

EXPERIMENTAL PROCEDURE: FJORDIC CASE

Setup of initial conditions; circular basin is filled with ambient fresh water; salt-water inflow salinity & temperature [$\Delta\rho = 5, 10, 20 \text{ kg.m}^{-3}$] and flow rate [$Q_1 = 0.008 \text{ \& } 0.016 \text{ m}^3.\text{s}^{-1}$] are specified for Test. One Test includes 5 runs. Max $Q_1 = 60 \text{ m}^3/\text{h}$. First run is used to fill slowly the sea-side basin up to the crest height [$h_s = 0.5 \text{ m}$] of obstacle. Ramped-up [$t_1 = 1 \text{ \& } 0.5 \text{ min}$] salt-water flow is used to establish bottom gravity currents over obstacle. Fjordic-side basin is filled gradually. No pumping of fresh water through channel [$Q_0 = 0$]. Max $Q_0 = 110 \text{ m}^3/\text{h}$.

Initial conditions setup

Set temperature and salinity for salt water inflow [$T = 20 \text{ }^\circ\text{C}$, $S = 8, 13, 19 \text{ ppt}$]

Check circular tank water level [$H = 0.9 - 1.0 \text{ m}$]

Check density at bottom and surface in sea-side basin [$\rho_0 = ? \text{ \& } \rho_1 = ?$]

Check density at bottom and surface in fjordic-side basin [$\rho_0 = ? \text{ \& } \rho_1 = ?$]

Density profiling in fjordic-side basin. (Use C1, C2 & C3.)

Open control valve V1 to set small Q_1 for sea-side basin filling up to the obstacle height

Acoustic interface profiles (I1 & I2) confirms initial interface height in sea-side basin

Acoustic interface profiles (I3 & I4) confirms initial interface height in fjordic-side basin

Test run with fixed $\Delta\rho$ & Q_1

LabView setups & step-motor system programming parameters.

Set density probes at position (at interface) in fjordic-side basin. (Use C1, C2 & C3.)

Set point-velocity at position (at interface) in fjordic-side basin. (Use ADV.)

Start camera recording for PIV (2 camera from side)

Start camera recording for LIF after PIV

Open control valve V1 for salt-water flow Q_1 over period t_1

Repeat the run

Notes

Calibration of acoustic interfacial profilers is needed

Initial time $t = 0$ is opening instant of control valve V1

Repeat ramped-up salt-water flow 5 times

After test deplete sea-side basin from salt water using side-gate valve at $x = 3.92$ m

new Test initial conditions setup

Two flow-rates $Q1 = 0.008$ & $0.016 \text{ m}^3\cdot\text{s}^{-1}$ are used. Thus $t1 = 60$ & 30 s to lift interface in sea-side basin up 10 cm.

Top-view camera for vertical scanning

Fig1.

