Reactive Transport Modelling applied to Ni laterite ore deposits in New Caledonia : Impact of discrete fractures on Ni mineralization

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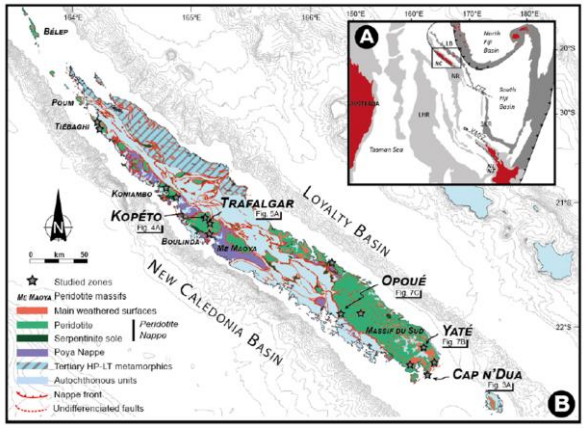
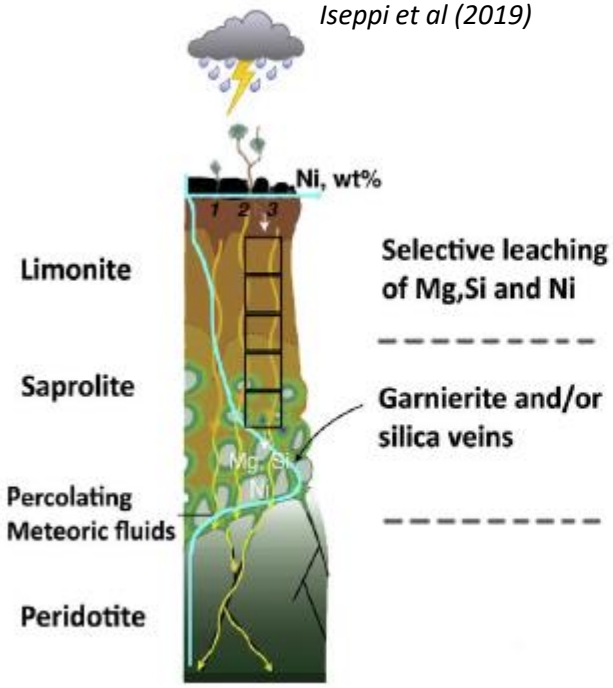
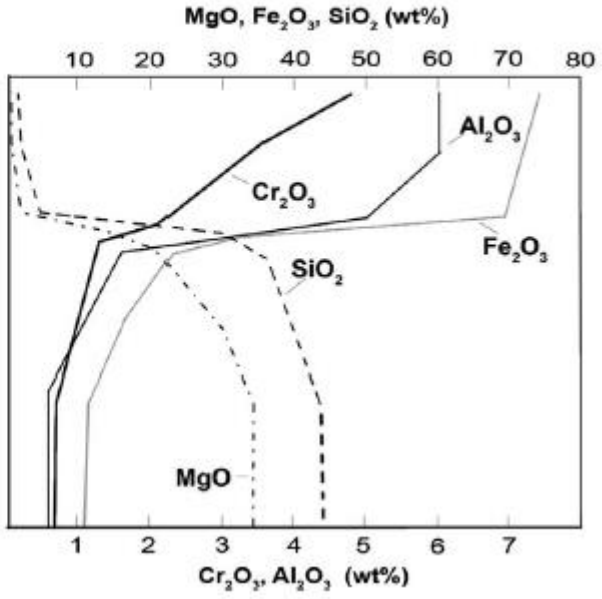
Context



