Institut de Recherche pour le Développement
FRANCE

The importance of inter-laboratory comparisons, and the proposal for a GLOSOLAN quality certification system for organic carbon measurements

Webinar

29 October 2024

Dr Christian Hartmann - IRD

christian.hartmann@ird.fr

Part A:

The importance of inter-laboratory comparisons

In the past:
labs were working in isolation and developped methods adaptaed to local needs.

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Since the beginnig of 2000 Environmental concerns => need to compare situations all around the world.

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Since the beginnig of 2000 Environmental concerns => need to compare situations all around the world.

Labortories need to join
Inter Laboratory Comparison (ILC)/ Proficiency testing (PT)?

What are ILC/PT ?

Inter Laboratory Comparison

Profeciency testing?

ILC/PT:

1. the same soil sample is provided to different labs

Statistically analysis to determine:

- **REPRODUCIBILITY (= how similar are the results from different labs)**

- **PERFORMANCES of the laboratories**

Научная жизнь

Глобальная сеть почвенных лабораторий (ГЛОСОЛАН) как мировая платформа управления почвенными данными для целей рационального землепользования

Е.В. Шамрикова

Институт биологии ФИЦ Коми НЦ УрО РАН,
г. Сыктывкар
shamrik@ib.komisc.ru

Аннотация

Проведение инвентаризации накопленных за исторический период планетарных почвенно-географических сведений обеспечивает разработка гармонизированных стандартов, а также поиск поправочных коэффициентов. Глобальная сеть почвенных лабораторий (ГЛОСОЛАН, GLOSOLAN), созданная в рамках Глобального почвенного партнерства Продовольственной и сельскохозяйственной организации ООН (ФАО), призвана объединить усилия почвенных лабораторий мира. Главная цель работы экспертов сети ГЛОСОЛАН – гармонизация методов анализа почв в целях согласования действий специалистов мирового научного сообщества в деле повышения эффективности управления и рационального использования почв.

Коллектив Института биологии ФИЦ Коми НЦ УрО РАН (Сыктывкар) как национальная референтная лаборатория России выполнил гармонизацию метода измерения содержания почвенного органического вещества (далее – ОВ), разработал и аттестовал модификацию метода Тюрина. Полученный результат позволяет интегрировать накопленный за более чем вековой период массив данных о содержании ОВ в различных типах почв России и ряде стран Евразии в глобальную базу – сеть мониторинга качества почв.

Ключевые слова:

международное сотрудничество, анализ почв, органическое вещество, гармонизация методов

Global network of soil laboratories (GLOSOLAN) as international platform for soil data management for sustainable land use

E.V. Shamrikova

Institute of Biology, Federal Research Centre Komi Science Centre of the Ural Branch of the Russian Academy of Sciences, Syktyvkar
shamrik@ib.komisc.ru

Abstract

The development of harmonized standards, as well as the search for correction coefficients, ensures an inventory of planetary soil and geographical information accumulated over the historical period. The Global Network of Soil Laboratories (GLOSOLAN), created within the framework of the Global Soil Partnership of the Food and Agriculture Organization of the United Nations (FAO), is designed to unite the efforts of the world's soil laboratories. The main goal of the work of the GLOSOLAN network experts is the harmonization of soil analysis methods in order to coordinate the actions of the world scientific community specialists in improving the efficiency of management and rational use of soils.

The staff of the Institute of Biology of the Komi Scientific Research Centre of the Ural Branch of the Russian Academy of Sciences (Syktyvkar), as a national reference laboratory of Russia, performed the harmonization of the method of measuring the content of soil organic matter (OM), developed and certified a modification of the Tyurin method. The obtained result makes it possible to integrate an array of data accumulated over more than a century on the content of OM in various types of soils in Russia and a number of Eurasian countries into the global soil quality monitoring network database.

Keywords:

international cooperation, soil analysis, organic matter, harmonization of methods

When different methods exist:

⇒ **problem for the reproducibility**

⇒ **need to decide Standard Oerating Procedures (SOPs)**

⇒ **need to make harmonisation between different methods**

harmonisation between different methods: hot issue !

