Reference

from **unsatfit** document: https://sekika.github.io/unsatfit/reference.html

It is all about Fit class of unsatfit.

1.Methods

1.1.For optimization

set_model(model, const=[], k_vapor=False)

Set hydraulic model for model with constant parameters of const. When k_vapor=True, isothermal vapor hydraulic conductivity is added from version 6.0. Several parameters need to be set when using this feature. See the source comment of model_k_vapor() for detail.

optimize()

Optimize parameteres.

f_ht(p, x)

Water retention function with free parameters p and pressure heads x. To be accessed after set_model.

f_hk(p, x)

Hydraulic conductivity with free parameters p and pressure heads x. To be accessed after set_model.

get_init()

Get initial estimate of water retention parameters except qs and qr. To be accessed after set_model. See models for function names by specifying a model.

get_wrf()

Get water retention parameters. To be accessed after set_model. See models for function names by specifying a model.

modified_model(hs)

Change the hydraulic model to modified model with hs value by Vogel et al. (2000)).

1.2.For figures

plot()

Plot a figure.

add_curve()

Add a curve for plot.

clear_curves()

Clear curves.

1.3.Pore-size distribution

See the source comments for detail. From version 5.4.

f_pore(p, r, C=0.149, epsilon=1e-8)

Pore-size distribution function d θ /dr

f_pore_log(p, r, C=0.149, epsilon=1e-8)

Pore-size distribution function d θ /d(ln r)

f_dtdh(p, h, epsilon=1e-8)

d θ /dh

1.4.HYDRUS and PEST

See HYDRUS, PEST and source comments for detail. From version 6.2.

save_template(filename="model.tpl")

Save a PEST template file for the current hydraulic model.

save_input(filename="model.inp", hc_param=[])

Save a model input file containing parameter values.

load_input(filename="model.inp")

Load model parameters from a model input file.

save_mater(filename="Mater.in")

Generate a HYDRUS lookup-table file from the current model.

1.5.Others

contour(x,y)

Draw contour of RMSE for x and y in parameter name.

test()

Test integrity of the code for development.

2.Properties for settings

swrc

(h, θ) dataset; h and θ as list respectively

unsat

(h, K) dataset (optimize only WRF when empty list [] is provided)

ini

Initial parameters. When it is a list (or tuple) of parameters, such as [a, b, c], the set of parameters is used as initial parameters. When it is a nested list, such as [[a1, a2, a3], [b1, b2]], all combination of the initial parameters is used.

- For boundary conditions, see source.
- For least square optimization, see source.
- For figure options, see source.

For specifying font in figures, FontProperties object can be set as self.fp. For example, set font_path as the absolute path to a font file and

```
import unsatfit
from matplotlib.font_manager import FontProperties
f = unsatfit.Fit()
f.fp = FontProperties(fname=font_path, size=9)
```

It can be used for using Japanese font.

3.Properties for return values of optimize()

fitted

Fitted parameters

message

Return message

success

True if optimization succeeded

mse_ht, mse_ln_hk

Mean squared error for θ and ln(K), respectively

se_ht, se_ln_hk

Standard error σ for θ and ln(K), respectively

r2_ht, r2_ln_hk

Coefficient of determination (R^2) for θ and ln(K), respectively

aic_ht, aic_ln_hk

AIC = 2n ln(σ) + 2k for θ and ln(K), respectively

aicc_ht, aicc_ln_hk

Corrected AIC = AIC + 2k(k+1)/(n-k-1) for θ and ln(K), respectively

jac

Modified Jacobian matrix. For WRF only.

perr

1 σ uncertainty on fitted parameters. For WRF only.

cor

Correlation matrix. For WRF only.

4.AI documentation

- DeepWiki