

Setting Up initial flow conditions in ALE

Oct 2010

The following data is need to set up the initial flow conditions in a model;

- The ALE multi-material volume fraction for each fluid (solid) element in the model (***INITIAL_VOLUME_FRACTION** card).
- The pressure in each fluid (solid) element (***INITIAL_STRESS_SOLID** card), where pressure = $-1/3 (\sigma_{xx} + \sigma_{yy} + \sigma_{zz})$.
- The velocity of each node on a fluid element (***INITIAL_VELOCITY_NODE**).

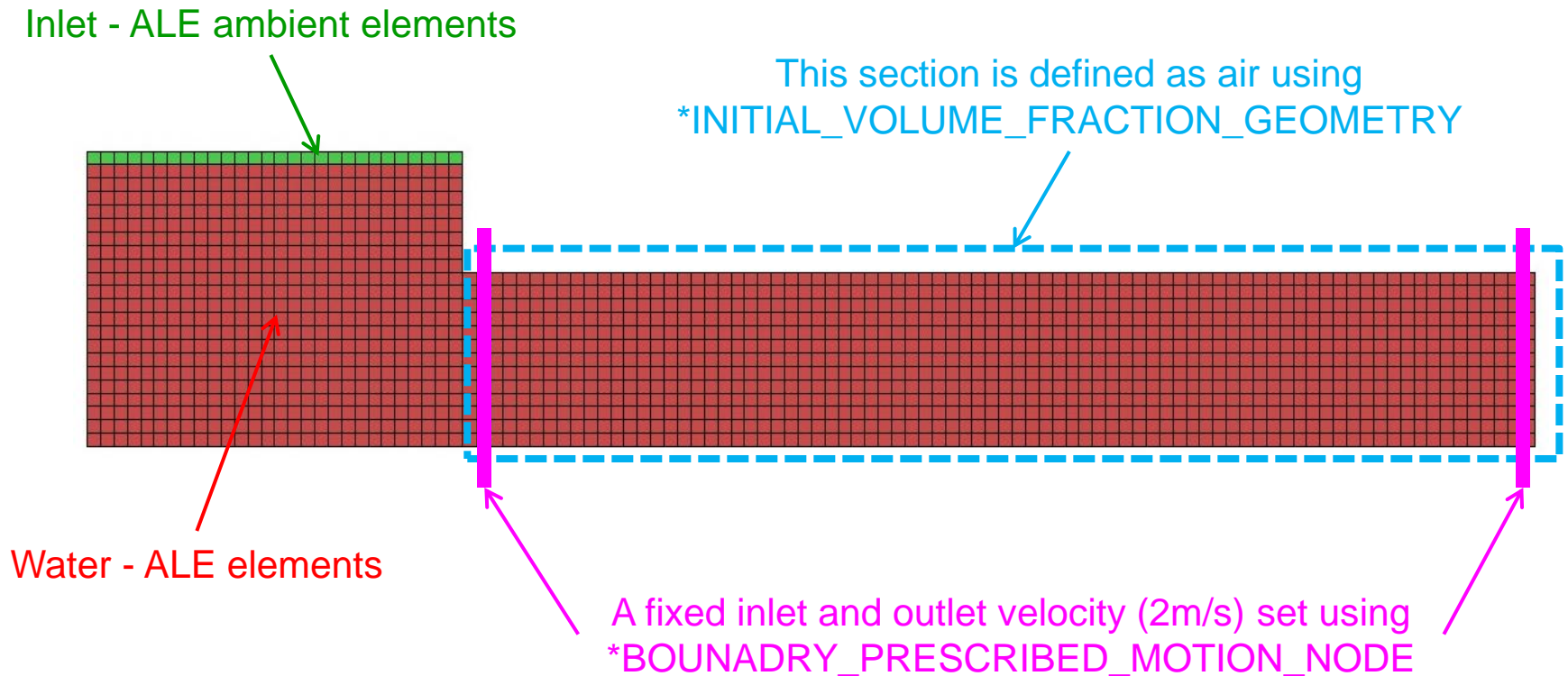
However in practice it is difficult to calculate these values for all the nodes and elements without actually running a model. So a setup model needs to be run to generate these values.

Also for the mapping to work there has to be two or more ALE_MULTI-MATERIAL_GROUPS in the model. If the model only has one fluid then setup a dummy part and ALE_MULTI-MATERIAL_GROUP but without any elements.

1. Run a setup model to generate the required input data.
2. Extract the data from the setup model result and write out in keyword format.
3. Merge this initial condition data into your main model.
4. Run the main model.

