Jos von Asmuth

TU Delft

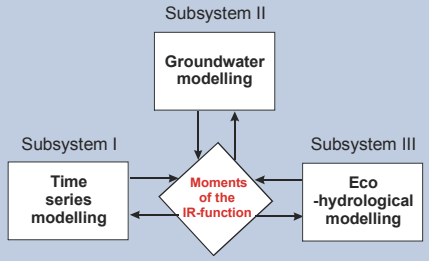
kiwa
Partner for progress

Waar fysica de statistiek kan helpen....

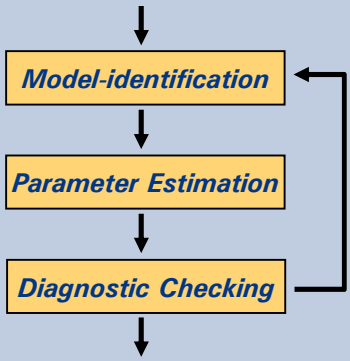
NHV Studiedag: Tijdreeksen in Grondwater, 8 juni 2004

Menyanthes tritoliata

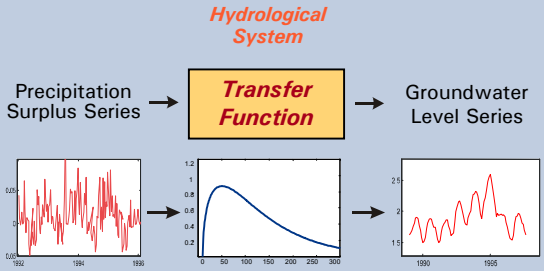
Opzet promotieonderzoek



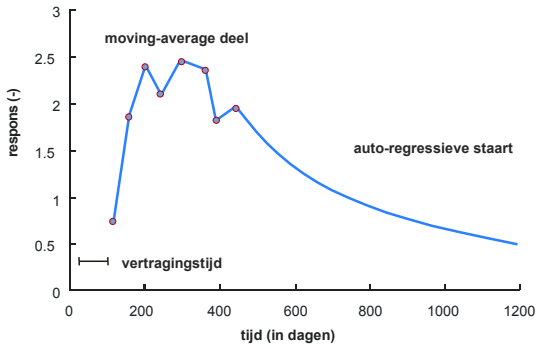
Box-Jenkins modelidentificatie-procedure (1970)



Een tijdreeksmodel



Box-Jenkins ARIMA-model:



Box-Jenkins model-orde

IR-functie met MA-teller en AR-noemer

$$\Theta(B) = \frac{\omega(B)}{\delta(B)}$$

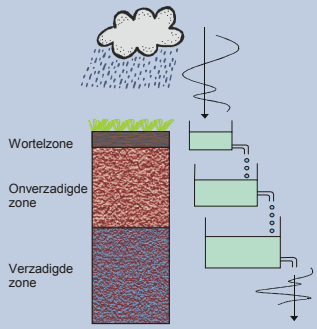
Model-identificatie:

$$\Theta(B) = B^{nk}\,\frac{\omega_0 + \omega_1 B + \omega_2 B^2 + ..\omega_{nb-1} B^{nb-1}}{1 + \delta_1 B + \delta_2 B^2 + ..\delta_{nd} B^{nd}}$$

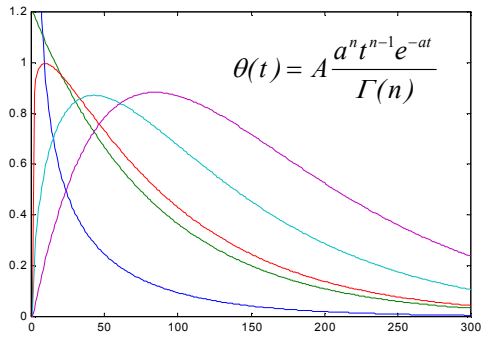
$$\varphi(B) = \frac{\theta(B)}{\phi(B)} = \frac{1 + \theta_1 B + \theta_2 B^2 + ..\theta_{nc} B^{nc}}{1 + \phi_1 B + \phi_2 B^2 + ..\phi_{nf} B^{nf}}$$

