

La Plateforme de modélisation VSOIL au service du couplage multiphysique

S. RUY + équipe Vsoil – UMR EMMAH



VSoil : kesako ?

Un outil (financement EA puis AES, début 2008) pour faciliter le développement et l'usage de modèles complexes (multiphysique et au-delà 😊) du fonctionnement des sols → <https://vsoil.hub.inrae.fr>

Welcome to the VSoil project!

VSoil (for Virtual Soil), is a **modelling software platform** supported by the **AgroEcoSystem** division of **INRAE** and developed and hosted in **EMMAH** laboratory. It is a tool to **help develop numerical models** describing the **physical, chemical and biological processes of the soil** in interaction with the **climate, plants and anthropic actions**. By **facilitating the coupling between these processes**, the platform makes it possible to **develop complex models from assemblies of existing or new codes**.

We advise you to read the **What you can do with VSoil** page before using VSoil in order to know more about what VSoil is, the capabilities it has and the functionalities it offers.

Look also at the top of this page to access more informations about the VSoil project: description of the **project** and the **software platform**, informations about the **project life**, procedures to **download** the VSoil software suite (on Linux and Windows), access to **documentations** of the VSoil software suite (including some tutorials) and how to **contact** us.

You can find below all the **news about the VSoil project**: new stable versions of VSoil software suite, new collaborations (projects, thesis, ...).

News

- A **new stable version** of the VSoil software suite (VSoil 20260723) is available. The main changes introduced in this version are: (1) **Ubuntu Noble 24.04** and **Resolute 26.04** were added to the list of supported Singularity operating systems, (2) **hydraulic_properties_from_PTF_classes**, **simple_tree** and

- (i) Coupler des processus physiques, chimiques, biologiques,...
- (ii) Différencier le processus de sa représentation numérique/informatique
- (iii) Outils d'aide au codage : approches graphiques, section prédéfinies, génération automatique de parties de codes, complétion automatique
- (iv) Export (utilisation en dehors de la plateforme) et mode collaboratif