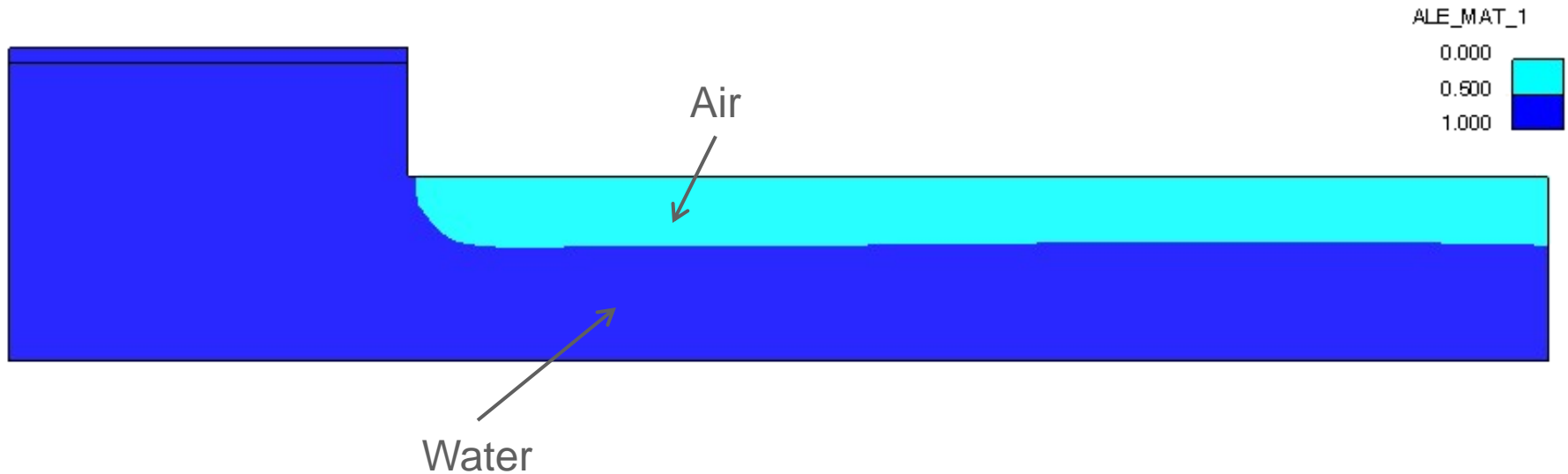
We want to set up some water flowing at 2m/s in a channel with a free surface and gravity applied.