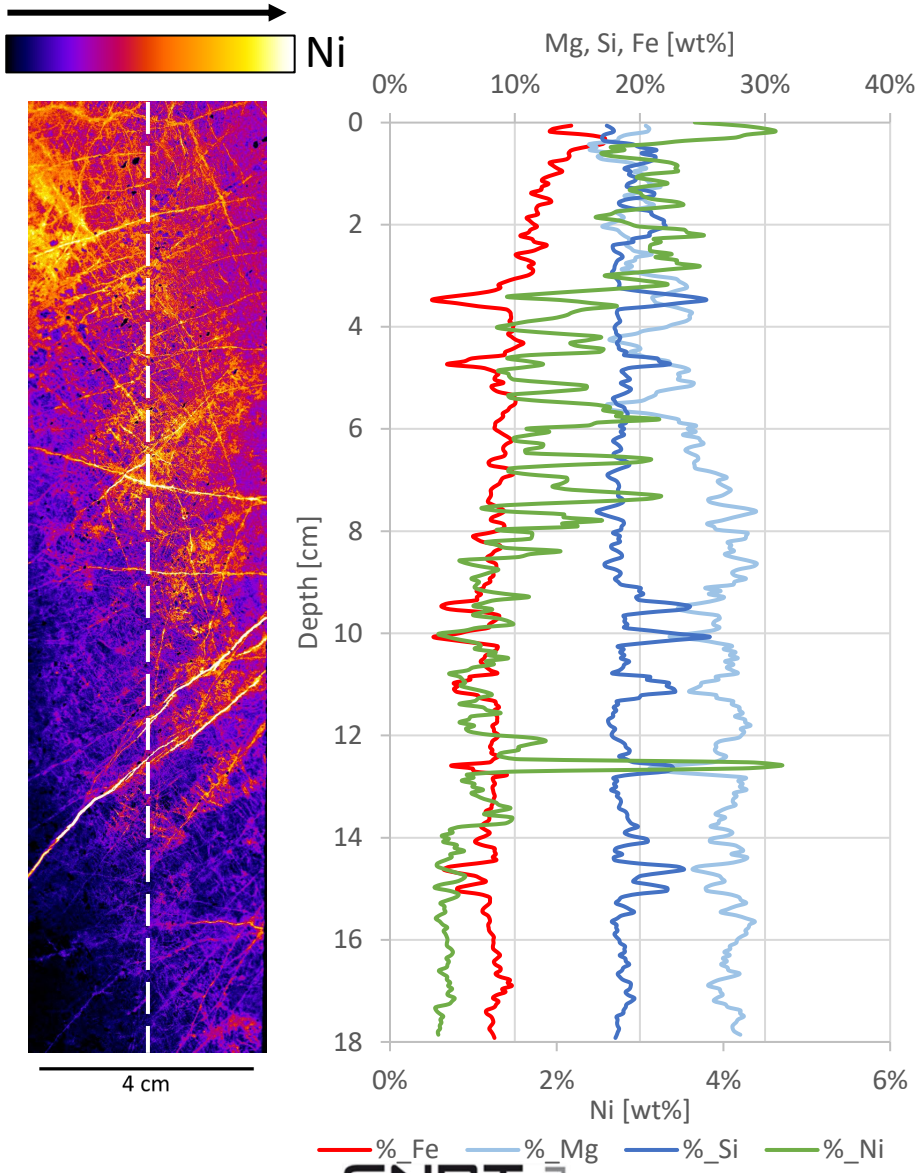
Iseppi et al (2019)

Iseppi (2018)





Myagkiy et al (2017)

