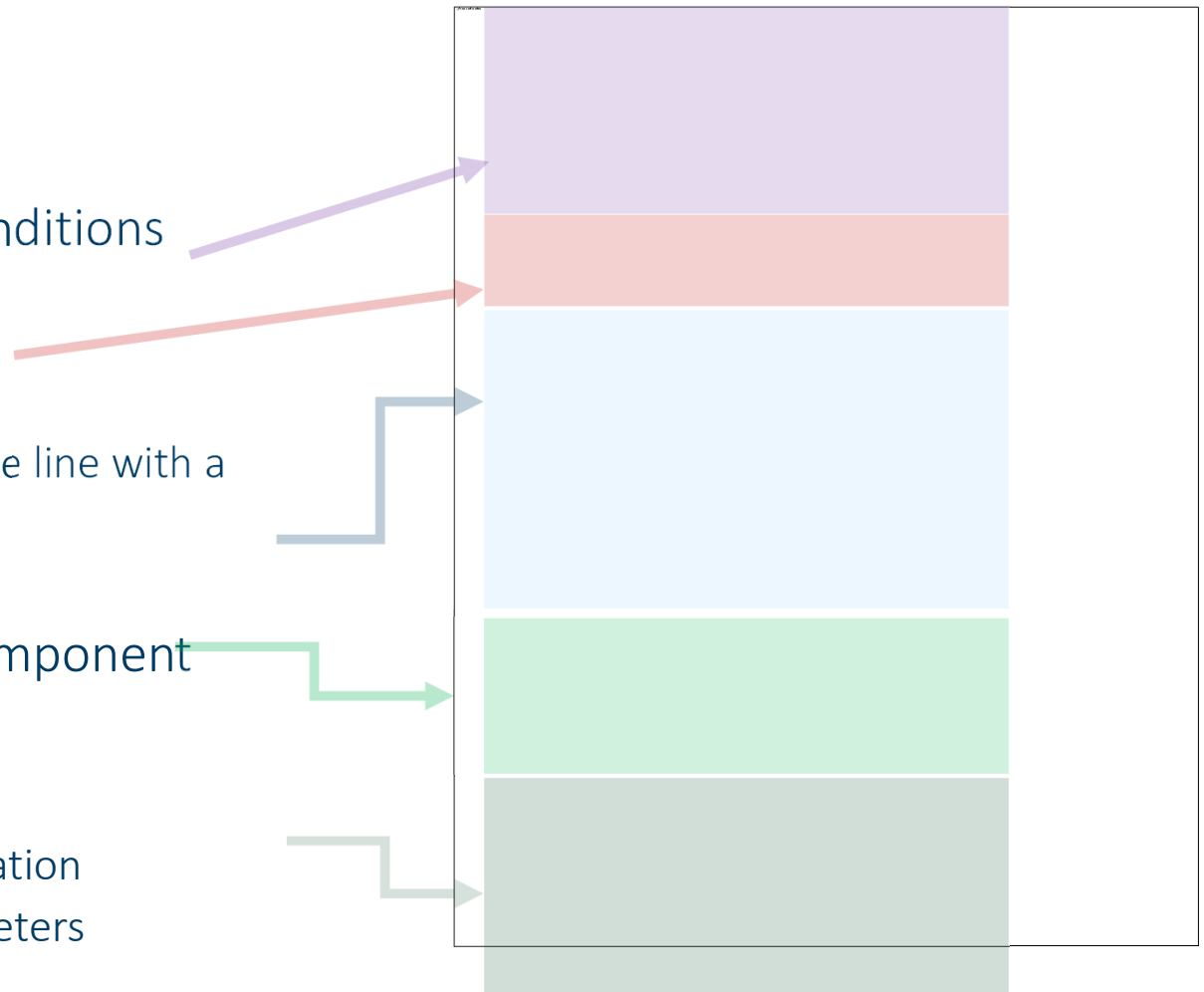


Boundary conditions



Slender system

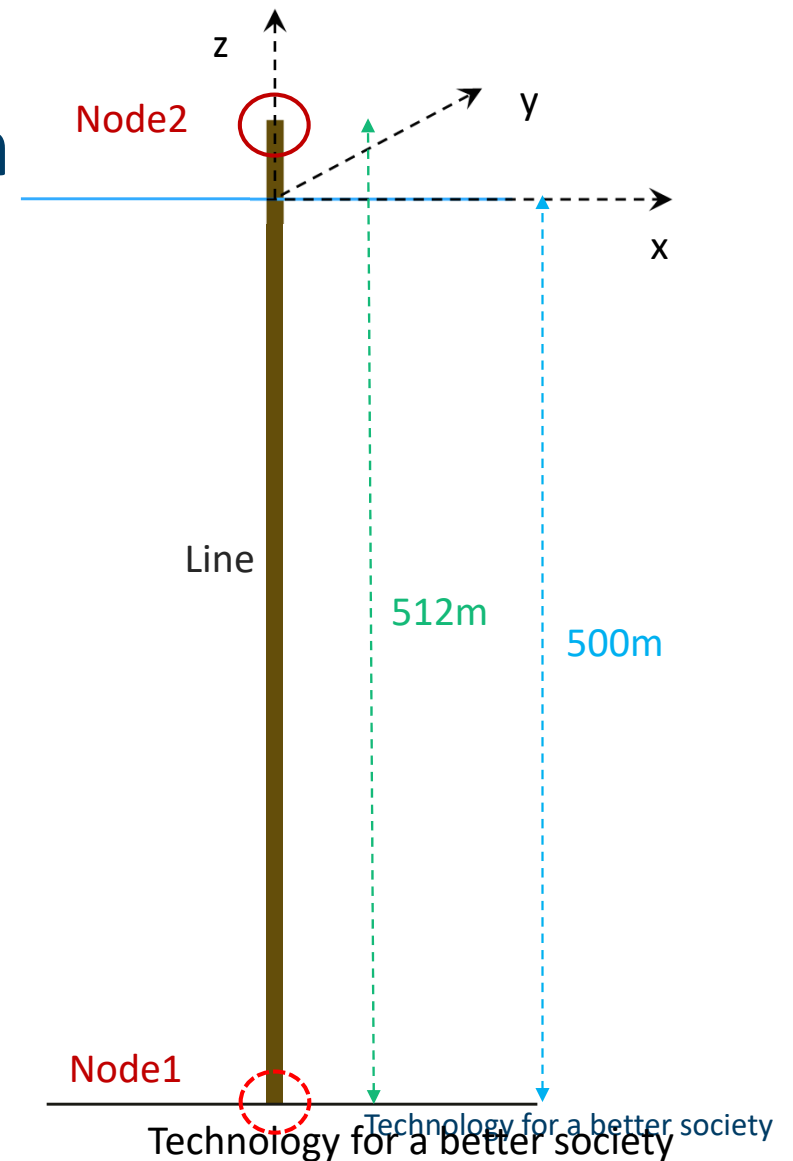
- Two super nodes with boundary conditions
- One line between the two nodes
- The line type consist of
 - Four segments (i.e. typical a length of the line with a specific cross section type)
 - Cross section with hydrodynamic load
- The riser is filled with fluid (i.e. a component type)
- The riser is top tensioned
