Generalised Serre-Green-Naghdi Model

May 27, 2020

---

1 Time Series of β_1

1.1 Smooth Dambreak

$$h(x,0) = h_0 + \frac{h_1 - h_0}{2}\left(1 + \tanh\left(\frac{x}{\alpha}\right)\right) \tag{1}$$

$$u(x,0) = 0 \tag{2}$$

$$G(x,0) = 0 \tag{3}$$

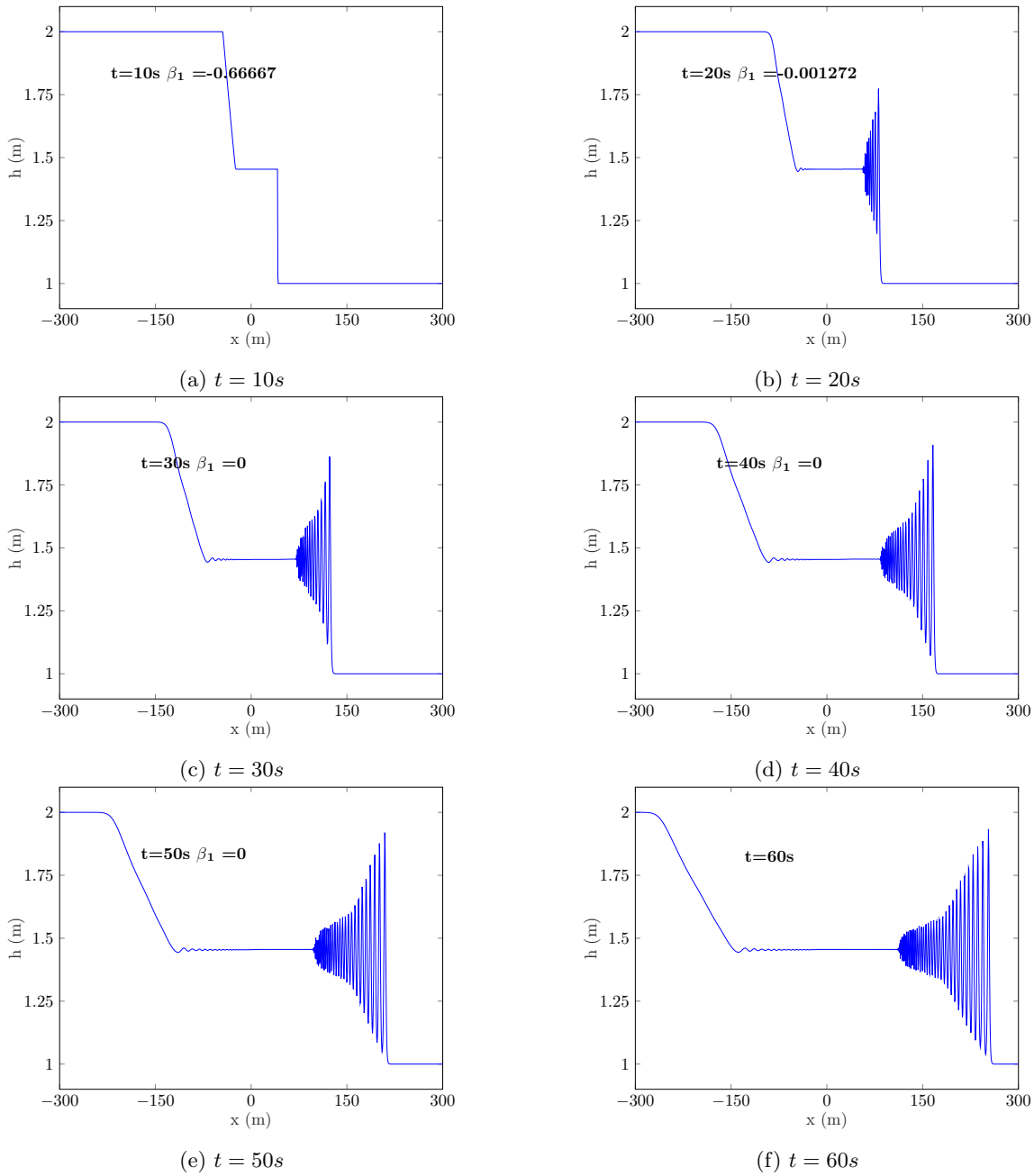
$\alpha = 0.1$ and $\beta_2 = 0$

1.1.1 Fixed Beta

Even small changes from $\beta_1 = -2/3$ can leade to significant dispersive wave trains.