Model-orde = $[nb\ nc\ nd\ nf\ nk]$

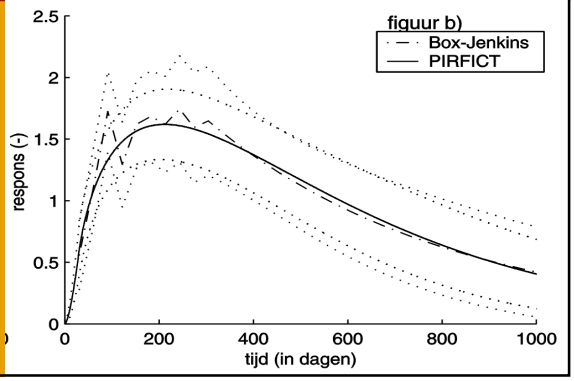
Model-identificatie op basis van de fysica....



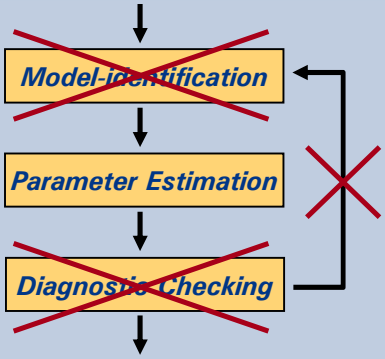
De Pearson III functie als impuls respons



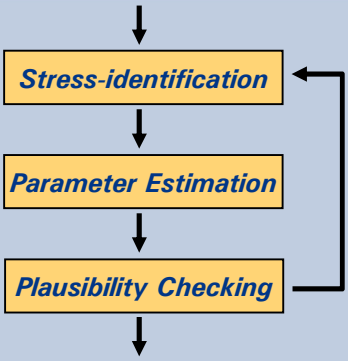
Vergelijking Box-Jenkins en PIRFICT-model (2002)



Identificatie transfer-model



Identificatie transfer-model: Voorstel voor procedure op basis van fysica



'Stress-identification'

- Geschiedenis gebied
- Randvoorwaarden / Beïnvloedende factoren
- Aard van de randvoorwaarden

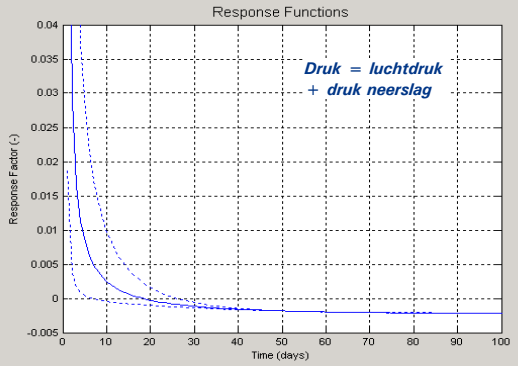
Aard van de randvoorwaarden

- Neerslag
- Verdamping
- Oppervlaktewater
- Onttrekking
- Luchtdruk
- Ingrepen

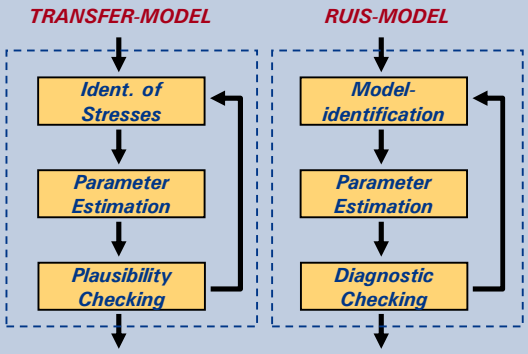
Aard van de randvoorwaarden

- Gesommeerde hoeveelheid of losse waarneming?
- Type respons (Pearson III, putformule, Krayenhoff-van de leur, etc.)
- Delen parameters met andere factoren