 - The force is specified in the static calculation
 - Specified in the static calculation parameters





Define the slender system

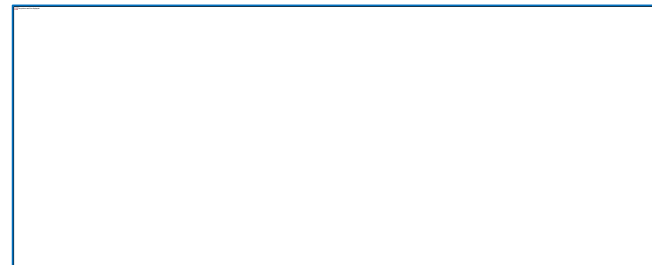
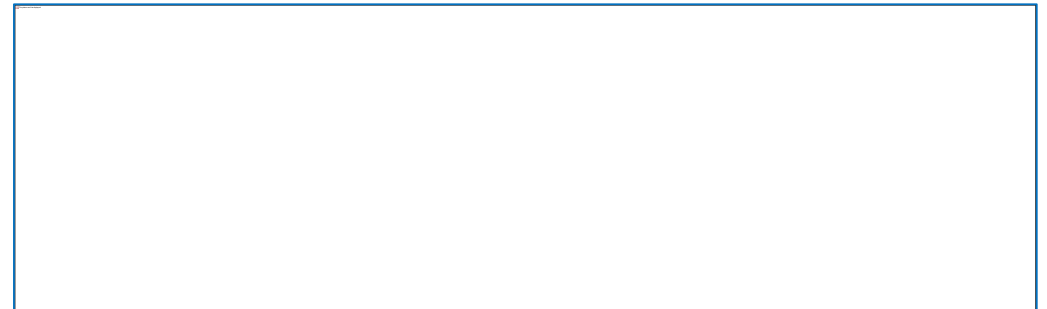
- One line → four segments → one cross section
 - Line from node1 to node2
 - Line of line type with different hydrodynamic loads
 - Lt_tdv
 - Cross section with CF and IL calculated separately
 - Lt_mor
 - Morison only
 - Added for comparison