1.1.2 Global Beta Transitionining

$$\beta_1(t) = \frac{b_1 - b_0}{t_1 - t_0}t + b_0 \tag{4}$$



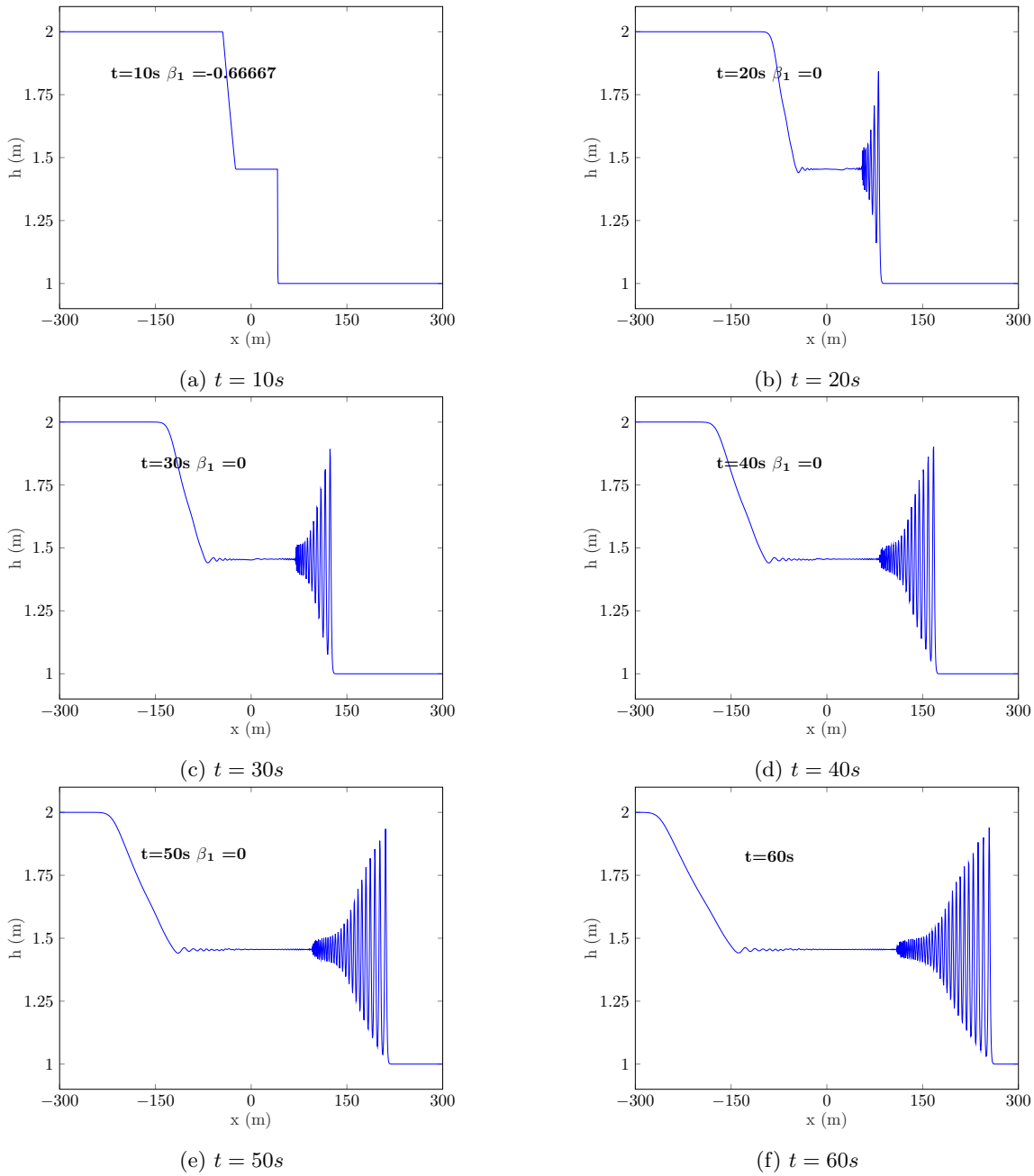
(a) $t = 10s$ (b) $t = 20s$

(c) $t = 30s$ (d) $t = 40s$

(e) $t = 50s$ (f) $t = 60s$

Figure 1: SWWE to Serre, linear transition from $10s$ to $20s$