Setup Model arrangement

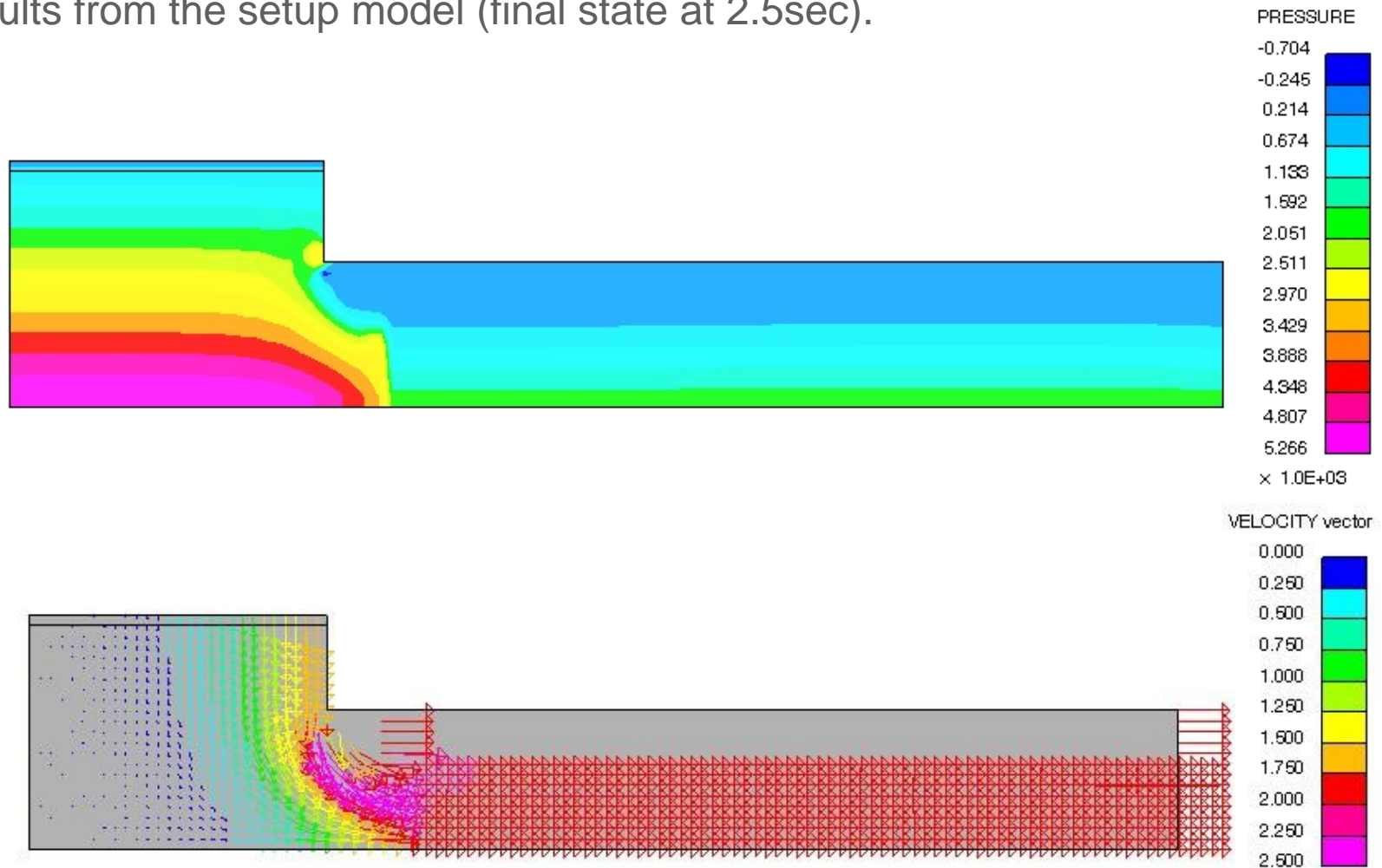


Results from the setup model (final state at 2.5sec).

ALE multi-material volume fraction



Results from the setup model (final state at 2.5sec).



The data from the final state of this setup run is then extracted using an Oasys D3PLOT JavaScript.

[ale_ini_v4-0.js](#) for Oasys D3PLOT 9.4

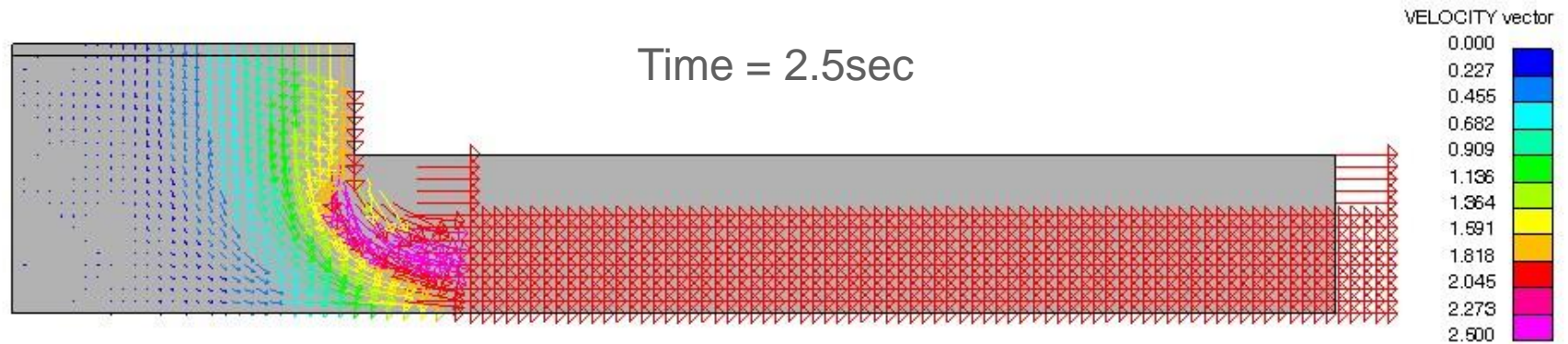
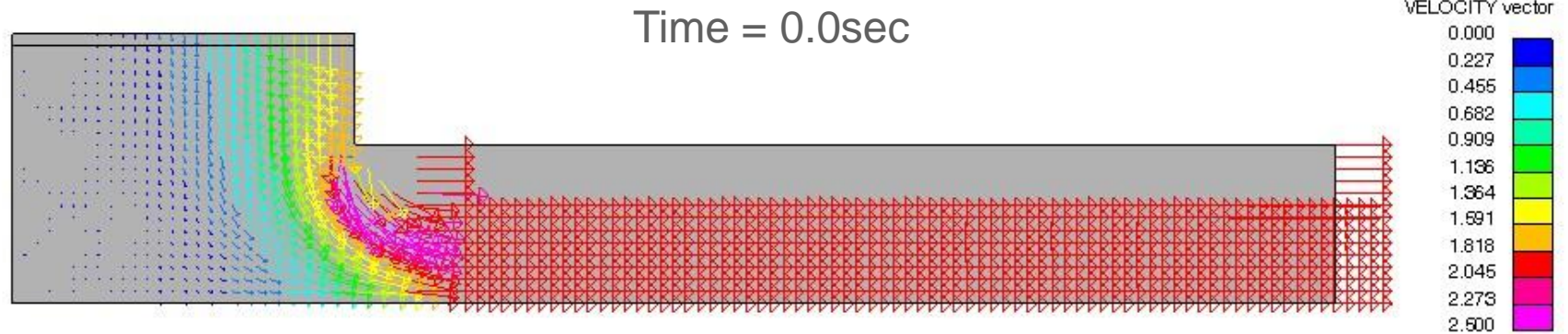
[ale_ini_oasys-10_v4-0.js](#) for Oasys D3PLOT 10.0