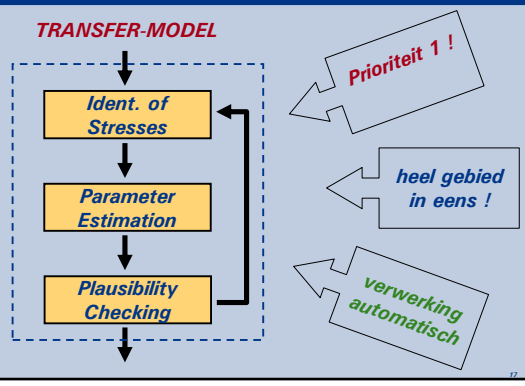
Voorbeeld: Druk



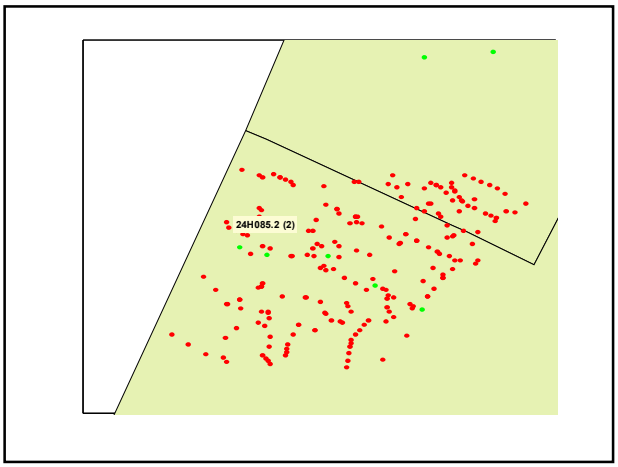
Nog meer procedures????????

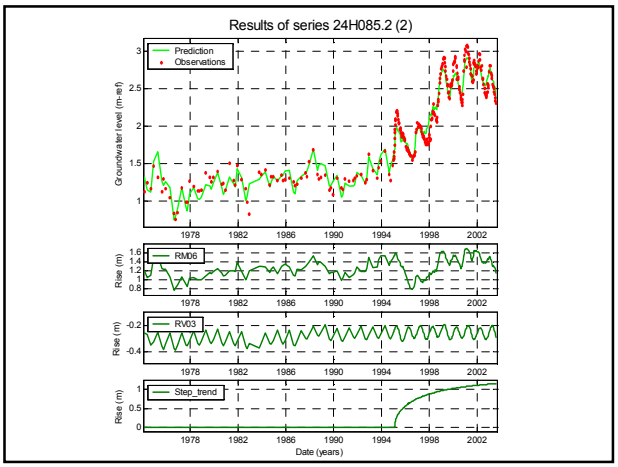


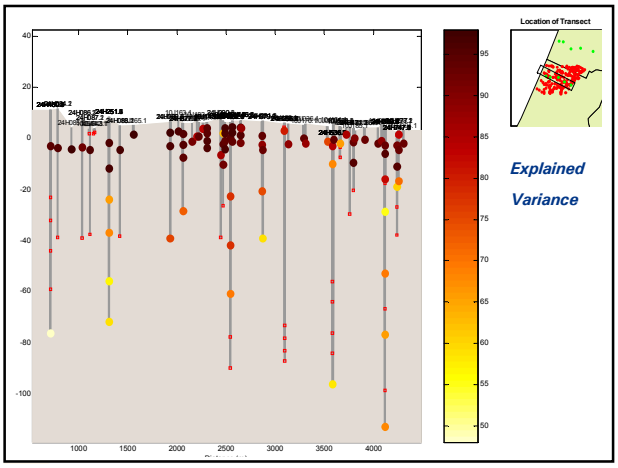
Nog meer procedures????????