File Name: VaryBeta1.tex
Date: 27/05/2020 at 1:20pm



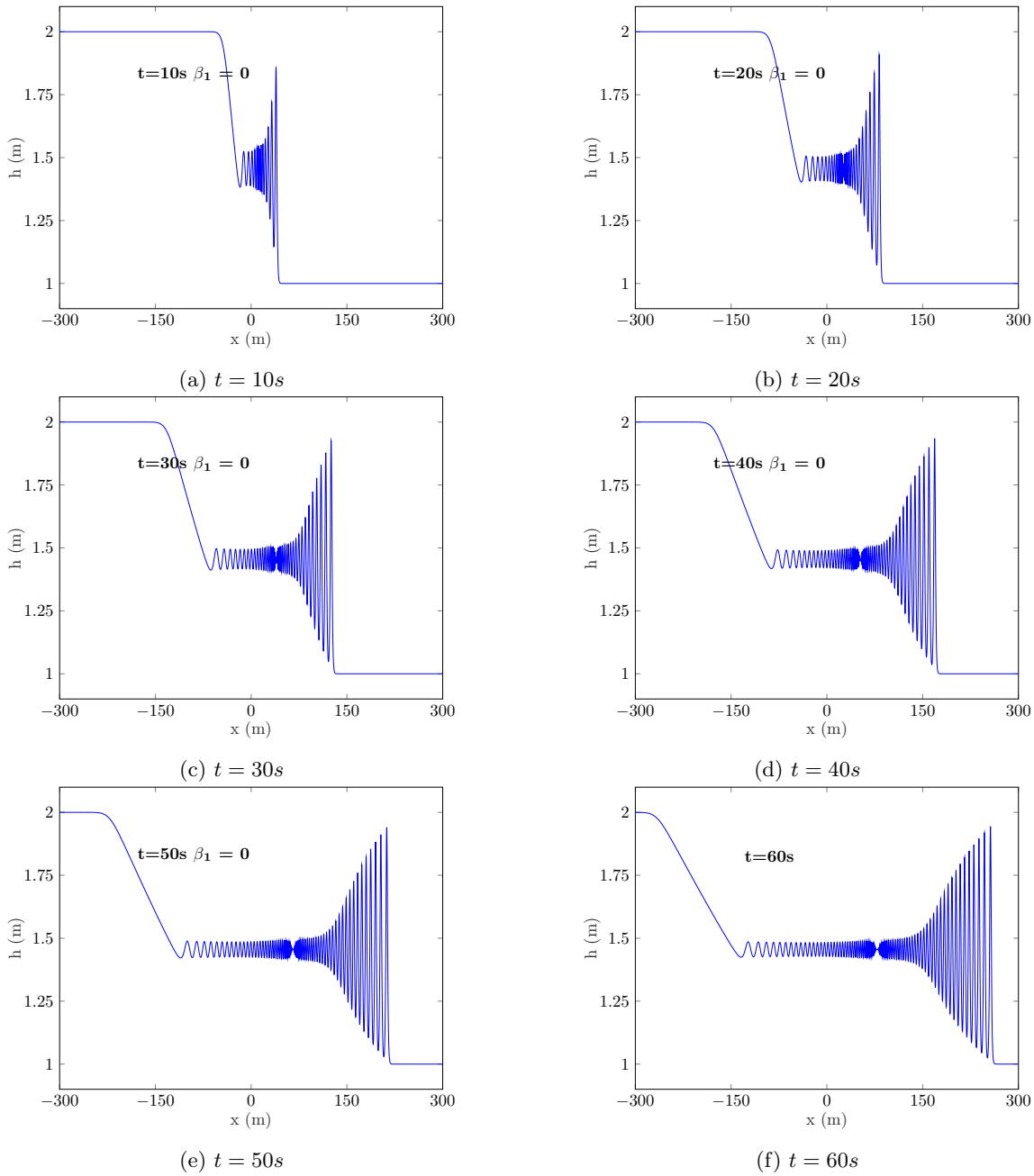
(a) $t = 10s$ (b) $t = 20s$

(c) $t = 30s$ (d) $t = 40s$

(e) $t = 50s$ (f) $t = 60s$

Figure 2: SWWE to Serre, linear transition from $10s$ to $11s$

File Name: VaryBeta1.tex