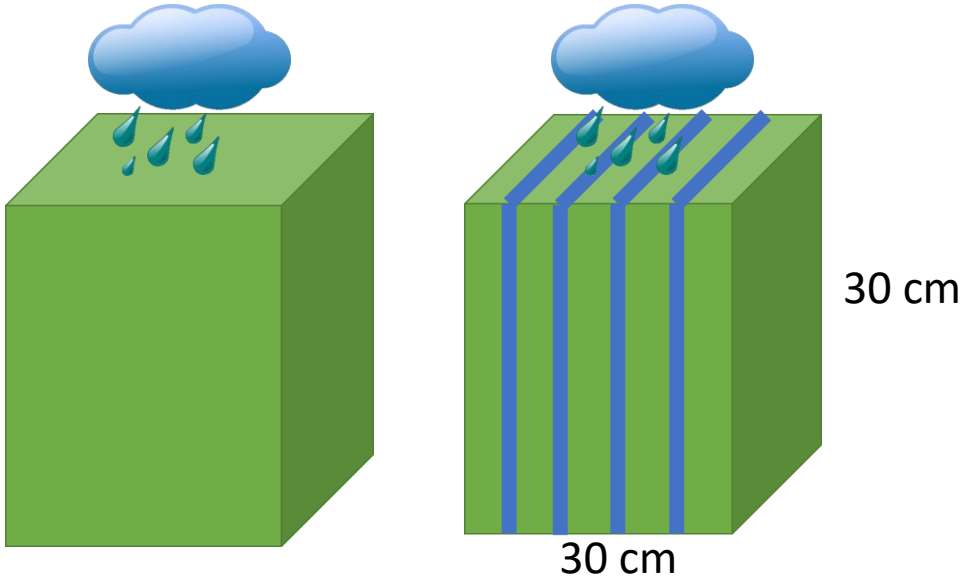


Objectives

PhreeqC simulation

Simple model

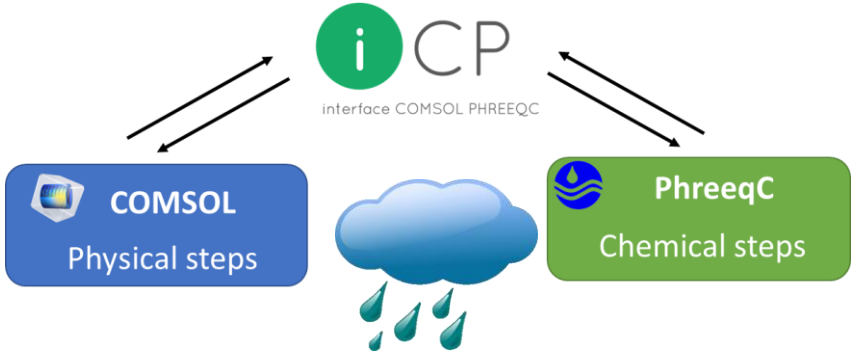
Dual porosity model

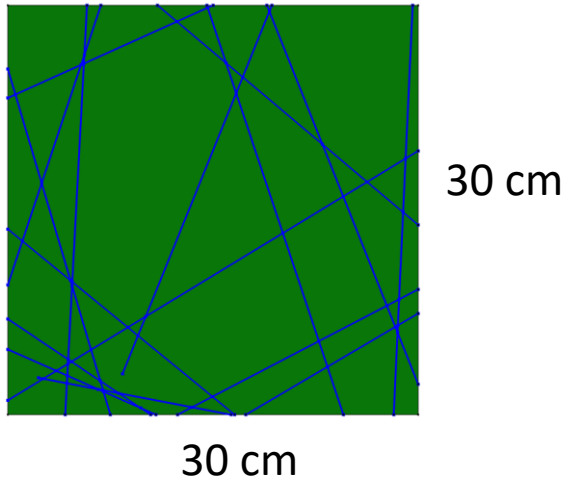


Olivine column

Fractured olivine column

PhreeqC – Comsol iCP





Fractured olivine column

Modeling Parameters of Olivine Dissolution

Fractures	Width [mm]	Aperture [mm]	k [m²]	Equivalent porosity [%]	Volume ratio [%]
Simple model	0	0	0	0%	0%
Dual porosity model	1	0.03	7.5E-11	4.9%	3%
iCP	1	0.03	7.5E-11	4.9%	4%

Matrix	k [m²]	Porosity [%]	Volume ratio [%]
Simple model	2.0E-15	2%	100%
Dual porosity model	2.0E-15	2%	97%
iCP	2.0E-15	2%	96%