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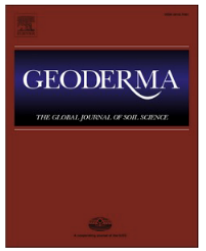

Transferability between soil organic matter measurement methods for database harmonization

E.V. Shamrikova [a], B.M. Kondratenok [a], E.A. Tumanova [a], E.V. Vanchikova [a], E.M. Lapteva [a], T. V. Zonova [a], E.I. Lu-Lyan-Min [a], A.P. Davydova [a], Z. Libohova [b,*], N. Suvannang [c]

[a] Institute of Biology Komi SC UrD RAS, Kommunisticheskay 28, Syktyvkar, Russian Federation
[b] USDA-ARS Dale Bumpers Small Farms Research Center, 6883 S. Hwy 23, Booneville, AR 72927, United States
[c] Land Development Department, 2003/61 Phaholyothin Road, Chatuchak, Bangkok 10240, Thailand

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Walkley-Black
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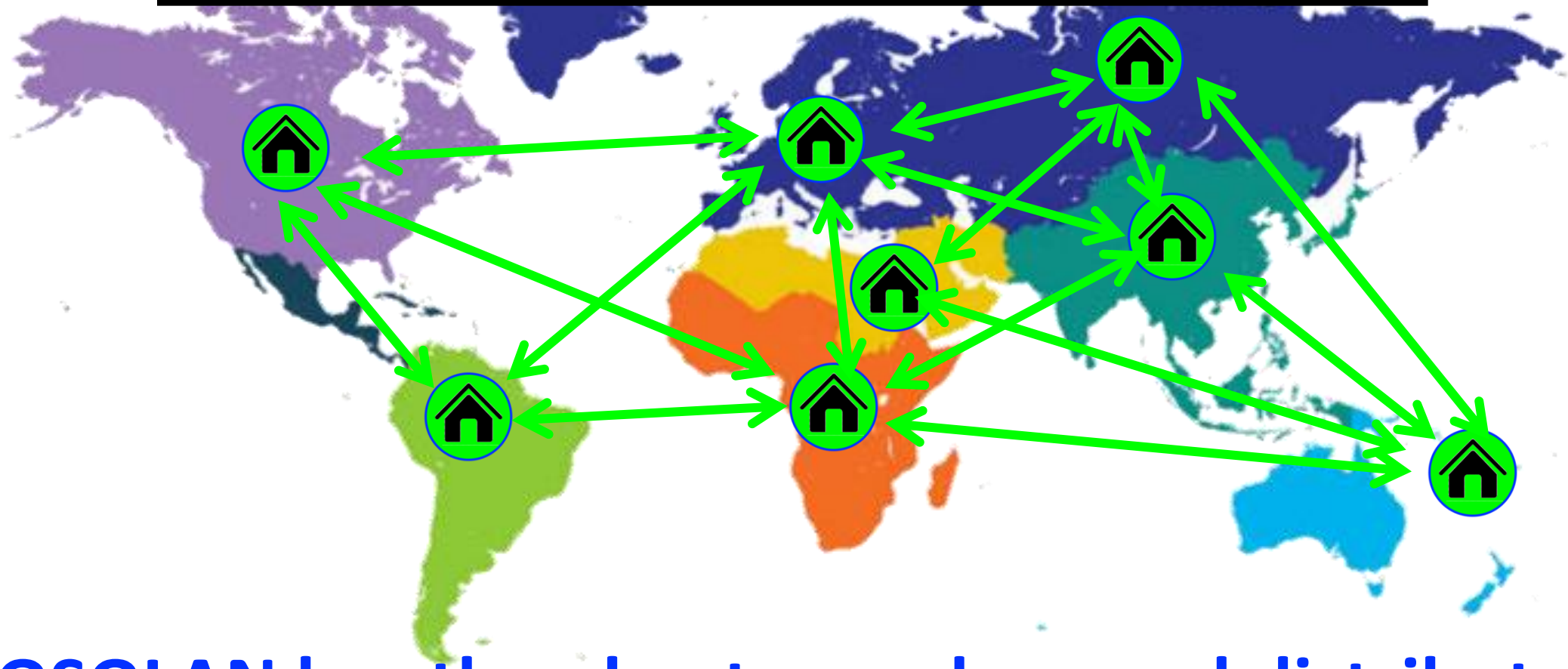
ABSTRACT