Location

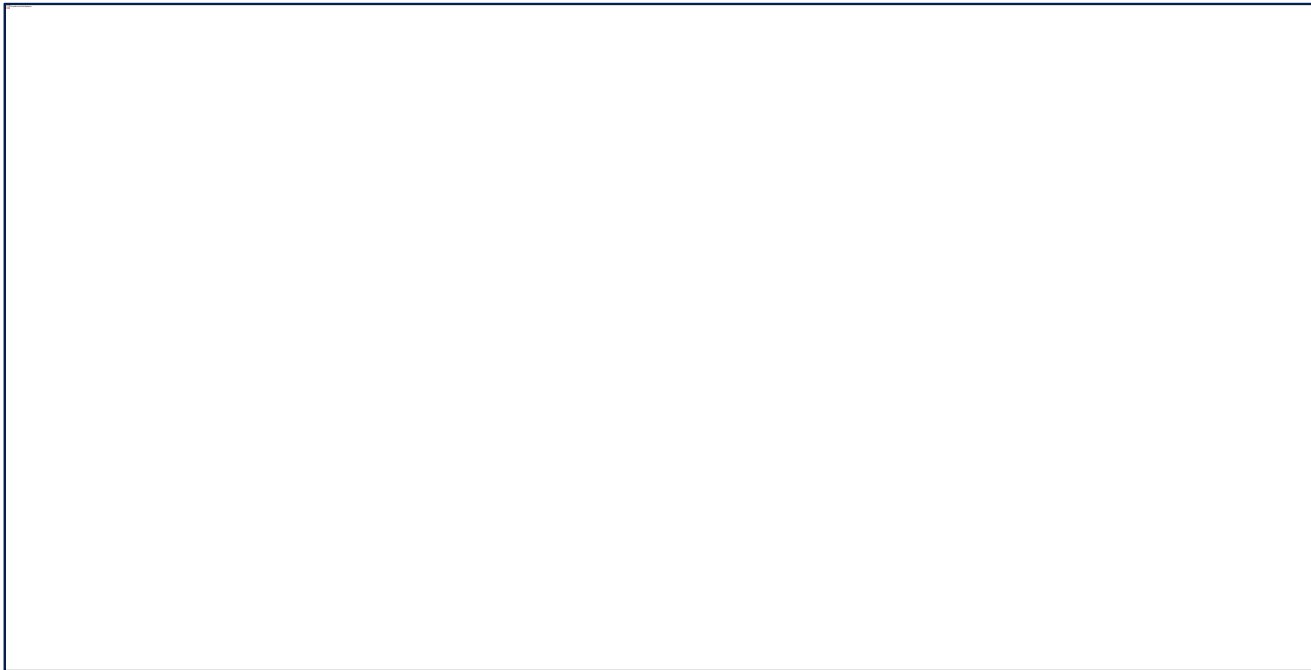
- Physical constants
 - Gravity, water depth etc, density etc
- Sea surface
- Sea floor
 - Here: flat bottom





