Unibest-TC practicum

* model
* Coast3D data
* eigen opdrachten

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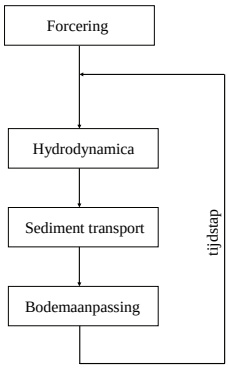
Model

- Doel: voorspellen van
  - hydrodynamica (golven, stroming),
  - sediment transport, en
  - morfologische veranderingen

  in een dwarsraai in de kustnabije zone
- Belangrijkste aanname: er is geen variatie in de kustlangse richting (kustlangs uniform)

Unibest-TC



Golven – 1 (H3)

Kustdwarse verdeling van de golfhoogte

$$\frac{d}{dx}\left(\frac{1}{8}\rho g H_{rms}^2 c_g \cos\theta\right) = -D_{br} - D_f$$

$$D_{br} = \frac{\alpha \rho g Q_b}{4T_p}\left[\frac{0.88}{k_p}\tanh\left(\frac{\gamma k_p h_r}{0.88}\right)\right]^2$$

$$D_f = \frac{f_w \rho}{\sqrt{\pi}} u_{orb}^3$$

Golven – 2 (H3)

Kustdwarse verdeling van de roller

$$\frac{d}{dx}\left(2E_r c \cos\theta\right) = D_r - D_{br}$$

$$D_r = \frac{2\beta g E_r}{c}$$

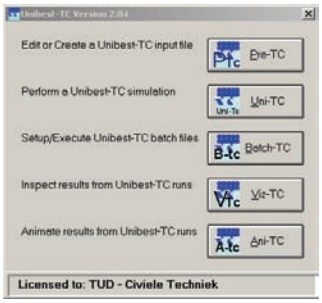
Golven – 3 (H3)

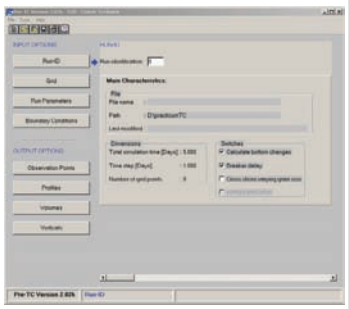
Kustdwarse verdeling van de set-up/down

$$\frac{d\eta}{dx} = -\frac{1}{\rho g h}\frac{dS_{xx}}{dx}$$

$$S_{xx} = \left(n + n\cos^2\theta - 0.5\right)E + 2E_r\cos^2\theta$$

Golven – Unibest

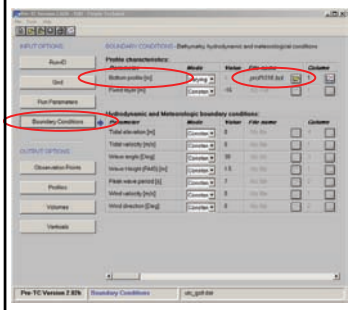




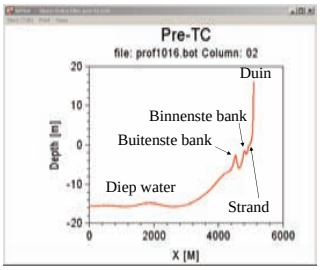
Binnenhalen file: druk op

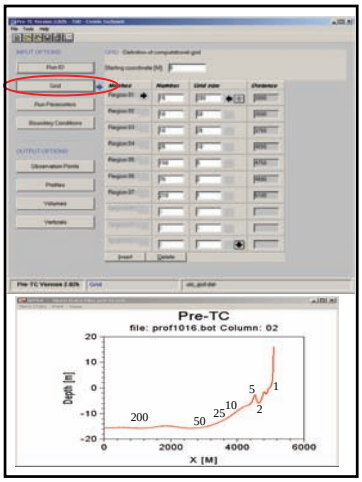
Parameter settings staan in een file
met extensie DAT