Soil organic matter (SOM) is one of the most important soil-forming factors and complex with a chemical composition not fully known. The amount of SOM traditionally is estimated by stoichiometric determination of carbon dioxide (CO_2) released from oxidation reaction with a chromium mixture, hence the term *soil organic carbon* (SOC). The two most common oxidation methods are Tyurin (T) and Walkley-Black (WB). However, the efficiency of organic carbon oxidation depends upon the conditions of the oxidation reduction (redox) reaction (temperature, reagent concentration, oxidation time), which vary for both methods. The lack of consistent results from the oxidation methods has led to widely different conversion factors. Although the Tyurin's method has been slowly removed from some laboratories, there still remains a large number of samples, especially from Eurasia, that have been measured by this method for more than a century and continue at the present time. The objective of this research was to develop equations or pedotransfer functions (ptf) for converting SOC determined by the Tyurin method to current and more widely used methods, such as WB and dry combustion (DC).

Part A:
the importance of inter-laboratory comparisons ?

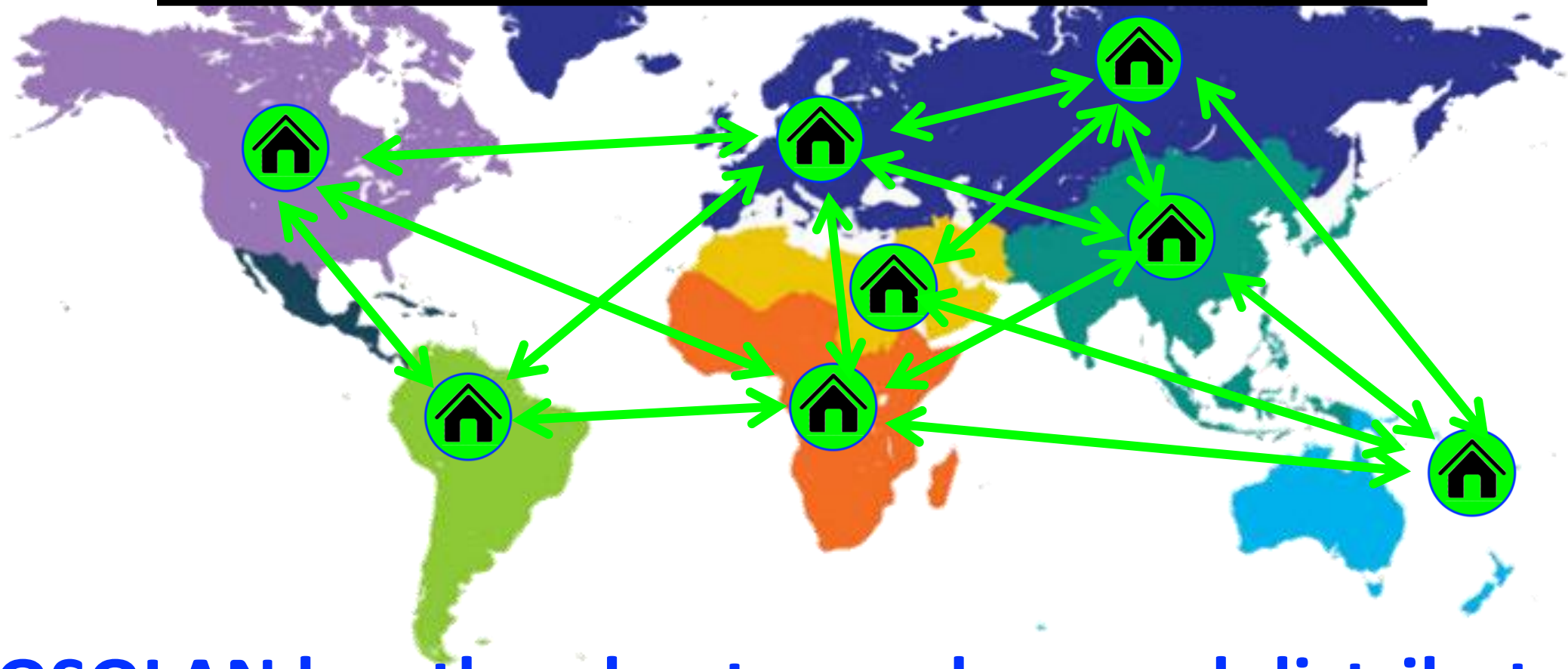
- allows the comparability among regions
- improves the worldwide reproducibility…