Define an axisymmetric cross section

- Cross- section properties





Stiffness properties

- Beam elements
- Axial stiffness
- Bending stiffness
- Torsion stiffness





Hydrodynamic force coefficients

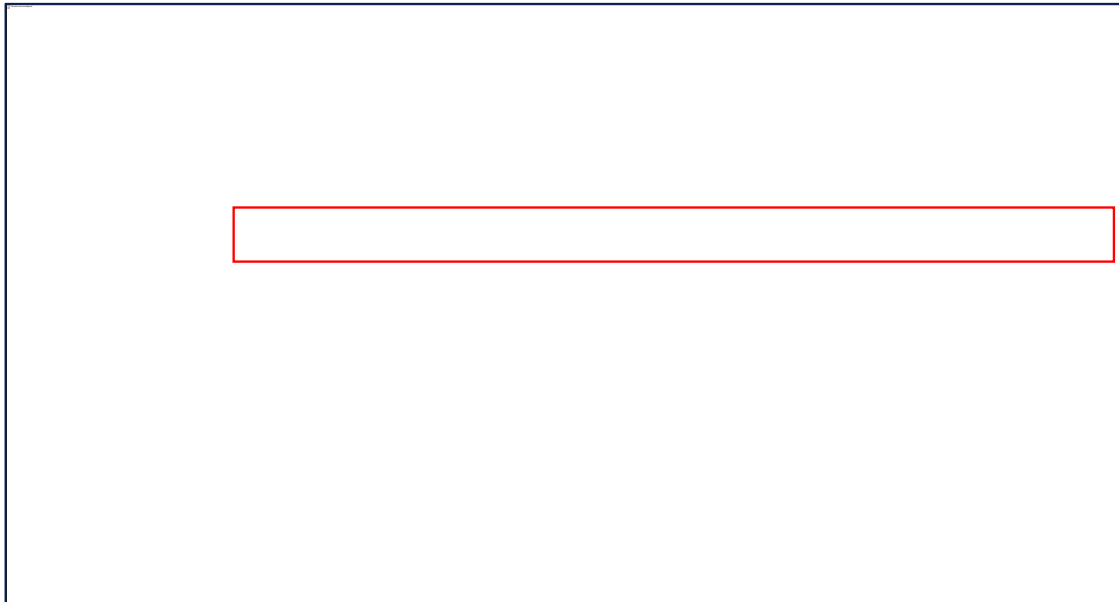
- Choose the load formulation (drop down list)

- Time domain VIV



TDV coefficients

- [See User Manual \(SIMA 4.6.3\)](#)





Other

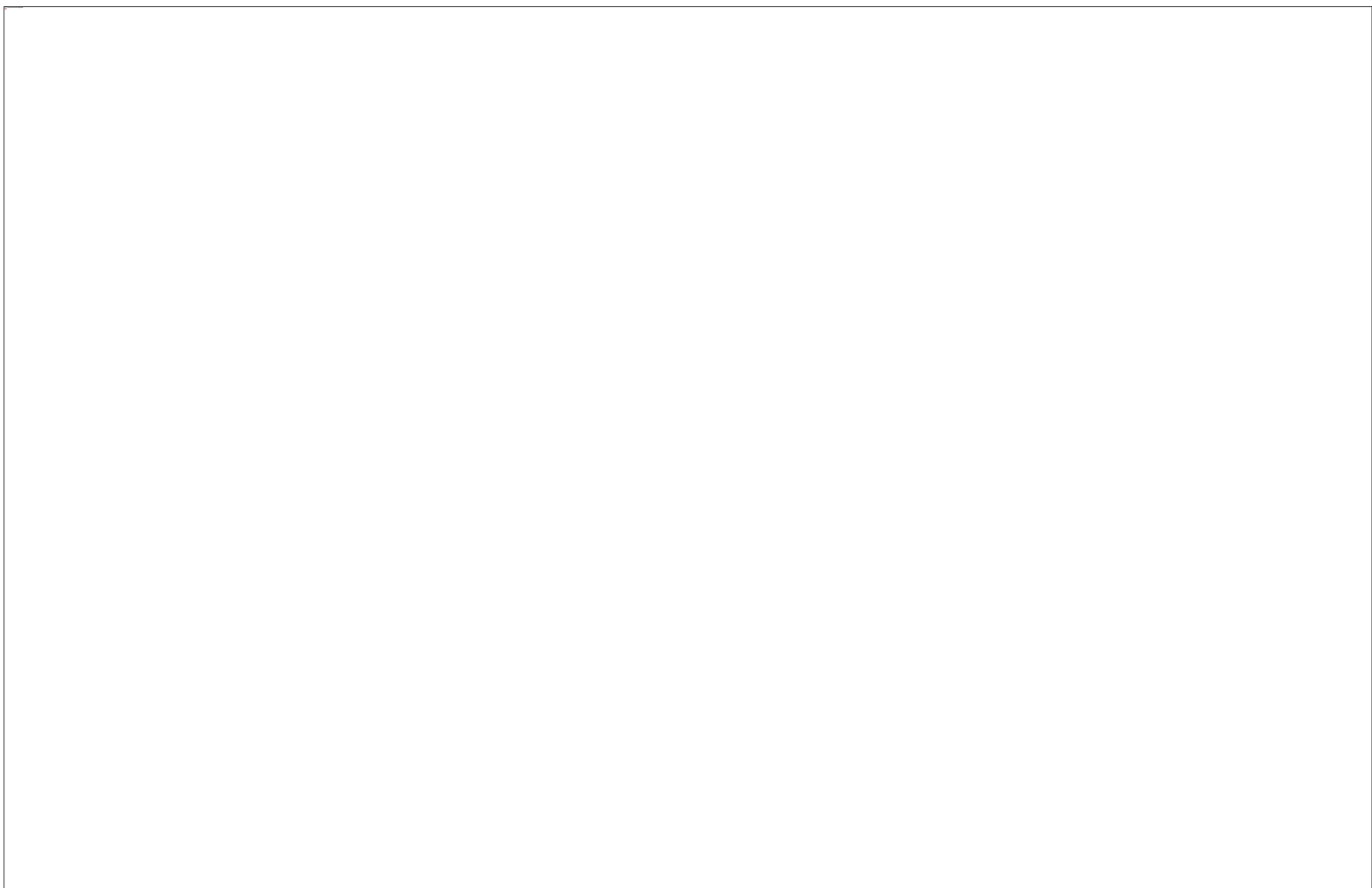
- Damping
- Aerodynamic force coefficients
- Capacity