Date: 27/05/2020 at 1:20pm



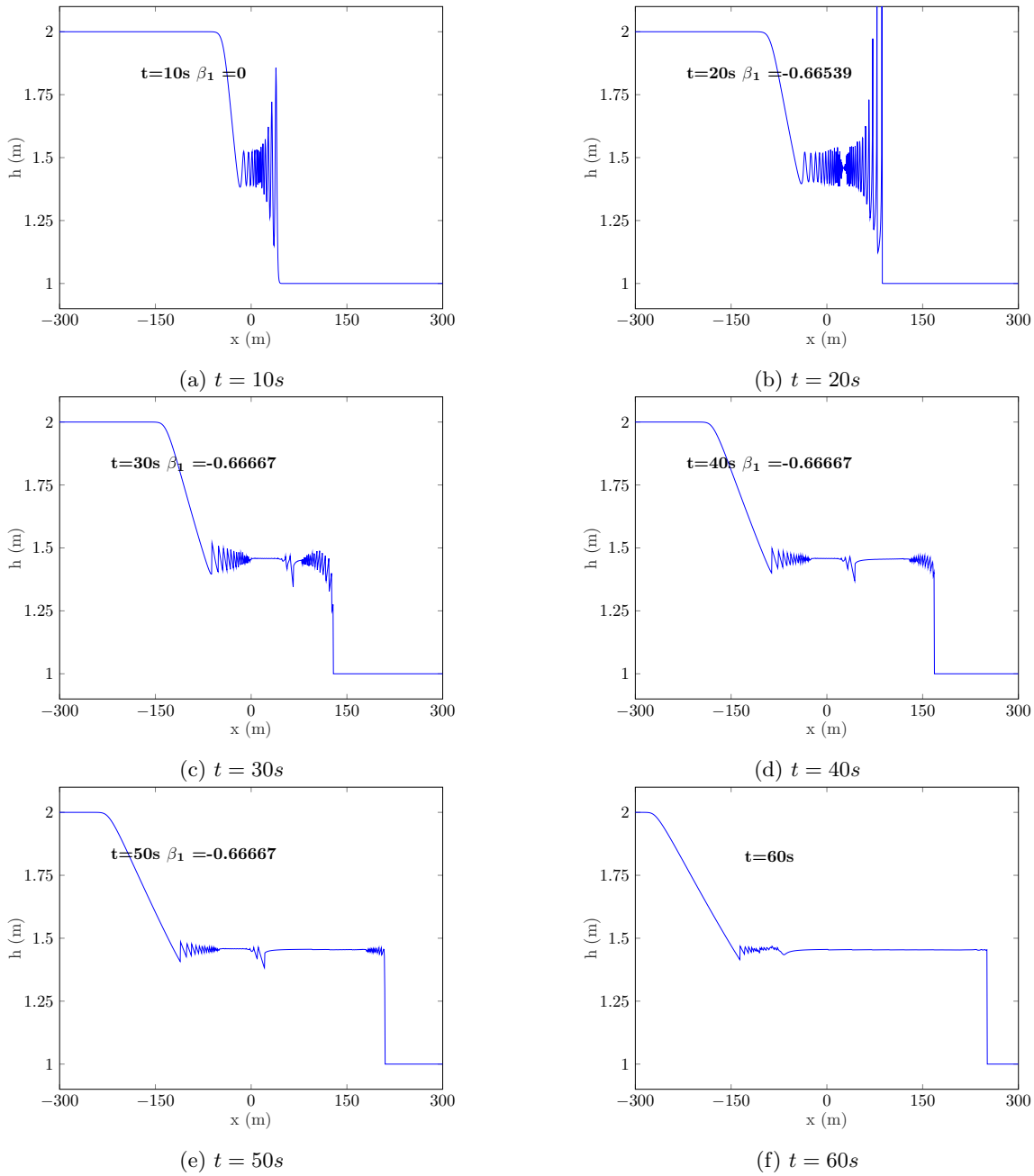
(a) $t = 10s$ (b) $t = 20s$

(c) $t = 30s$ (d) $t = 40s$

(e) $t = 50s$ (f) $t = 60s$

Figure 3: Serre equations throughout,Solutions are smooth, only resolution issues stop it from appearing so