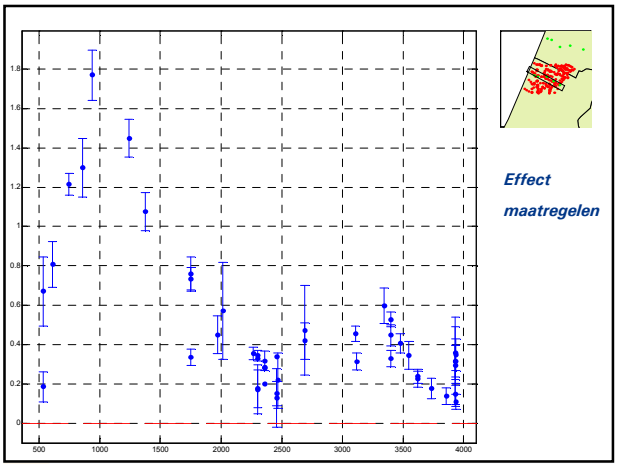


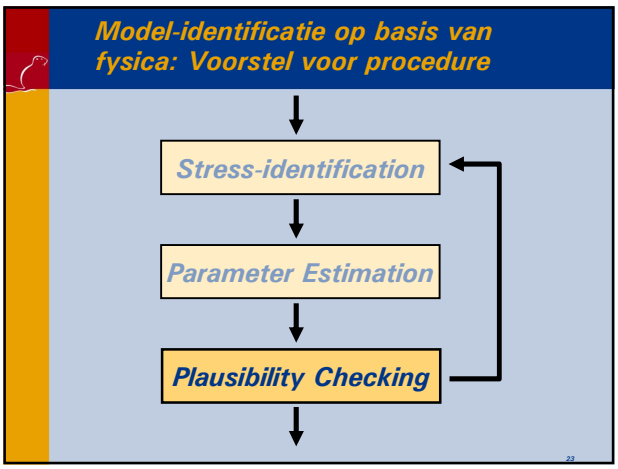
Voorbeeld: Anti-verdrogingsmaatregelen in AWD

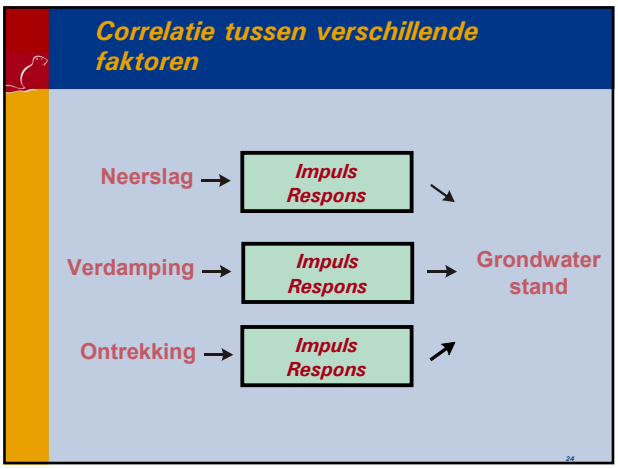

24H085.2 (2)


Results of series 24H085.2 (2)
Prediction
Observations
Groundwater level (m-ref)
RM06
Rise (m)
RV03
Step_trend
Date (years)

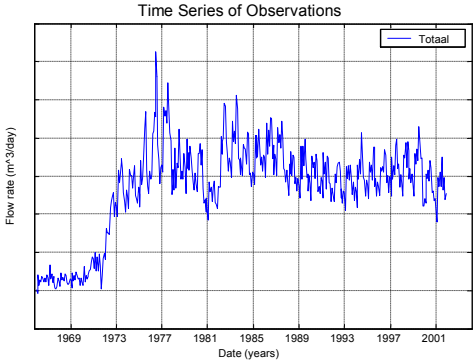

Location of Transect
Explained
Variance


Effect
maatregelen

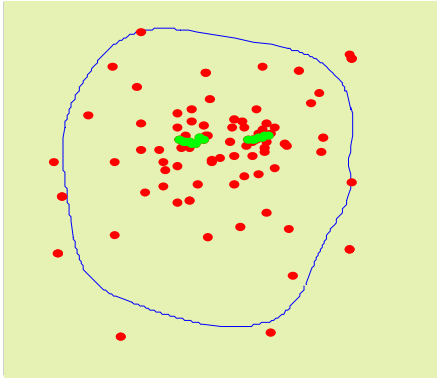

Model-identificatie op basis van fysica: Voorstel voor procedure
Stress-identification
Parameter Estimation
Plausibility Checking