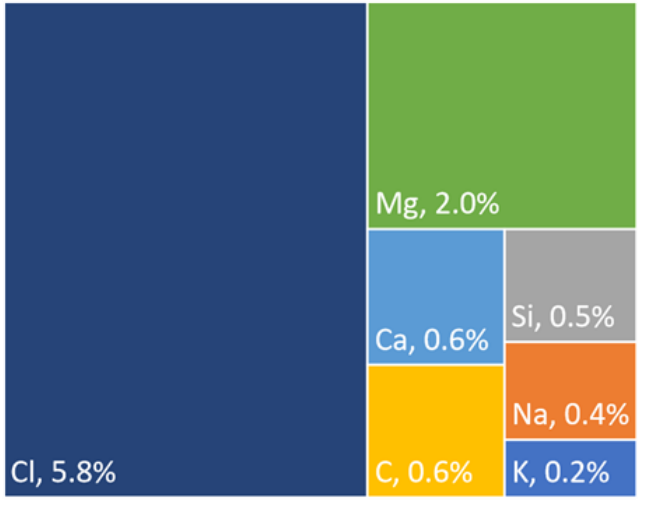
Equivalent permeability : **7.6E-14 m²**

Input flow rate : **1.5 m/yr**

Mineral	Formula	log_k
Pimelite	$Ni_3Si_4O_{10}(OH)_2:H_2O$	11.46
Kerolite	$Mg_3Si_4O_{10}(OH)_2:H_2O$	25.79
Falcondoite	$Ni_4Si_6O_{15}(OH)_2:6H_2O$	12.31
Sepiolite	$Mg_4Si_6O_{15}(OH)_2:6H_2O$	30.44
Goethite_Ni	$Fe_{0.98}Ni_{0.03}OOH$	0.53
Olivine	$Mg_{1.865}Fe_{0.127}Ni_{0.008}SiO_4$	-

Myagkiy et al (2018)