File Name: VaryBeta1.tex
Date: 27/05/2020 at 1:20pm



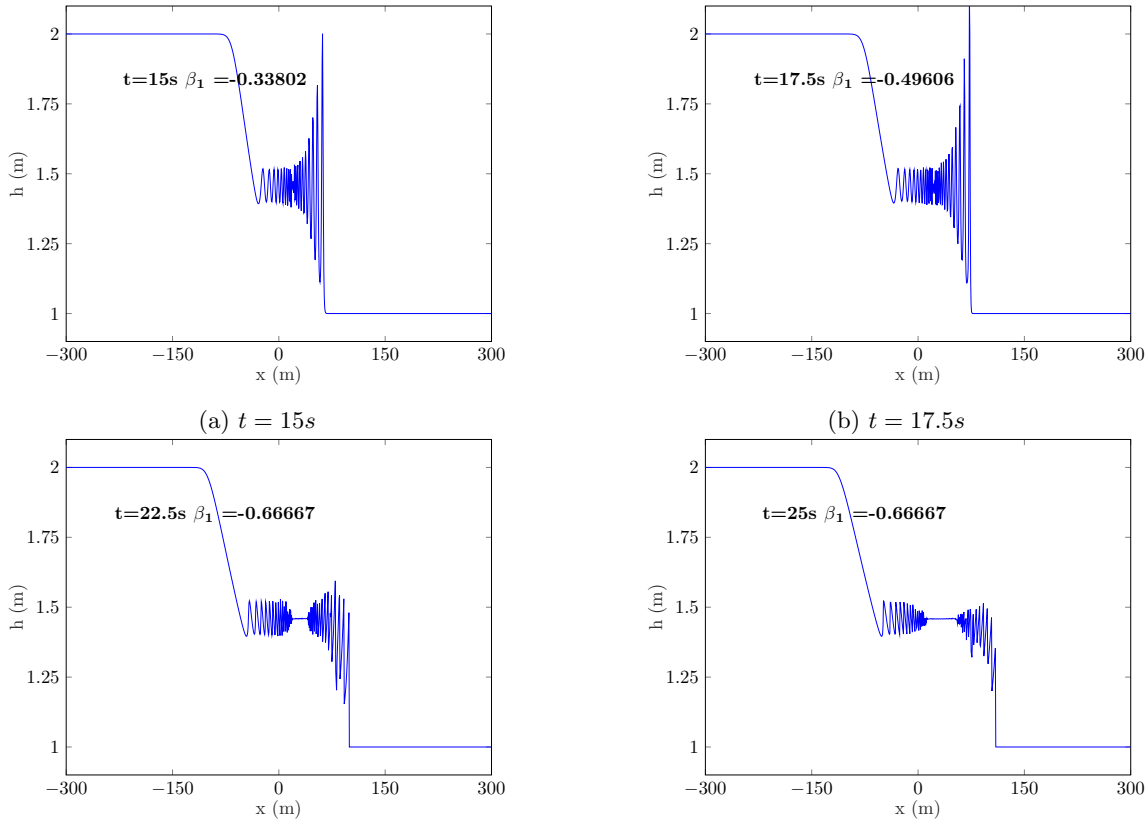
(a) $t = 10s$ (b) $t = 20s$

(c) $t = 30s$ (d) $t = 40s$

(e) $t = 50s$ (f) $t = 60s$

Figure 4: Serre to SWWE, linear transition from $10s$ to $20s$