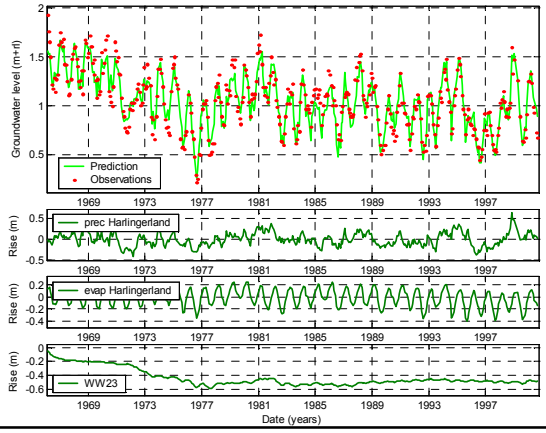

Correlatie tussen verschillende faktoren
Neerslag
Impuls Respons
Verdamping
Impuls Respons
Ontrekking
Impuls Respons
Grondwater stand

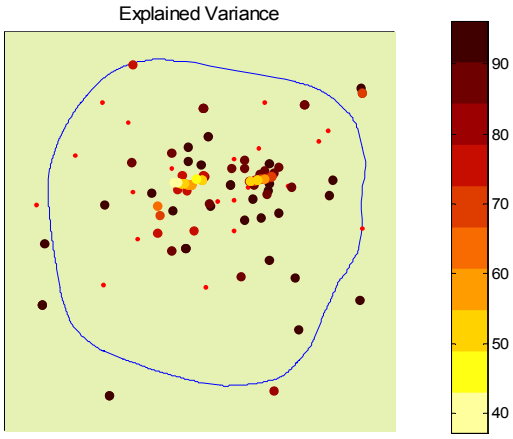
Onttrekking……



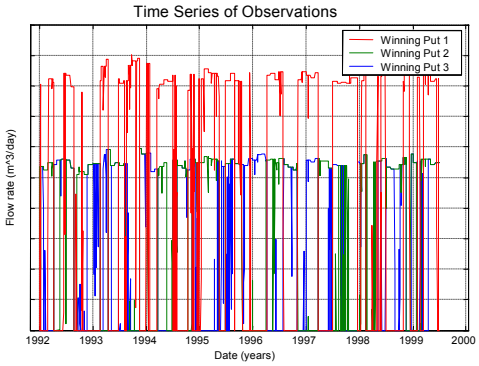
Voorbeeld: Een waterwingebied in Duitsland