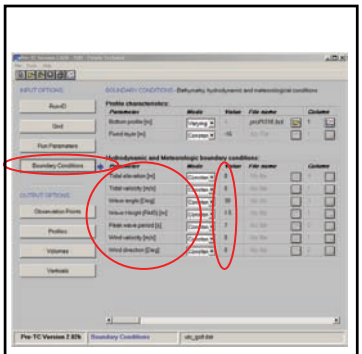
utc_golf.dat

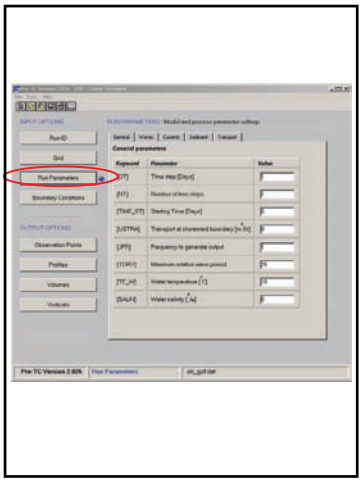


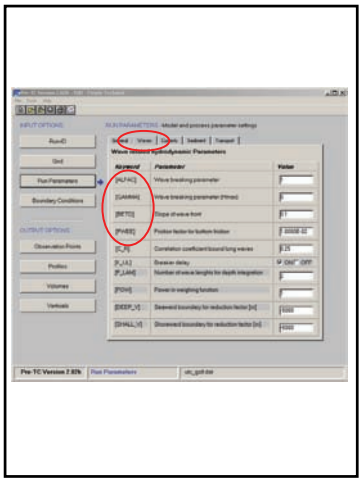
binnenhalen file
bekijken file

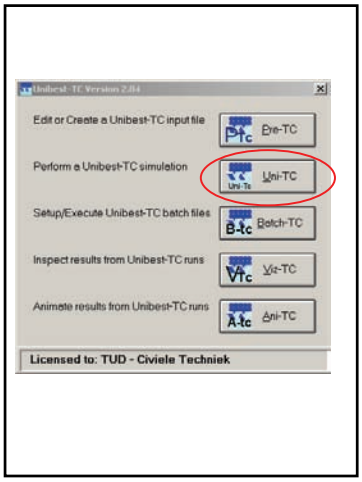


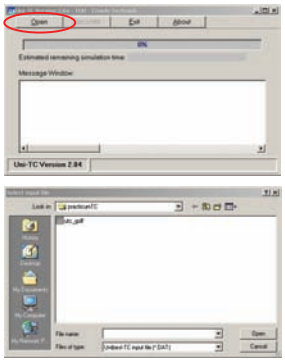


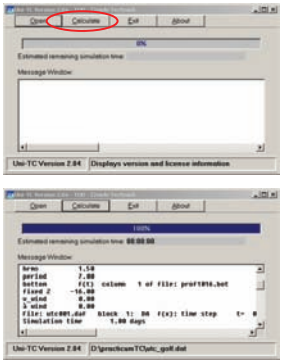




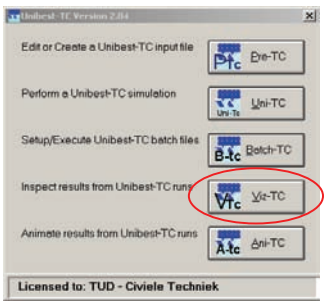




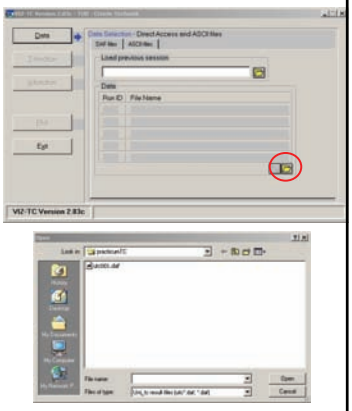


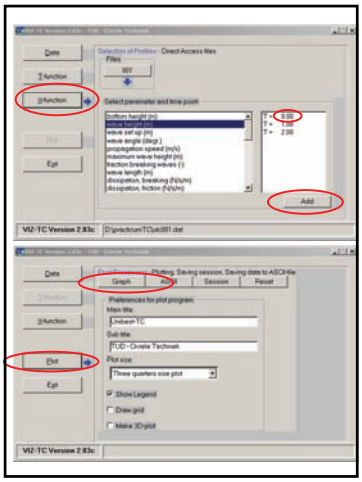


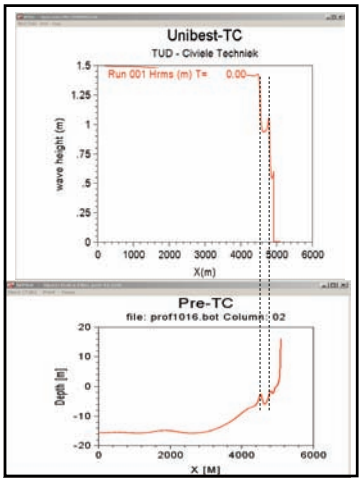
klaar? Druk op exit

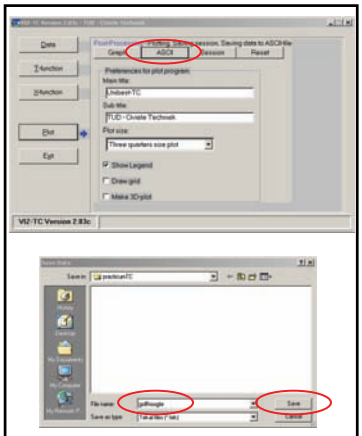


Resultaten staan in een file met extensie DAF

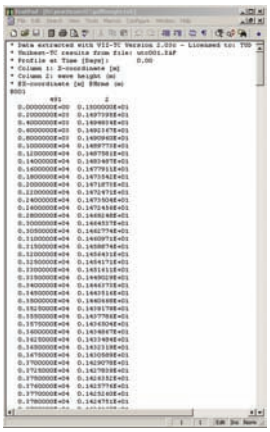