File Name: VaryBeta1.tex
Date: 27/05/2020 at 1:20pm



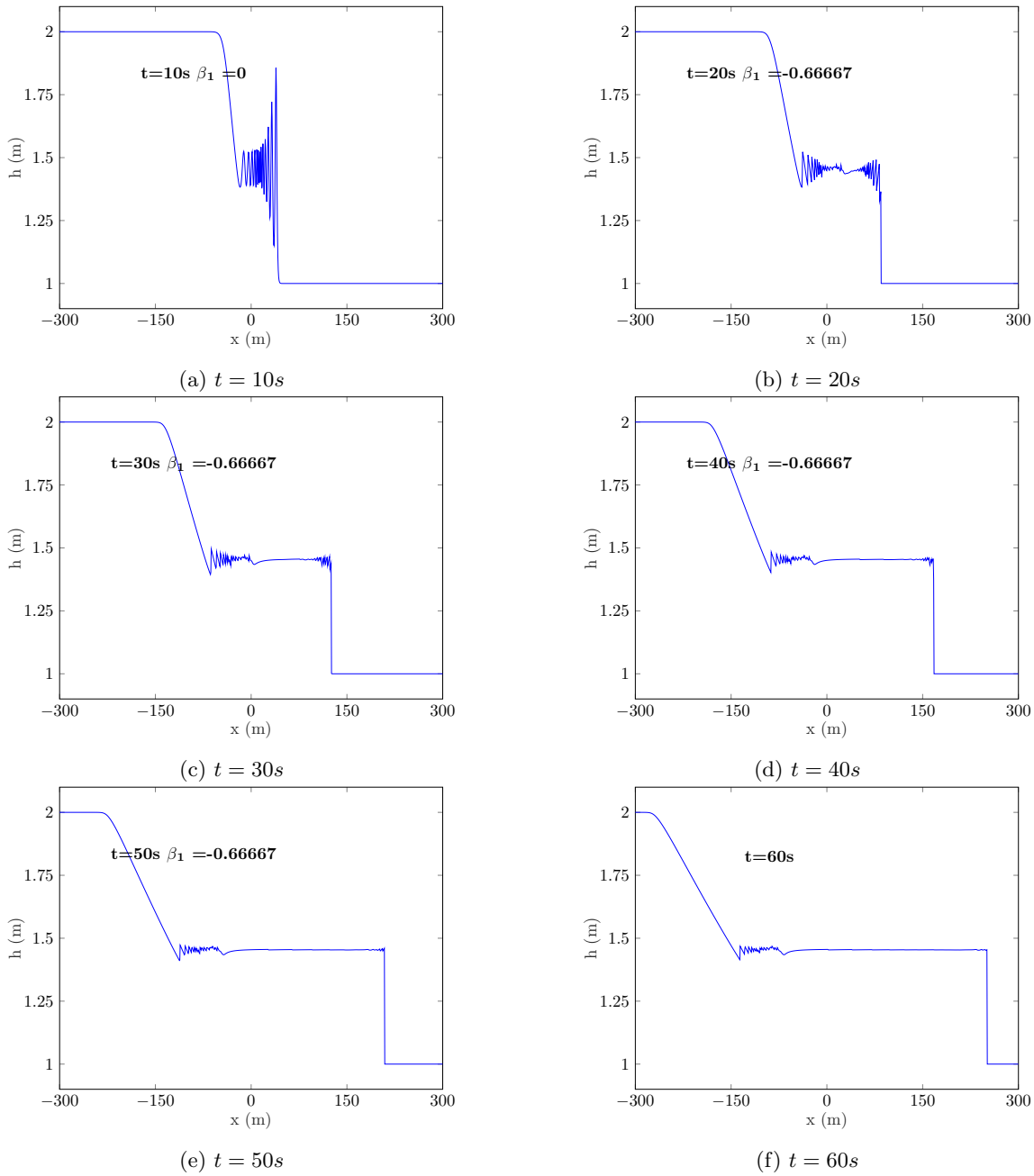
(a) $t = 15s$

(b) $t = 17.5s$

(c) $t = 22.5s$

(d) $t = 25s$

Figure 5: Serre to SWWE, linear transition from $10s$ to $20s$, more times - does go above h_l and below h_r