Super nodes

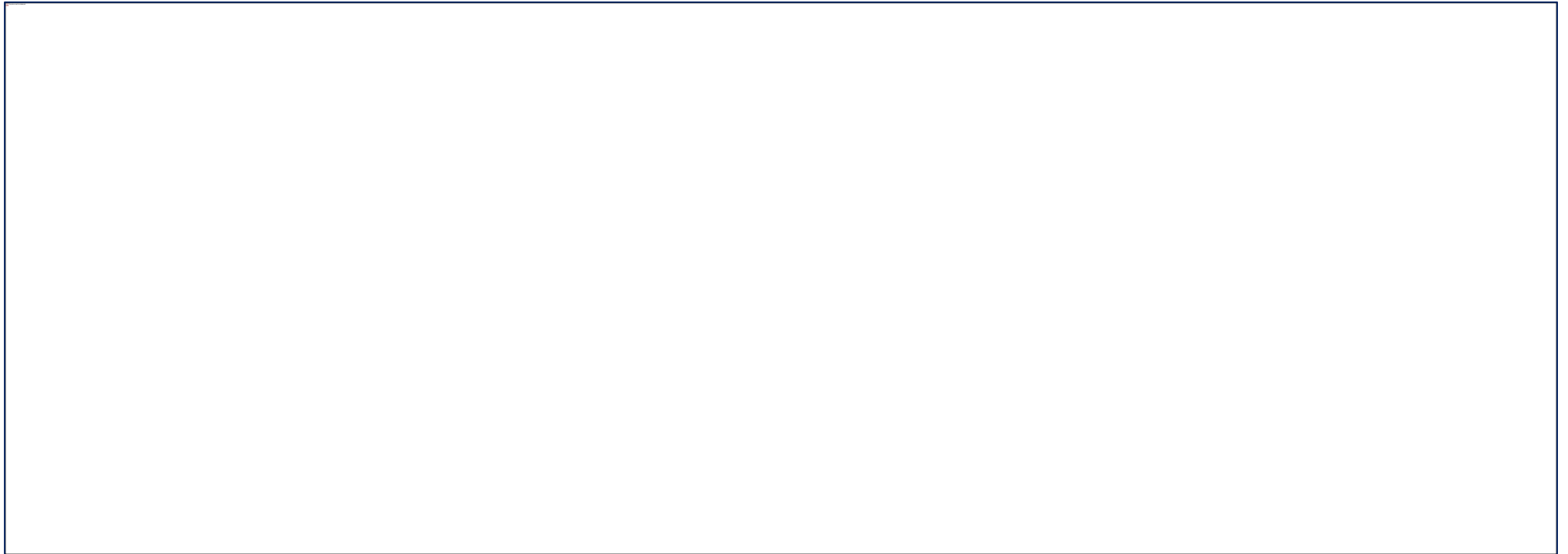
- Node1 – sea floor
- Node 2 – at the top of the ttr







Line type





Line between two super nodes of a line type

- Link the line to the super nodes and line type you want to use





Environments



- In the example, there are three environments
 - Current only (Cu)
 - Waves only (Wa)
 - Waves and current (WaCu)
- Referred to by *conditions*