ASCII output krijgt extensie TEK



Inlezen in Excel

Stroming – 1 (H4)

Kustdwarse stroming

$$\bar{u} = \frac{(E + 2E_r)\cos\theta}{hc}$$

M.b.v. eddy viscosity concept wordt $\bar{u}$ omgezet in een verticaal stromingsprofiel

Stroming – 2 (H4)

Kustlangse stroming

$$-\frac{1}{\rho}\frac{dSyx}{dx}+\frac{\tau_y w}{\rho}-gh\frac{d\varsigma}{dy}=f_c\bar{v}\,|\,\bar{v}\,|$$

metingen

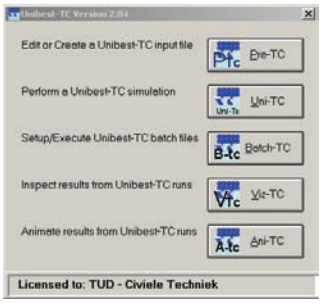
$$\frac{dS_{yx}}{dx}=-\frac{\sin\theta}{c}D_r$$

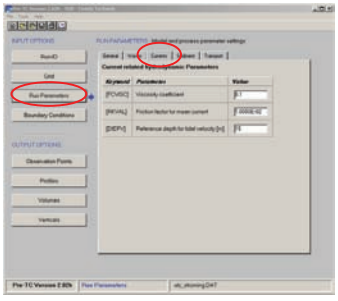
M.b.v. eddy viscosity concept wordt dit omgezet in een verticaal stromingsprofiel