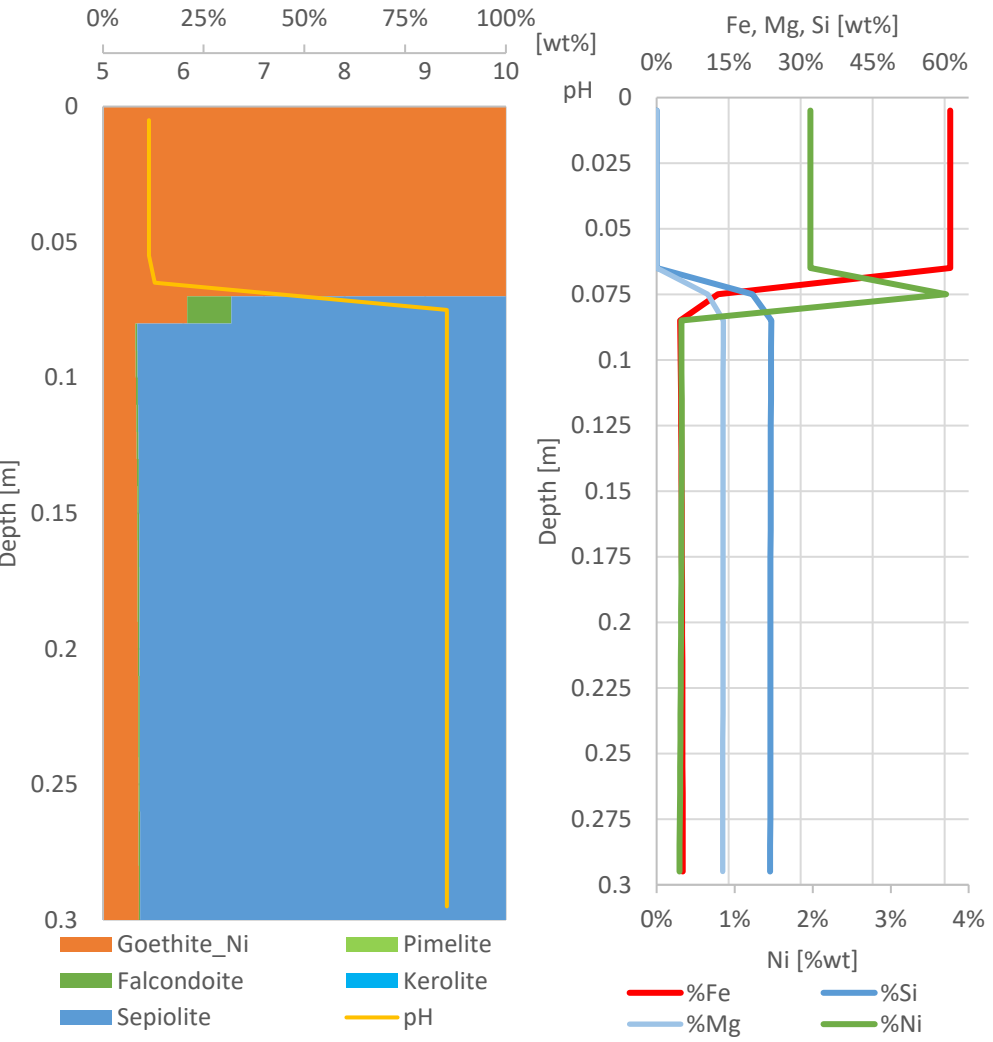
Rain water pH = 5,56



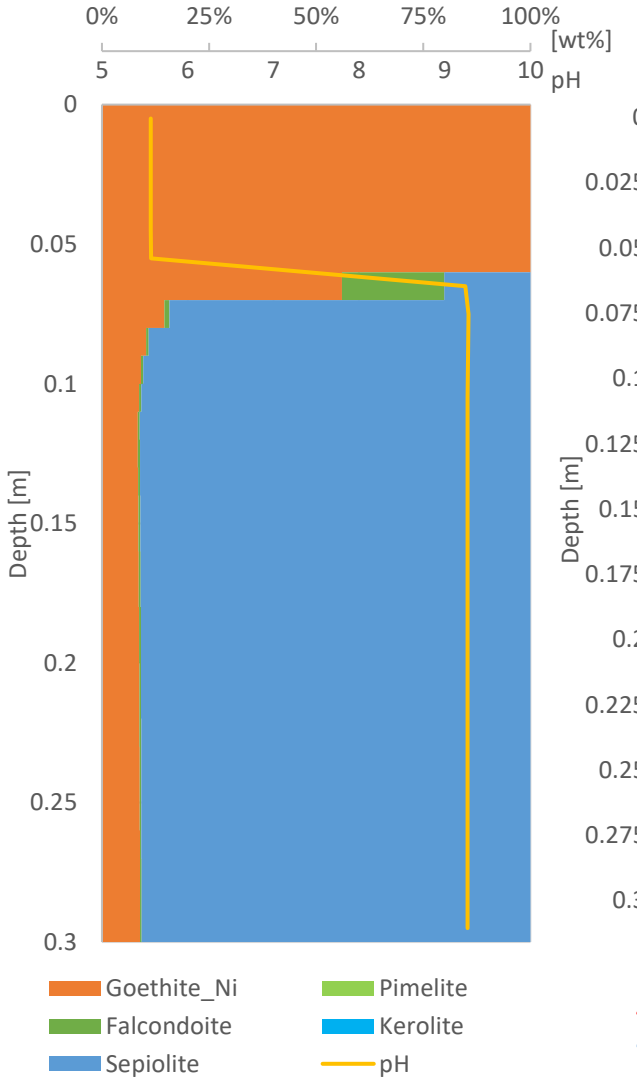
Trescases (1983)