Static parameters

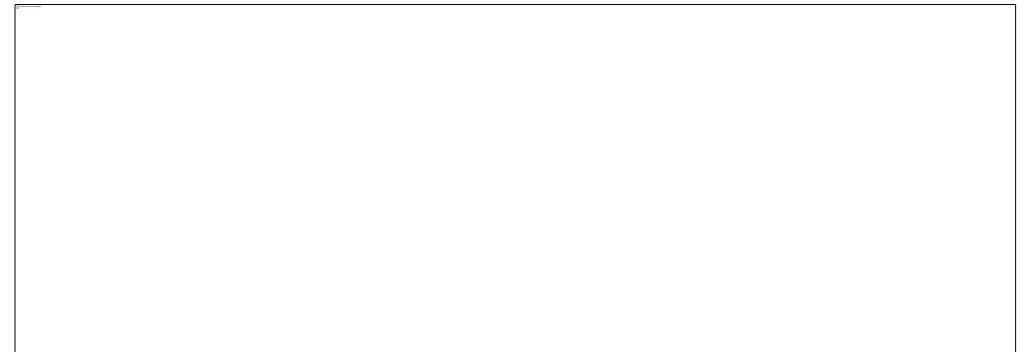
- Specify the order of the load types to be applied in the static run
 - 4 load groups in this case
 - Specified forces
 - Volume forces
 - Specified forces (*see bullet point 2*)
 - Current forces
- Specify the tension force in the top node
 - T=21473 KN in Global z-direction (dof_3) in super node **node_2** (=segment 4 & node 5)
 - *NOTE: The force is added in static analysis using the load group **Specified forces***



Dynamic parameters

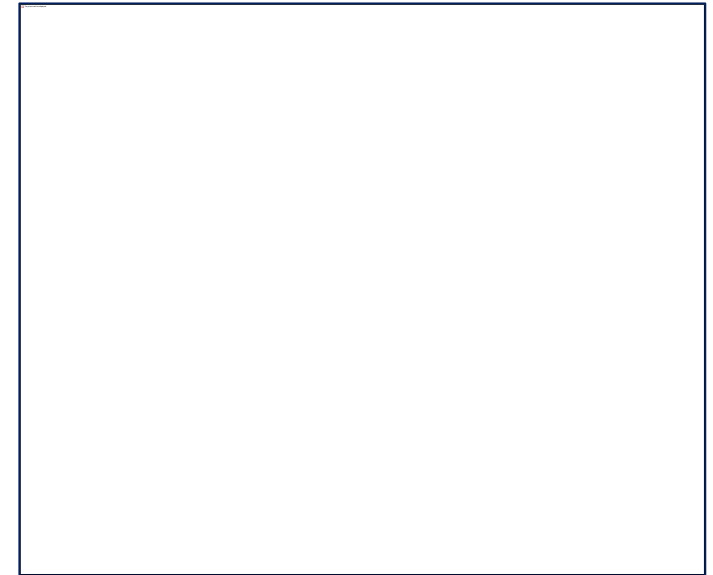


- Set up the dynamic analysis
 - Simulation length and time steps
- Time series generation parameter
 - Related to pre-generated kinematics
 - NOTE:
 - Requested time series length > Simulation length





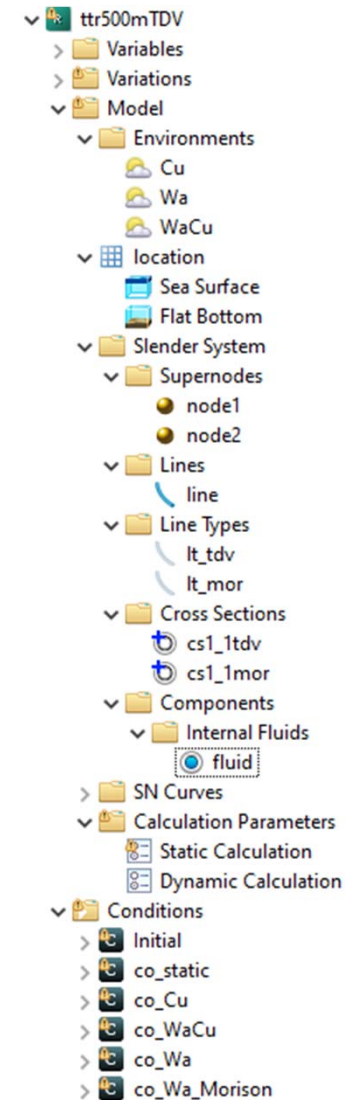
- Dynamic procedure
 - Random number, integration and damping parameters
 - Force model
 - Nonlinear integration procedure
 - Convergence criteria
- Dynamic loads
- Storage of data
 - Displacement