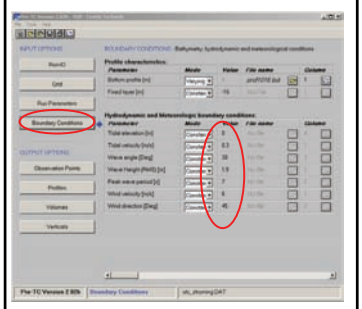
Vrije parameters

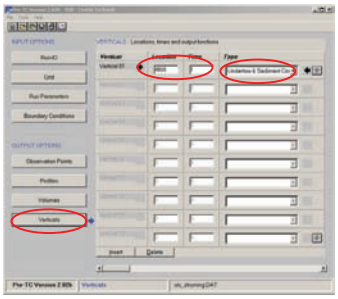
- ruwheid RKVAL: bepaalt grootte van snelheid
- FSVISC: parameter in eddy viscosity
- beta β (golfmodel, roller vergelijking): locatie van snelheidsmaximum

Stroming – Unibest



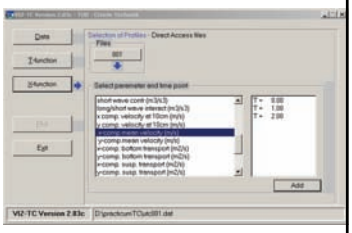




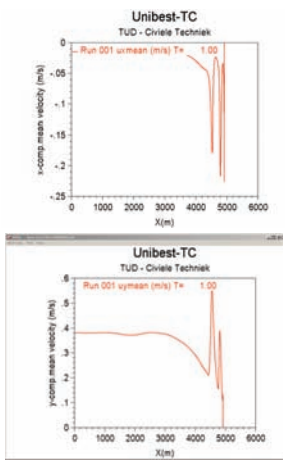


Ok: draai nu de berekeningen maar!

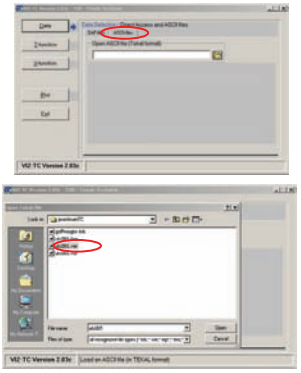
Kustdwarse profiel van gemiddelde dwars- en langssnelheid staan in DAF file

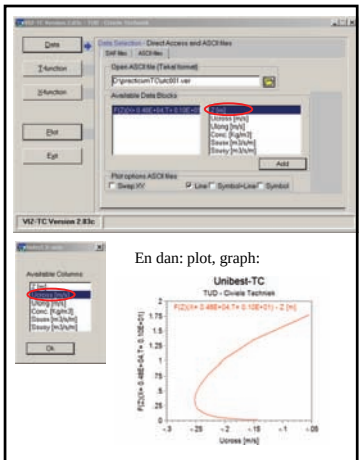


undertow: x-comp mean velocity (m/s)
langsstroom: y-comp mean velocity (m/s)



Verticale profielen van gemiddelde dwars- en langssnelheid staan in ASCII file





En dan: plot, graph:

Sediment transport

- Bedload (H6, H5, H9)
  - golf-asymmetrie (landwaarts)
  - gebonden lange golf (zeewaarts)
  - gemiddelde stroming heel dicht bij de bodem (zeewaarts)
- Suspended load (H7, H8, H9)
  - gemiddelde stroming (zeewaarts)

Sediment transport

Bed load (Ribberink)

$$q_b = 9.1\frac{\beta_s}{1-p}\{|\theta'(t)| - \theta_c\}^{1.8}\frac{\theta'(t)}{|\theta'(t)|}\sqrt{\Delta g d_{50}^3}$$

Vrije parameter:

- tan φ (rusthoek)
  0.03 – 0.25

Sediment transport

Suspended load (Van Rijn)

Algemeen:

$$q_s = \int_a^h U(z)C(z)dz$$

Voor C(z):

$$w_{s,m}c + \varphi_d \varepsilon_{s,w}\frac{dc}{dz} = 0$$

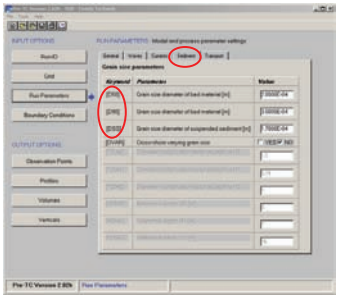
Randvoorwaarde:

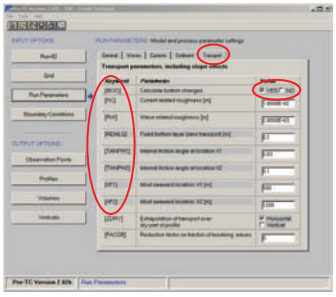
$$c_a = 0.015\rho_s \frac{d_{50}}{a}\frac{T^{1.5}}{D_*^{0.3}}$$

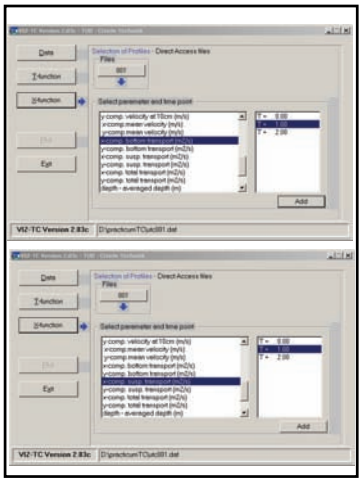
Vrije parameters (suspended load)

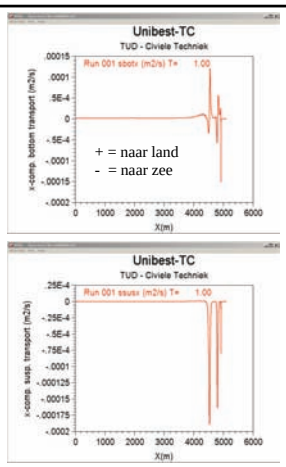
- ruwheid RC = stroomruwheid (0.02 – 0.05 m) = a
- ruwheid RW = golfruwheid (0.005 – 0.03 m), zit in T
- advies: kies RC > RW (anders model snel instabiel)

Terug naar pre-TC









Bodem aanpassing (H2)

$$\frac{d(q_b + q_s)}{dx} + \frac{dz}{dt} = 0$$

Oftewel: sediment transport gradiënten in de ruimte geven bodemaanpassingen in de tijd

Geen vrije parameters

NB
IBOD = 0: in de tijd, geen bodemaanpassing
IBOD = 1: in de tijd, wel bodemaanpassing

Gegevens

- Coast3D (Egmond aan Zee)
- najaar 1998
- duur campagne: 33 dagen

- Input: randvoorwaardes
- Output:
  - kwantificeren fout
  - calibratie
  - validatie

Input

- Diep water gegevens:
  - golfparameters (hoogte, periode, richting)

  - windparameters (snelheid, richting)
  - waterstanden (vertical getij)
  - getij-snelheden (‘verhang’)

Input

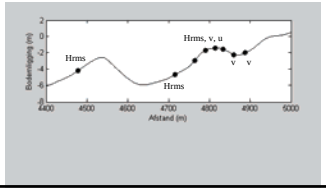
- Bodemprofiel
  - begin Coast3D op 16 oktober 1998

Meetgegevens

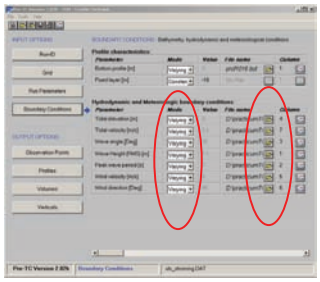
- Bodemprofielen
  - 7x tijdens Coast3D, ruwweg wekelijks

- Hydrodynamica binnenste bank
  - golfhoogte
  - stroomsnelheid (dwars en langs)

- Details over wanneer, hoe vaak, waar, hoe lang staan in de readme.

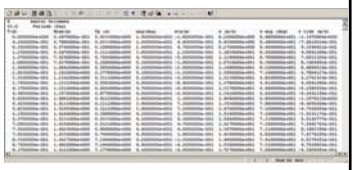


pre-TC en tijdseries



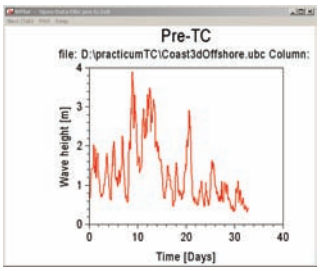
Zet mode op varying, kies Coast3doffshore.ubc m.b.v. en stel de kolomnummers goed in. Bekijk de tijdseries m.b.v.