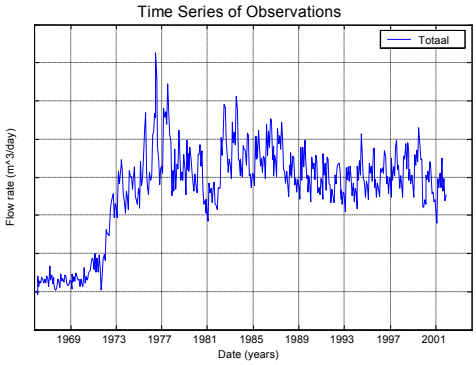




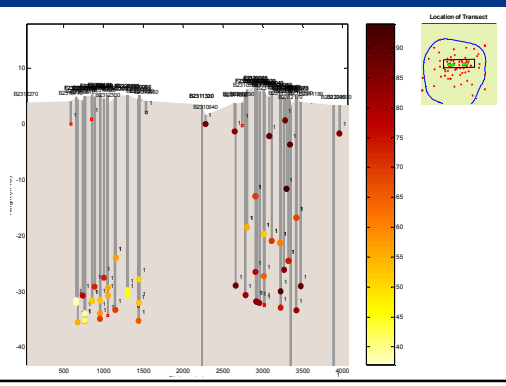
Winning van de individuele putten

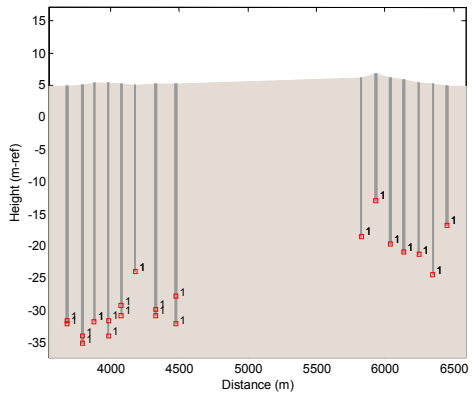


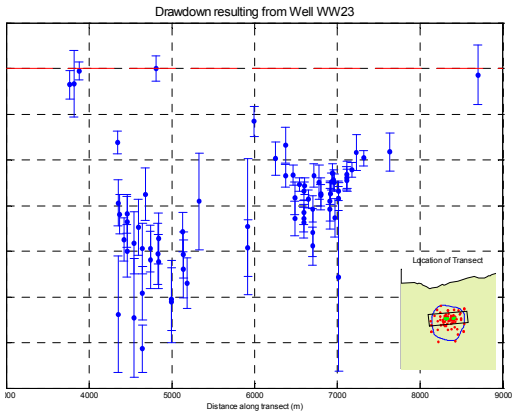
Som van alle putten……

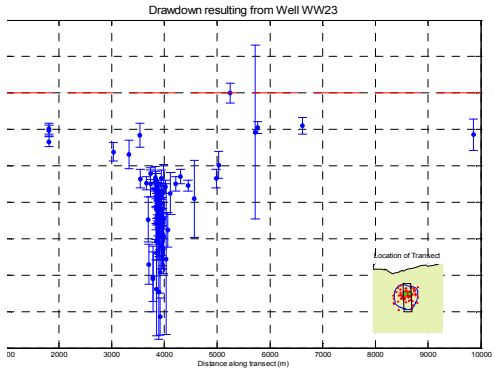


Verklaarde variantie

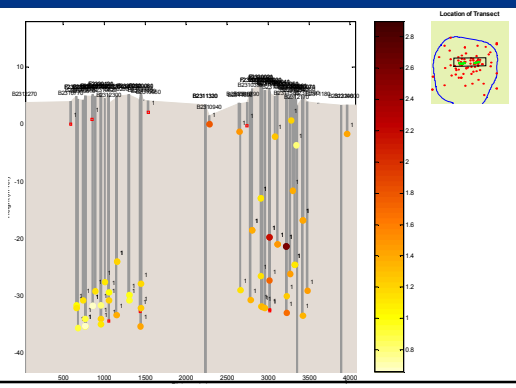




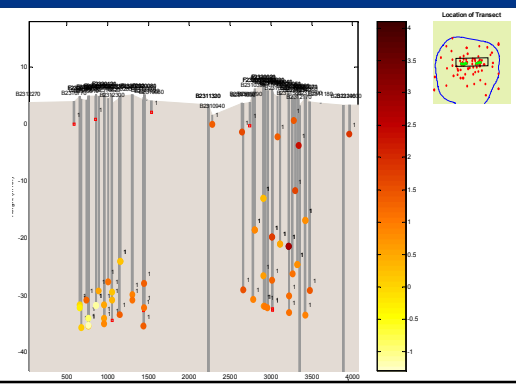




Verdampingsfactor (Prec-f*Evap)



Drainage basis



'Plausibility Checks'

- Verklaarde variantie
- Verdampingsfactor
- Drainage-basis
- Ruimtelijke samenhang

37

'Plausibility Checks'

- Verklaarde variantie
- Verdampingsfactor
- Drainage-basis
- **Ruimtelijke samenhang**

38

Meer info?

www.hydrology.citg.tudelft.nl/asmuth/home.htm

39