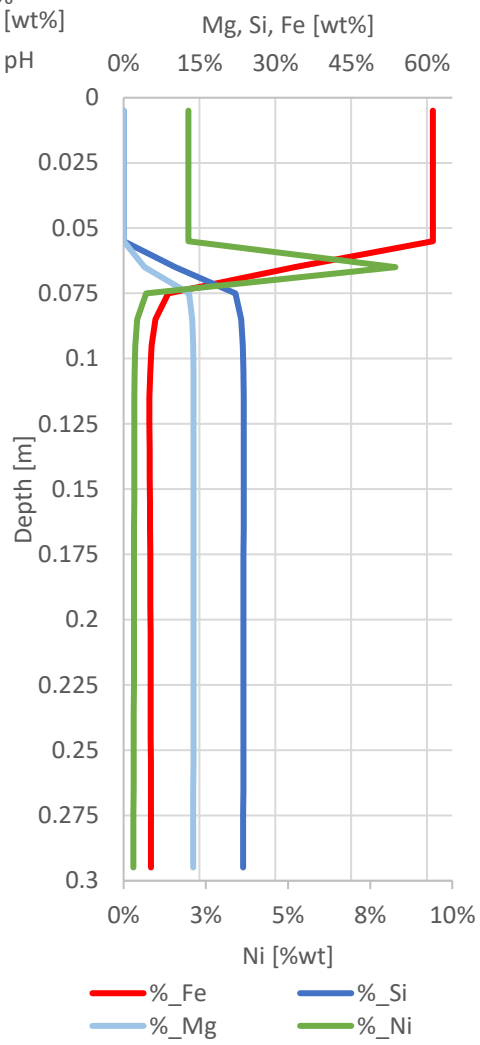
Results – PhreeqC models comparison

Simple Model @ 5 300 years

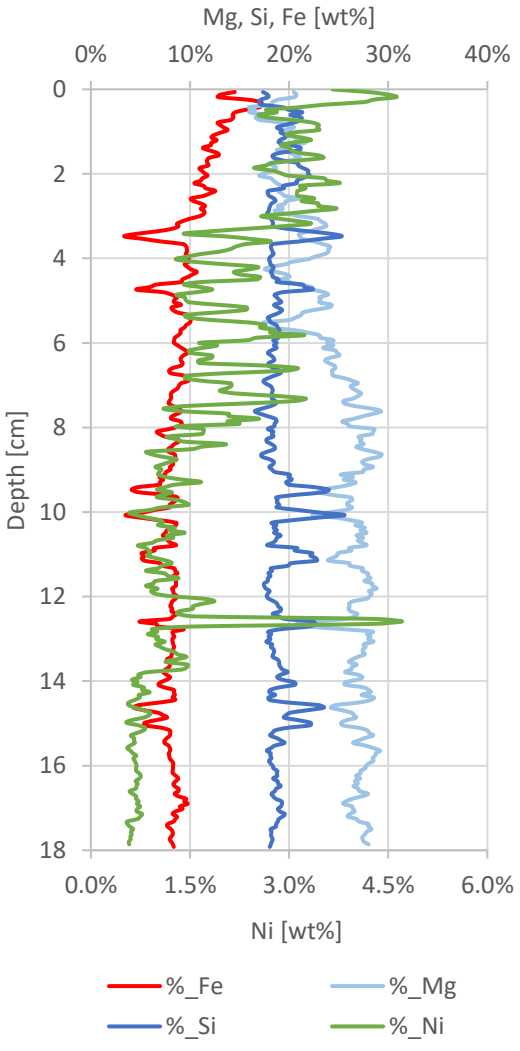