Full model

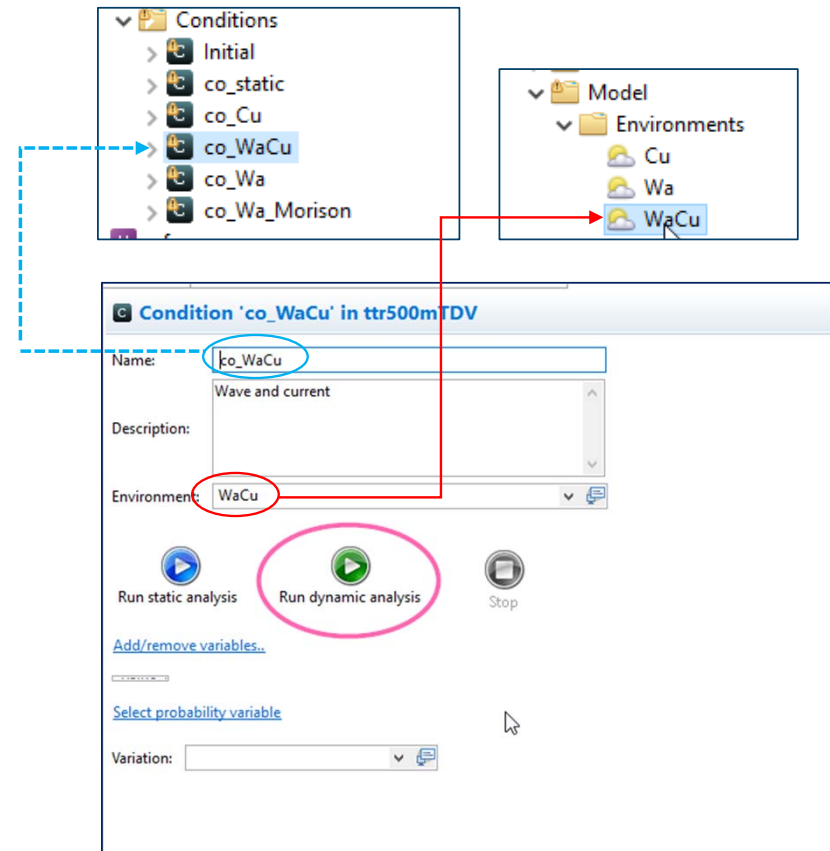
- Environment
- Location
- Slender system – where the TTR is defined
 - Super nodes
 - Lines and Line types
 - Cross sections
 - Components
 - Internal fluid
- SN curves
- Calculation parameters
 - Static & dynamic settings
- Conditions of the model
 - Initial is the base case
 - Initial always use the first listed environment