Coast3doffshore.ubc is een ASCII (txt) file met de invoergegevens volgens onderstaand format:

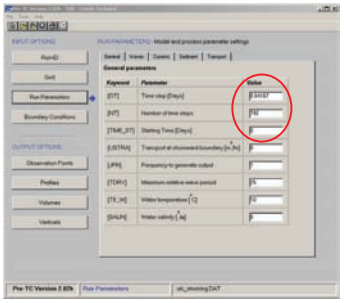


Kolom 1 = tijd in dagen (telt in pre-tc telling niet mee). Dus H_{rms} is kolom 2 in de file, is kolom 1 in pre-tc

Golfhoogte tijdens Coast3D campagne op diep water

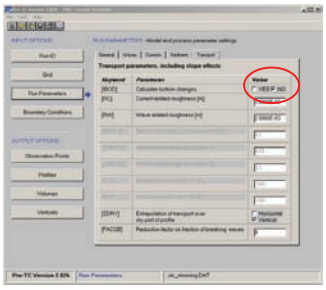


pre-TC en tijdseries



DT = tijdstap in dagen = 1 uur = 0.04167
NT = aantal tijdstappen = 792 (792*0.04167 = 33)
TIME_ST = startpunt = 0

pre-TC en tijdseries



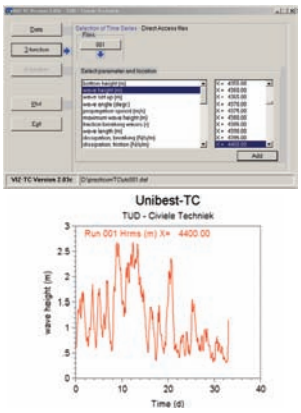
Alleen hydrodynamica in de tijd: IBOD = NO (0)
Wel bodemveranderingen in de tijd: IBOD = YES (1)

Opdracht

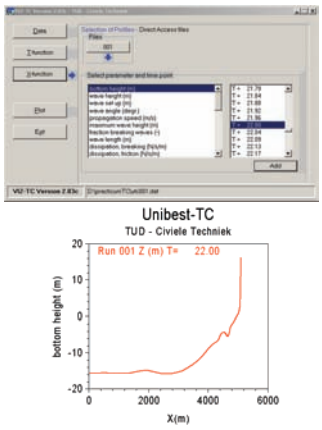
- Draai de Coast3D campagne d.m.v. utc_serie.dat

Gegevensverwerking

- VIZ-TC
  - DAF file
  - T-function: op 1 locatie in de tijd
  - X-function: op 1 moment in de ruimte
- ANI-TC
  - ‘filmpjes’

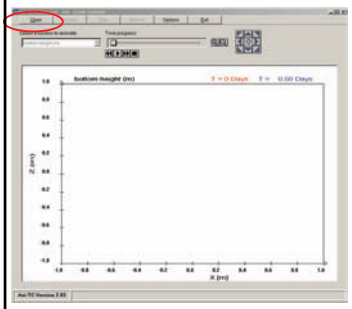


Via tab ASCII naar file te schrijven



Via tab ASCII naar file te schrijven

ANI-TC



Open: lees DAF file
Select a function to animate: kies wat je wilt zien
Play (en ⏮▶⏭■): speel animatie af

Geen uitvoermogelijkheden!

Extra informatie

- Overview of model formulations, door Bosboom et al.
- User guide, door Walstra
- Readme.txt files in de Coast3D directories (ESSENTIEEL VOOR EIGEN ONDERWERPEN)

Eigen onderwerpen

- 7 stuks, groepjes van 2 of 3 studenten
- eigen tijd wenselijk/nood-zakelijk
- presentaties