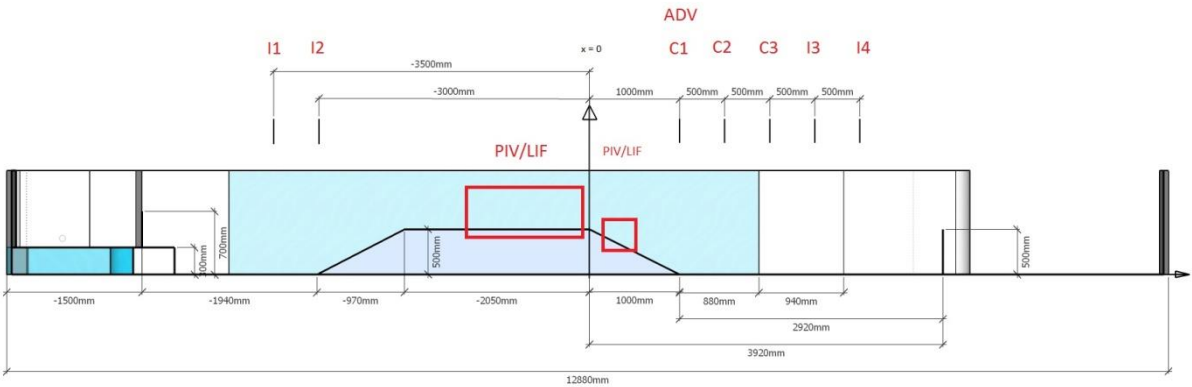
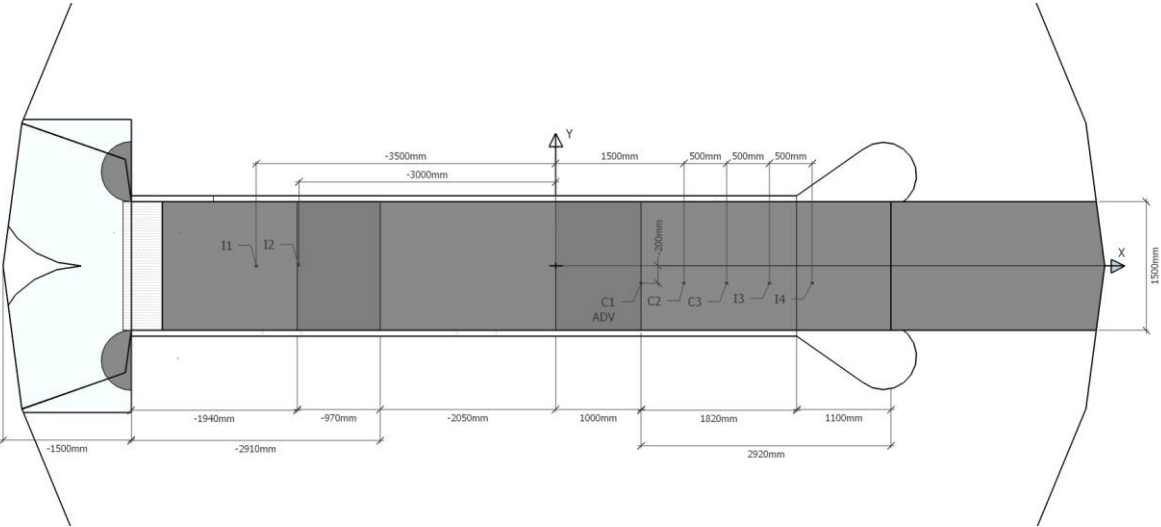


Fig.2



Table

Configuration: Fjord
Fixed obstacle
$f = 0$ (no rotation)
$h_s = 0.5$ m
$l_s = 2 + 2 = 4$ m
$Q_0 = 0$ (no fresh-water flow)
Q_1 – salt water flow; h_1 - salt water height in fjordic-side basin

Test	Run	$\Delta\rho$ [kg.m-3]	Q_1 [m3.s-1]	h_1 [m]	Pumping time
1	1	5	0.008	0.0	1min
	2	5	0.008	0.1	1min
	3	5	0.008	0.2	1min
	4	5	0.008	0.3	1min
	5	5	0.008	0.4	1min
Deplete fjordic-side basin, change flow rate to 0.016 m3.s-1					
2	1	5	0.016	0.0	0.5 min
	2	5	0.016	0.1	0.5 min
	3	5	0.016	0.2	0.5 min
	4	5	0.016	0.3	0.5 min
	5	5	0.016	0.4	0.5 min
Deplete fjordic-side basin, change flow rate to 0.008 m3.s-1, change $\Delta\rho$ to 10 kg.m-3					
3	1	10	0.008	0.0	1 min
	2	10	0.008	0.1	1 min
	3	10	0.008	0.2	1 min
	4	10	0.008	0.3	1 min
	5	10	0.008	0.4	1 min
Deplete fjordic-side basin, change flow rate to 0.016 m3.s-1					
4	1	10	0.016	0.0	0.5 min
	2	10	0.016	0.1	0.5 min
	3	10	0.016	0.2	0.5 min
	4	10	0.016	0.3	0.5 min
	5	10	0.016	0.4	0.5 min
Deplete fjordic-side basin, change flow rate to 0.008 m3.s-1, change $\Delta\rho$ to 20 kg.m-3					
5	1	20	0.008	0.0	1 min
	2	20	0.008	0.1	1 min
	3	20	0.008	0.2	1 min
	4	20	0.008	0.3	1 min
	5	20	0.008	0.4	1 min
Deplete fjordic-side basin, change flow rate to 0.016 m3.s-1					
6	1	20	0.016	0.0	0.5 min
	2	20	0.016	0.1	0.5 min
	3	20	0.016	0.2	0.5 min
	4	20	0.016	0.3	0.5 min
	5	20	0.016	0.4	0.5 min