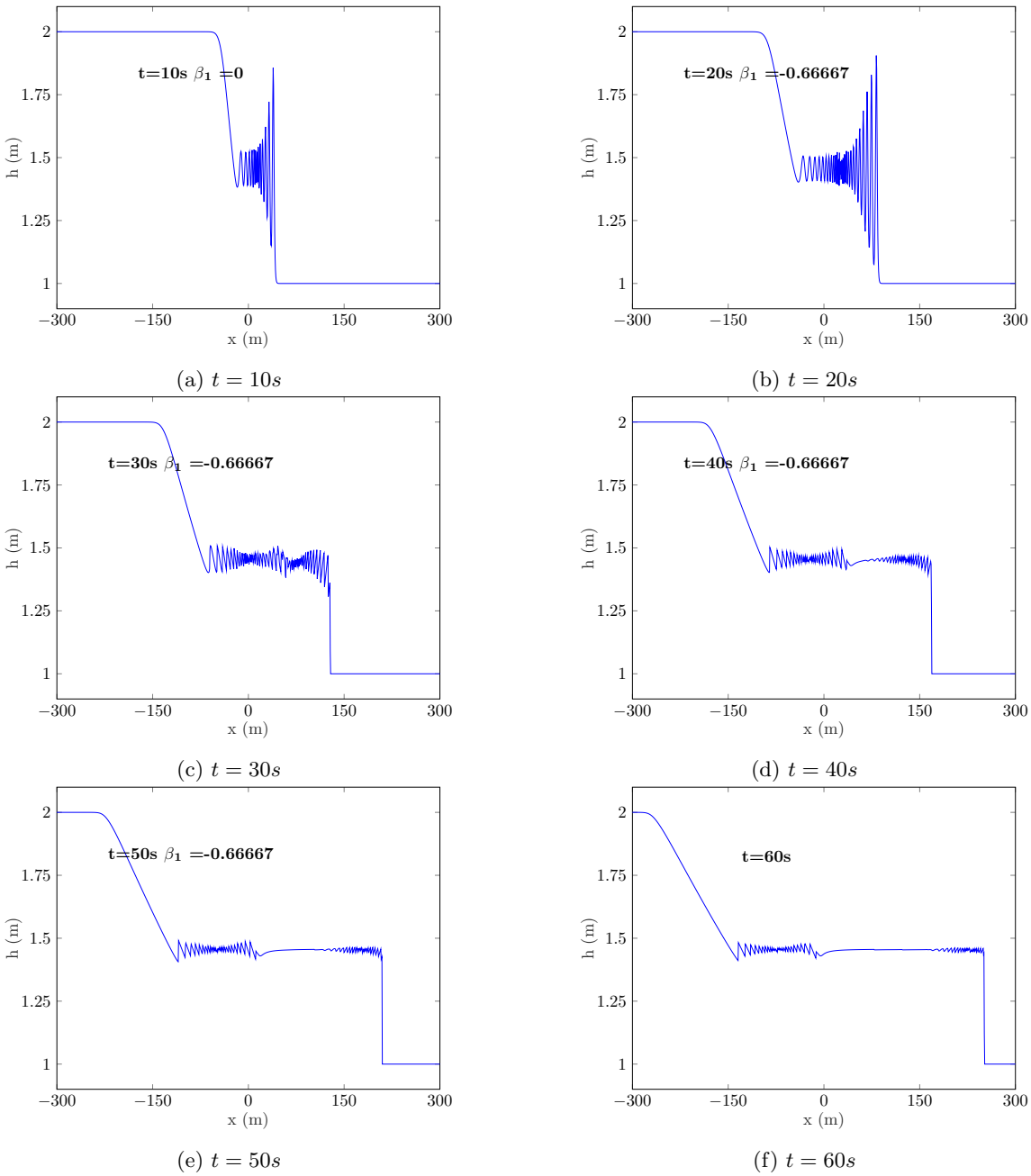
(a) $t = 10s$ (b) $t = 20s$

(c) $t = 30s$ (d) $t = 40s$

(e) $t = 50s$ (f) $t = 60s$

Figure 6: Serre to SWWE, linear transition from $10s$ to $11s$

File Name: VaryBeta1.tex
Date: 27/05/2020 at 1:20pm



(a) $t = 10s$ (b) $t = 20s$

(c) $t = 30s$ (d) $t = 40s$

(e) $t = 50s$ (f) $t = 60s$

Figure 7: Serre to SWWE, instant transition at $20s$

File Name: VaryBeta1.tex
Date: 27/05/2020 at 1:20pm