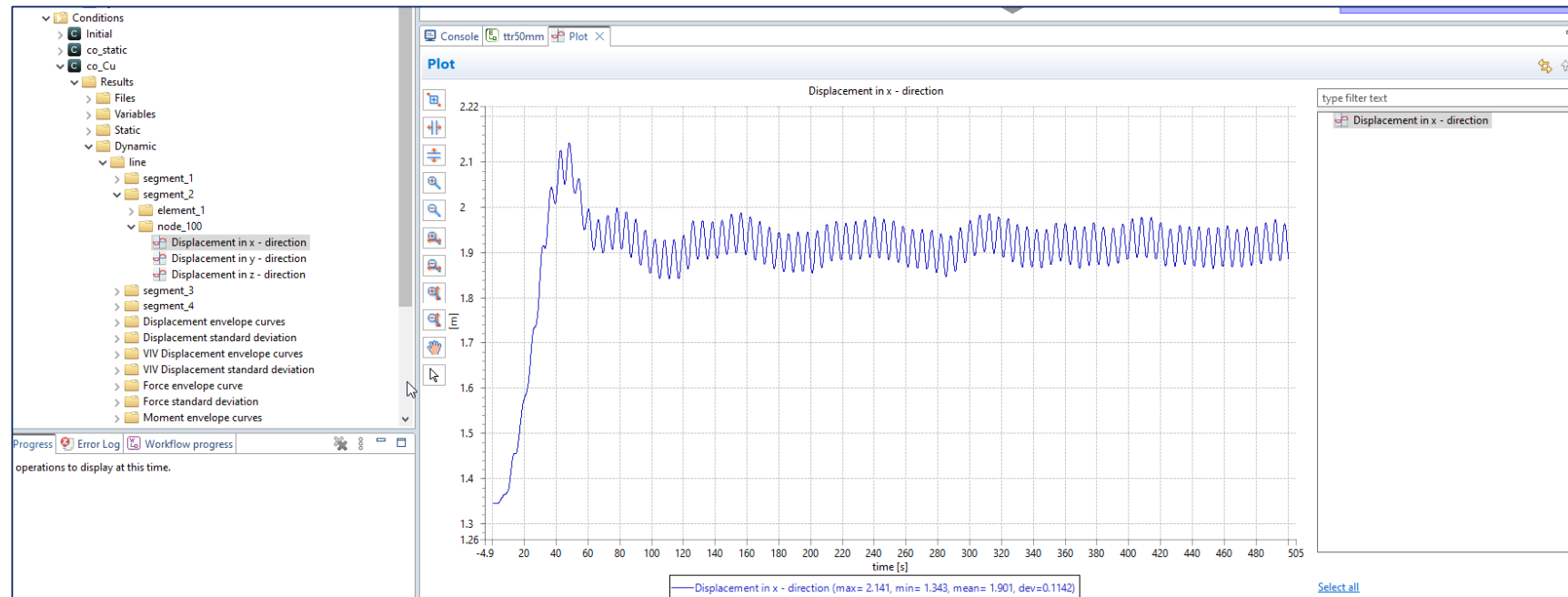
Run a condition

- Choose condition
- Run dynamic
- Example:
 - Condition: Co_WaCu
 - Environment *WaCu* (Wave and Current)
 - $H_s=5m$, $T_p=15s$
 - Uniform current $0.4m/s$
 - Line type with TDV loads on cross sections (default)



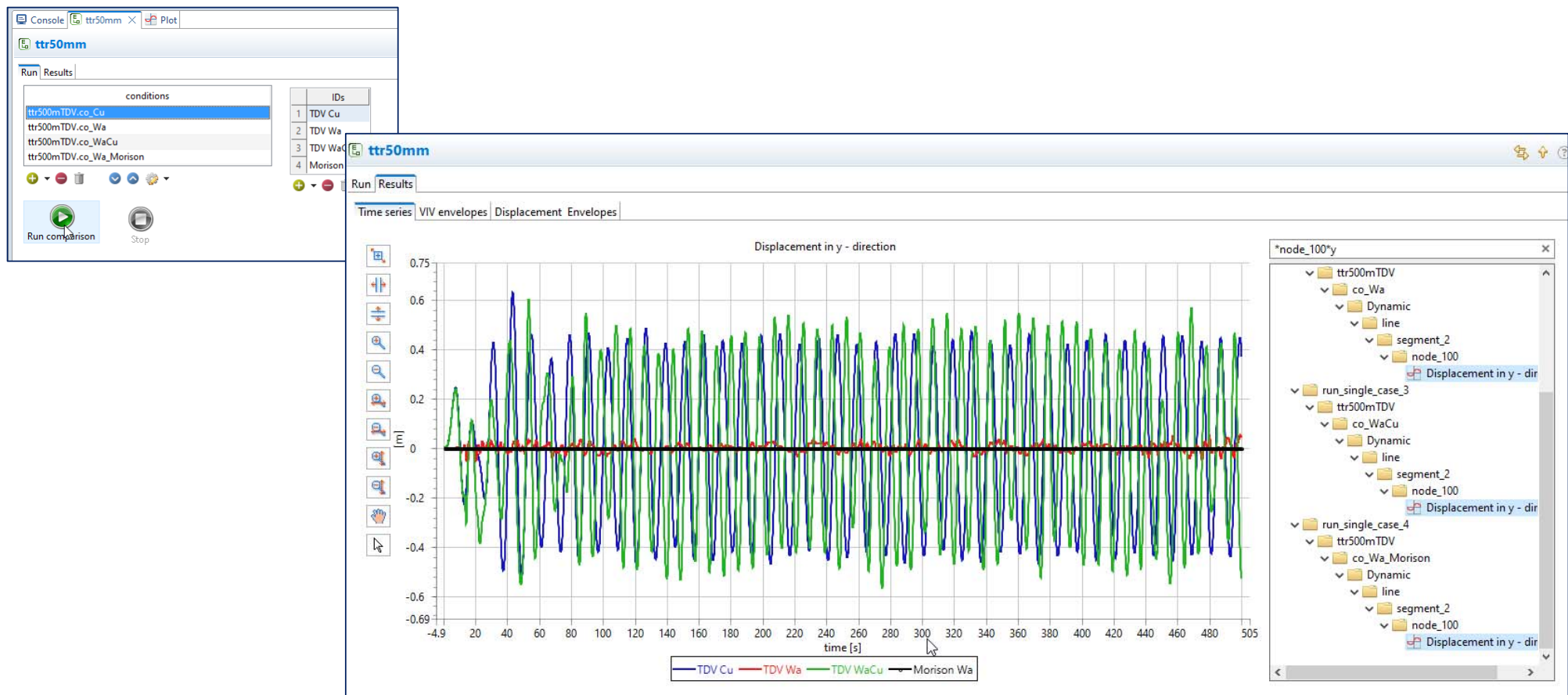


Look at results





Compare environments & TDV v Morison





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