This will write out a file ini_fac.key which contains;

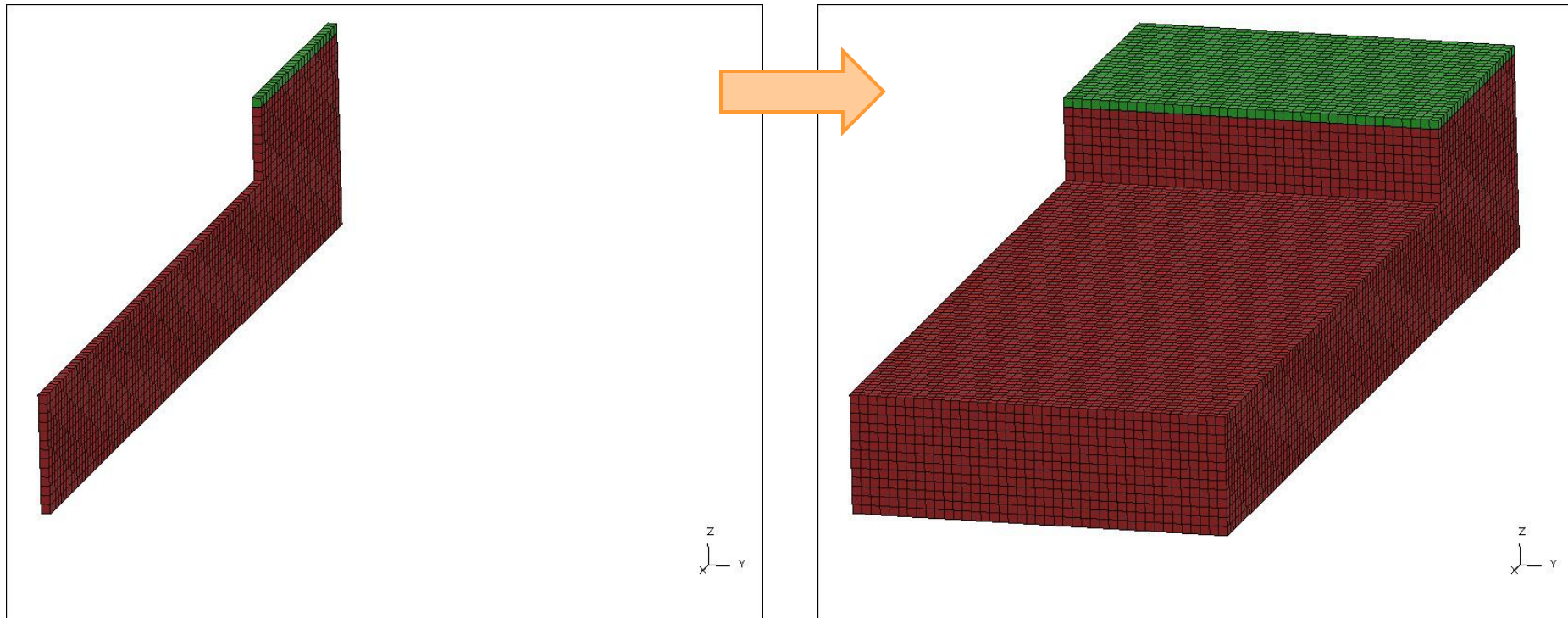
- ***INITIAL_VOLUME_FRACTION** cards for all solid elements in the model
- ***INITIAL_STRESS_SOLID** cards for all solid elements in the model
- ***INITIAL_VELOCITY_NODE** cards for all nodes in the model.

This data can be taken and merged with the original model (flow_set-up_001.key) to create a model with the flow in a steady state.

Result for the model with the initial condition data added.



The example model looks at only a single element wide slice. However once the setup model has been run and the data imported into the main model this single element slice can be copied using the ORIENT and NODES → MERGE functions in Oasys PRIMER to generate a block as wide as is required.





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