Inter-calibration BETWEEN Regions



GLOSOLAN has the plan to produce and distribute soil reference samples accessible to nearly all laboratories…

Inter-calibration BETWEEN Regions



GLOSOLAN has the plan to produce and distribute soil reference samples accessible to nearly all laboratories…

why not all laboratories?

Part B:

the proposal for a GLOSOLAN quality certification system for organic carbon measurements

In the first part, compared the different laboratories

Result1

Result2

Result3

Result4

Result5

Result6

Etc...

In the first part, compared the different laboratories

Result1 ?

Result2 ?

Result3 ?

Result4 ?

Result5 ?

Result6 ?

Etc… ?

What is the quality of data provided by each lab?

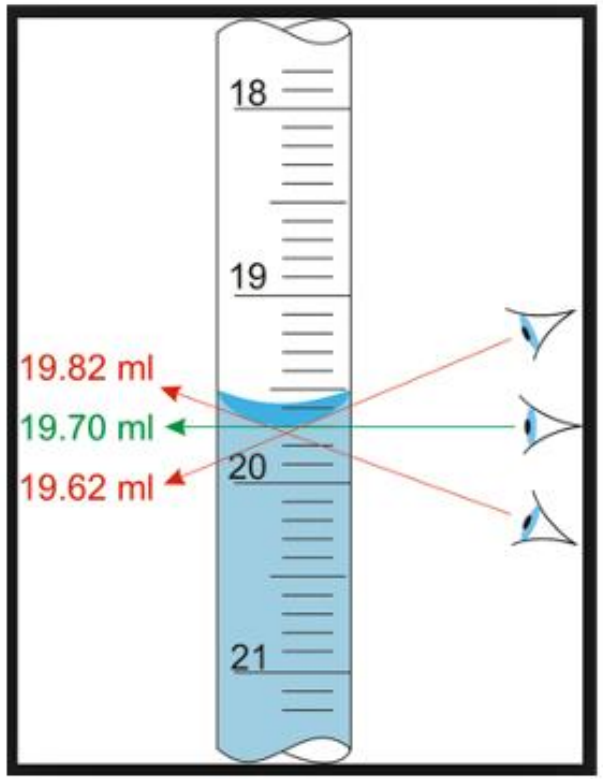
In the first part, compared the different laboratories