Dual Porosity Model @ 5 300 years

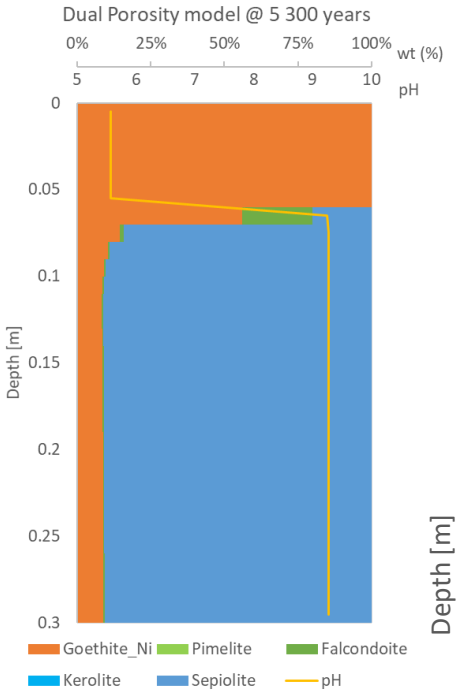


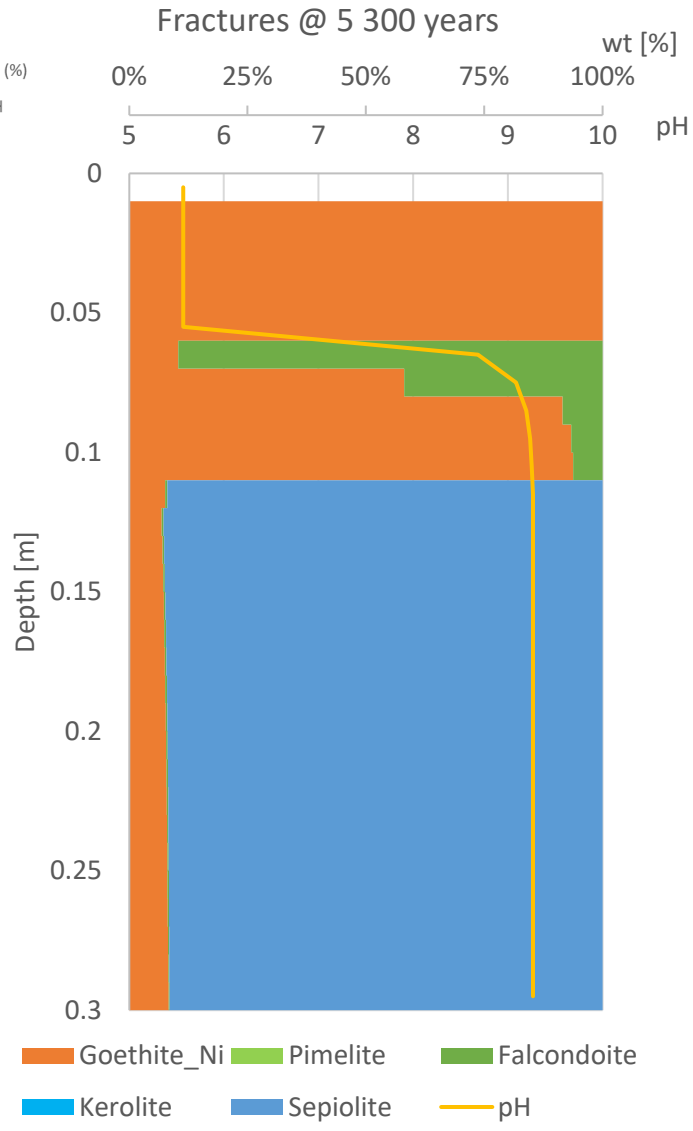