VSoil : une suite de 4 ateliers logiciels

4 ateliers logiciels

Compilation en local et
exécution en local ou sur
des serveurs

Interrogation de BDD, y.c.
climat

Une équipe support

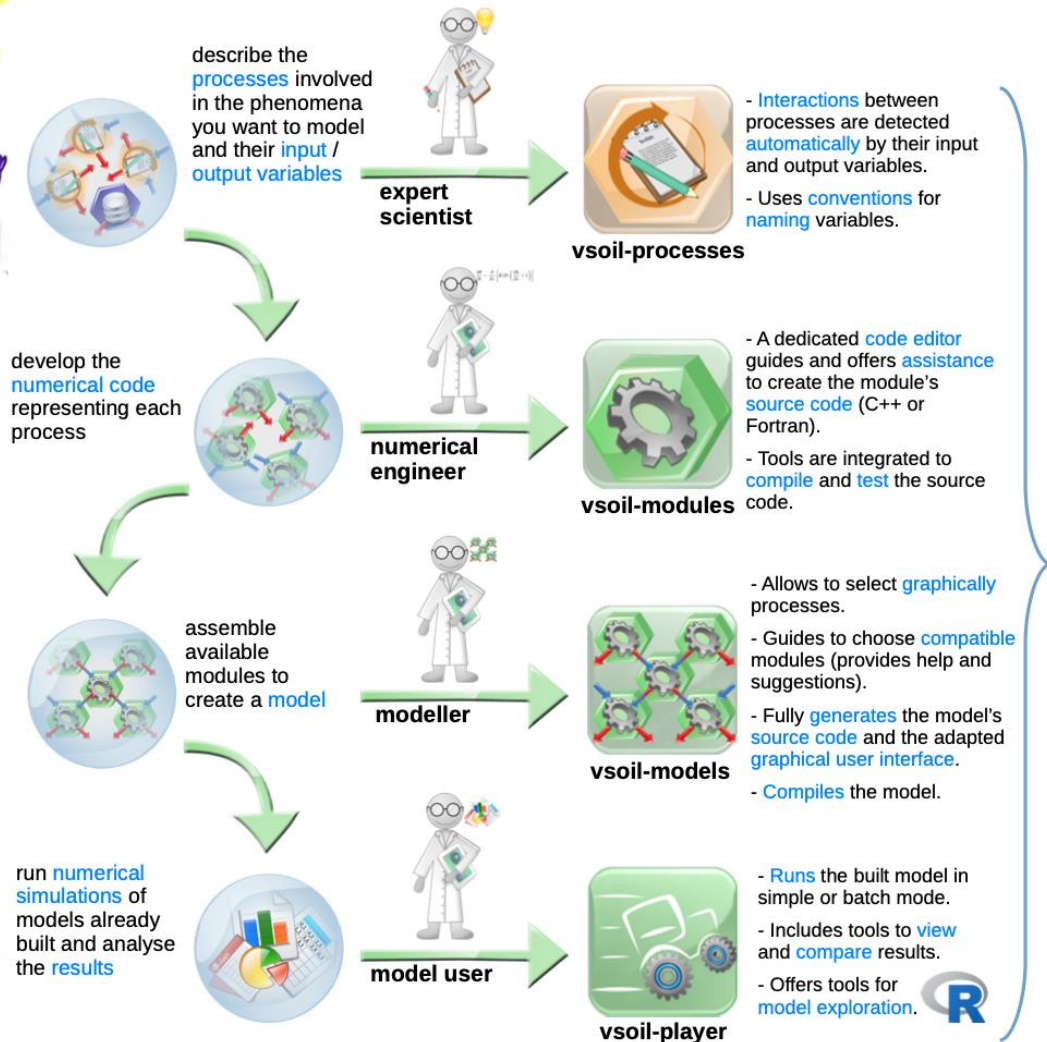
vsoil@inrae.fr

vsoil-support@inrae.fr

Serveur Discord



2.1 The VSoil software suite



Un exemple de couplage multiphysique avec VSoil

CARACTERISATION DES PROPRIÉTÉS HYDRAULIQUES DU SOL PAR INVERSION JOINTE ELECTRIQUE-HYDRIQUE

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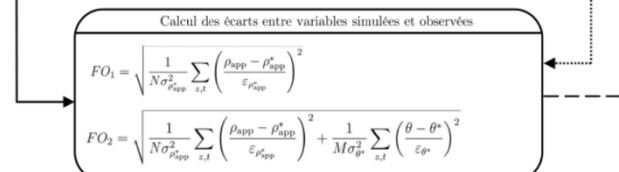
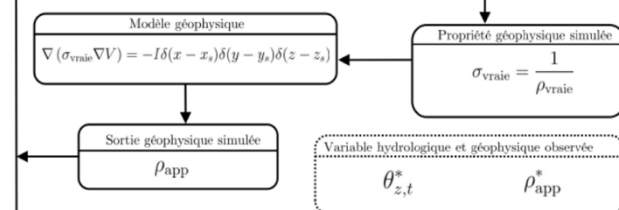
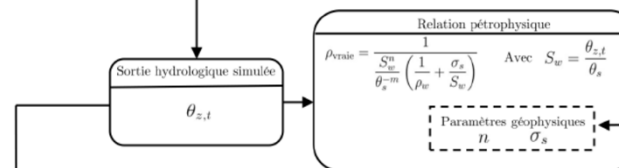
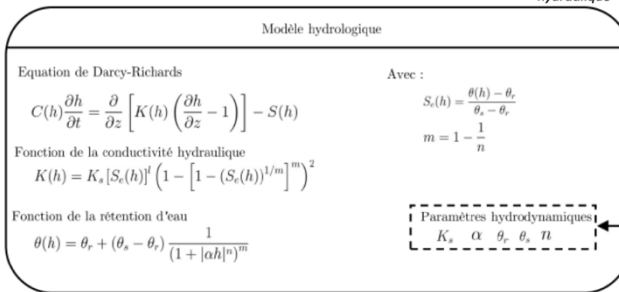
Schéma de l'inversion

α n_{vg} θ_r θ_s K_s σ_s n_{petro}
hydraulique géophysique

Module
préexistant
dans VSoil

Création du
modèle (direct)
couplé

Création d'un
module à
partir de
pyGIMLI



Interfaçage
avec R
- Analyse
sensibilité
- Inversion



Et aussi

Utilisation de la plateforme pour
générer un OAD
(webservice climatique)

Capacité à intégrer des données
issues de l'imagerie

<https://doi.org/10.1016/j.jhydrol.2025.133791>

<https://doi.org/10.1016/j.geoderma.2020.114643>

En projet : Approche 1D => approche 2 ou 3D ?

Intérêt pour AQUA ?

Pour plus d'infos :

- Le site : <https://vsoil.hub.inrae.fr>
- Les contacts : vsoil@inrae.fr ; vsoil-support@inrae.fr
- Les publis associées : <https://vsoil.hub.inrae.fr/communications>

3.2 Building a model for predicting the risk of rutting in forest soils

Funding: ADEME, *partners:* ONF, CNPF-IDF, FCBA, INRAE.

Context: forestry machine traffic is one of the main causes of physical degradation of forest soils and, consequently, of forest stands.

Forestry machinery travels on dedicated tracks known as skid trails, whose practicability must be maintained over the long-term.



Ruts in the Grand-Pays national forest (Meuse, France) – March 2021



Forestry machinery traffic test - 2018

Development of a climate service prototype for real-time prediction of the water status of skid trails over the next 14 days:

observed and forecast weather data (ECMWF) + model to simulate the degree of water saturation of skid trails + ask minimum information to forestry operators = predicting the risk of rutting