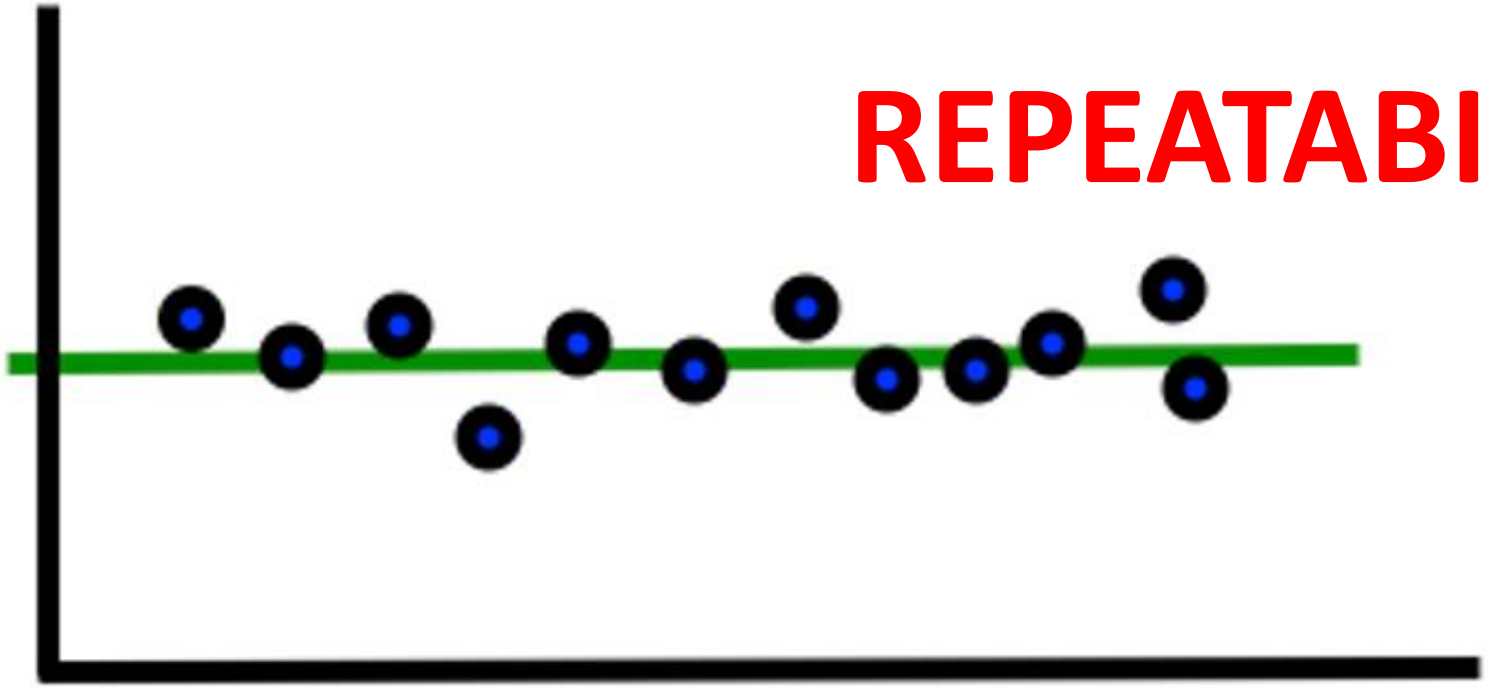
Result1 Result2 Result3 Result4 Result5 Result6 Etc...

What is the REPEATABILITY?

= how similar are the results when analysing several times the same sample?

Every measures contains <u>random</u> or ‘unpredictable’ deviations between replicates





REPEATABILITY

GLOSOLAN tested the REPEATABILITY

5 replicates of the same soil sample

good repeatability

C %

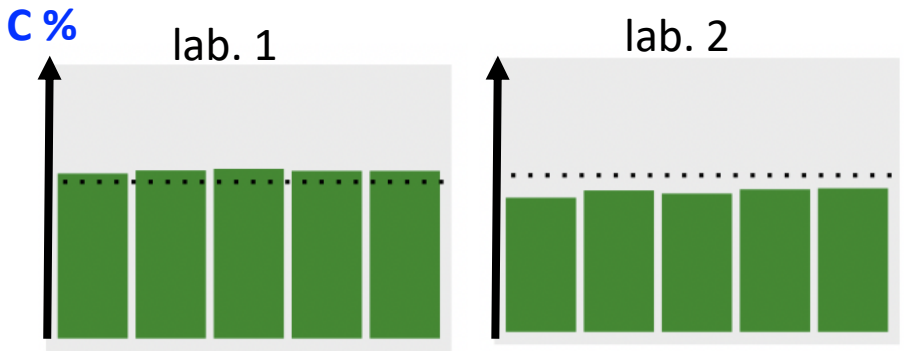
lab. 1

lab. 2

REPEATABILITY ?

