

unsatfit

from [unsatfit](#) document: <https://sekika.github.io/unsatfit/index.html>

unsatfit is a Python library for optimizing parameters of functions of soil hydraulic properties (water retention function and hydraulic conductivity function) where equations are explained in the following paper.

- Seki, K., Toride, N., & Th. van Genuchten, M. (2022) [Closed-form hydraulic conductivity equations for multimodal unsaturated soil hydraulic properties](#). Vadose Zone J. 21; e20168.

The proposed equations are useful for practical applications as shown in the following paper.

- Seki, K., Toride, N., & Th. van Genuchten, M. (2023) [Evaluation of a general model for multimodal unsaturated soil hydraulic properties](#). J. Hydrol. Hydromech. 71(1): 22-34.

1. User manual

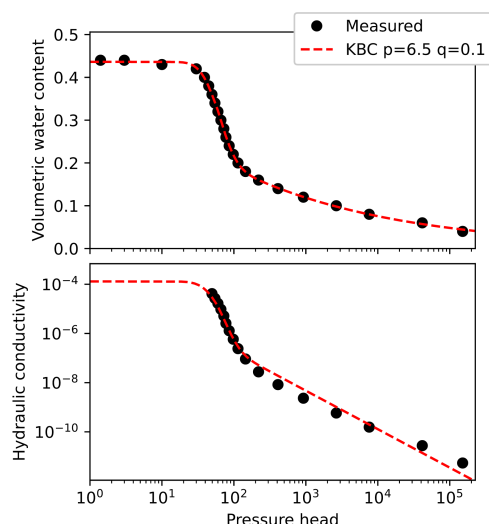
A [user manual](#) ([日本語](#)) is available.

See [install](#) and [sample code](#) for a quick start.

If you encounter any issues, feel free to ask [questions](#).

2. Example output

This is an example output of this program; water retention curve (top) and hydraulic conductivity curve (bottom) of Gilat loam fitted with KBC (KO₂BC₂-CH) model.



For more examples, see Fig. 6 and Appendix in Seki et al. (2023).

3. Integration with HYDRUS and PEST

unsatfit can be used together with HYDRUS for forward simulations and with PEST for inverse parameter estimation.

- [Using unsatfit with HYDRUS](#)
- [Using unsatfit with PEST](#)

4. History ([Detailed version](#))

- 2007-02-27: [SWRC Fit](#) started to run on the web.
- 2021-08-13: SWRC Fit was recommended at [土壌の物理性](#).
- 2021-11-24: A [paper](#) written with unsatfit was published at VZJ.
- 2022-01-04: Released unsatfit 4.0, including a new version of SWRC Fit.
- 2023-01-06: Released the [UNSODA viewer](#), a web app that displays data from [UNSODA 2.0](#). For each dataset, water retention data is linked directly to SWRC Fit for model fitting.
- 2023-02-04: A [paper](#) introducing unsatfit was published in JHH.
- 2024-06-10: Added [Zenodo integration](#) for permanent archiving.
- 2024-10-20: Received the JSSP award ([土壌物理学会賞](#)) from the Japanese Society of Soil Physics for the [paper of dual-VG fitting](#). A [summary report](#) was subsequently published in Japanese. [Movie in Japanese](#).
- 2024-11-13: Presented a [poster](#) on hysteresis and [hystfit](#) at [ASA, CSSA, SSSA meeting](#); took a [photo with Rien van Genuchten](#).
- 2025-05-08: [Presented](#) on multimodal soil hydraulic models and unsatfit at [Rien van Genuchten conference](#) in Rio de Janeiro. [Movie](#)
- 2025-09-29: Released unsatfit 6.0; added [trimodal models](#) and an option for isothermal hydraulic conductivity to the [set_model\(\)](#) method.

[Update of this document](#)