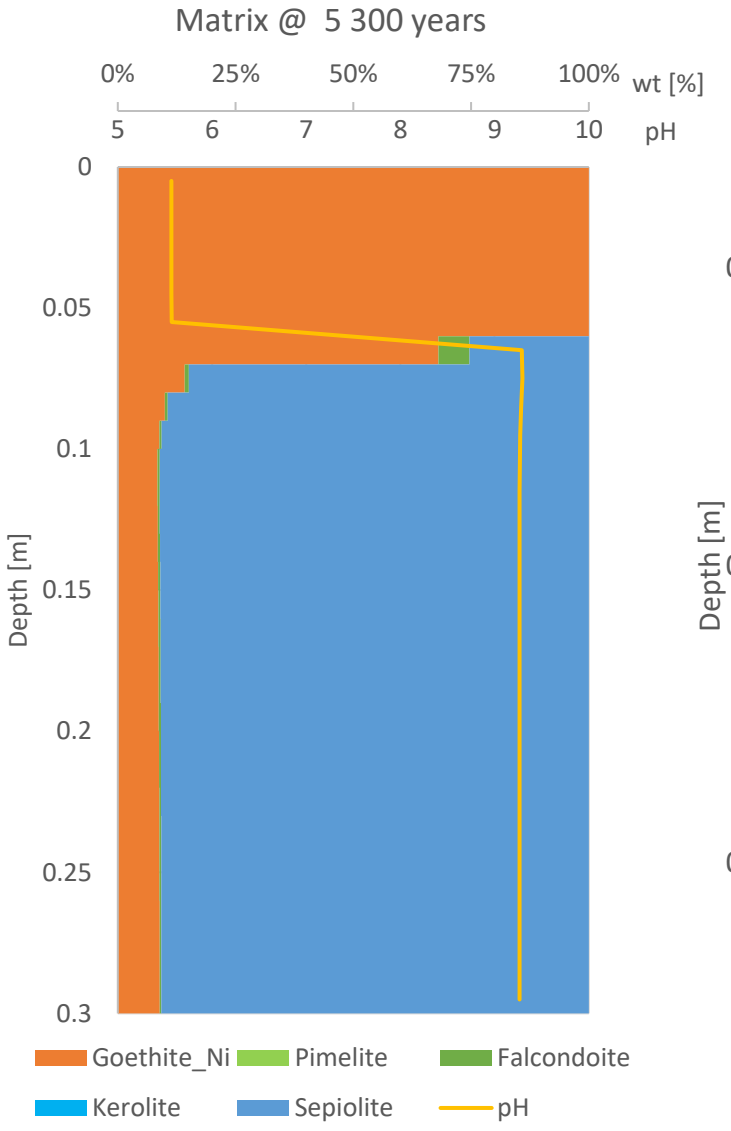
Sample

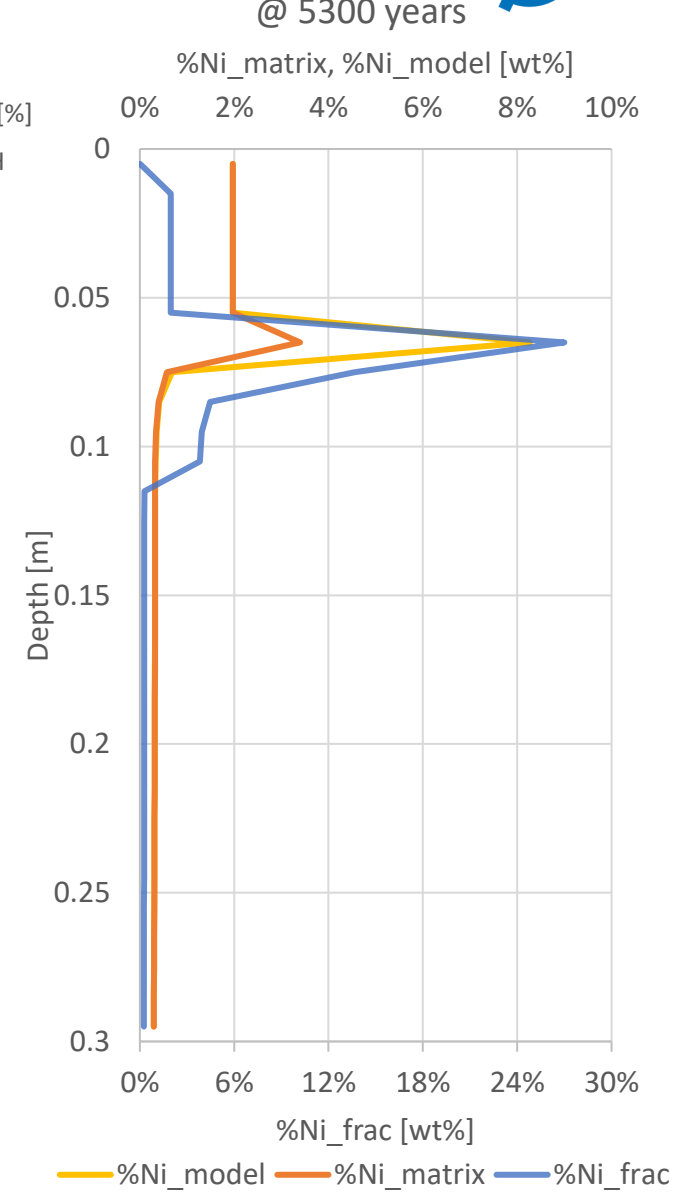


Results – Dual Porosity model









Results – iCP model