5 replicates of the same soil sample

good repeatability

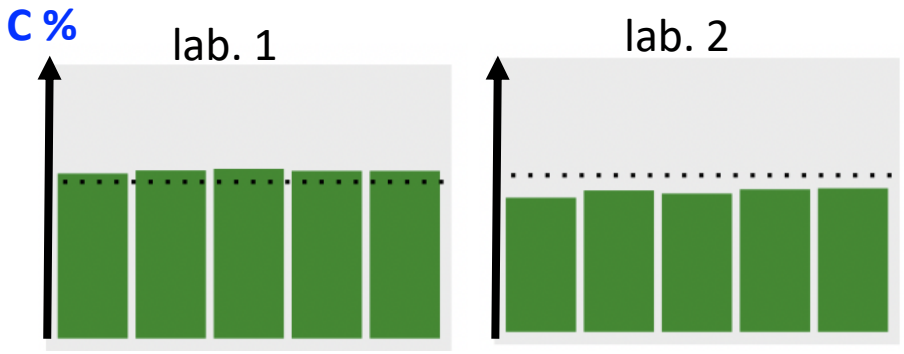


=> control of the analytical process

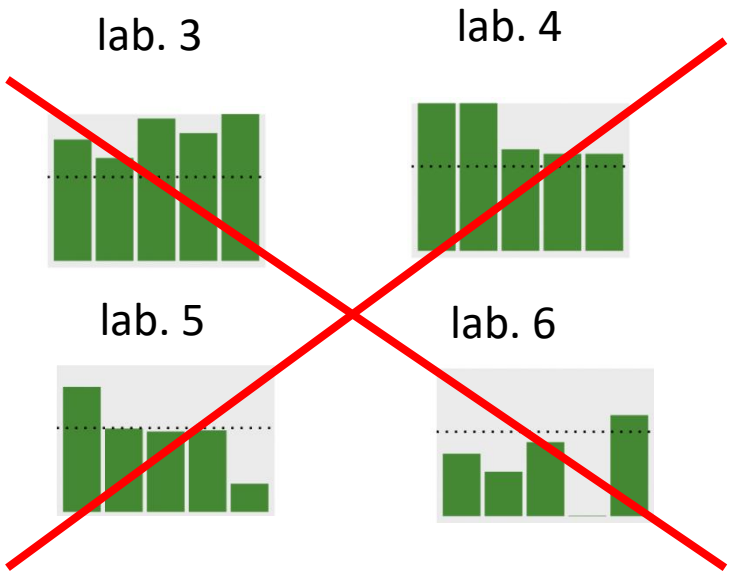
➡ **relevant decision**

REPEATABILITY ?

5 replicates of the same soil sample

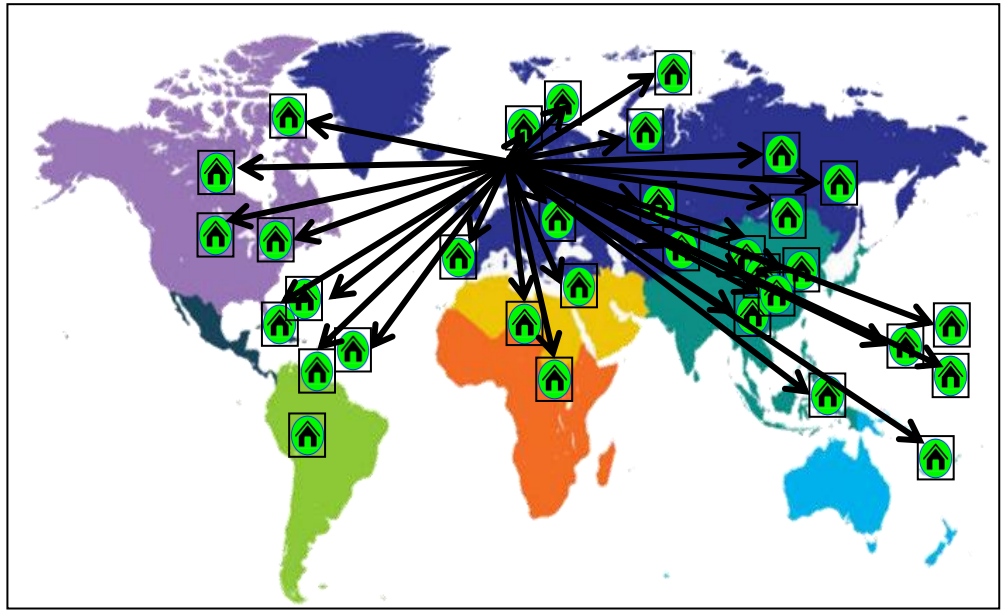


poor repeatability



→ **ir-relevant decision**

current situation in the world?

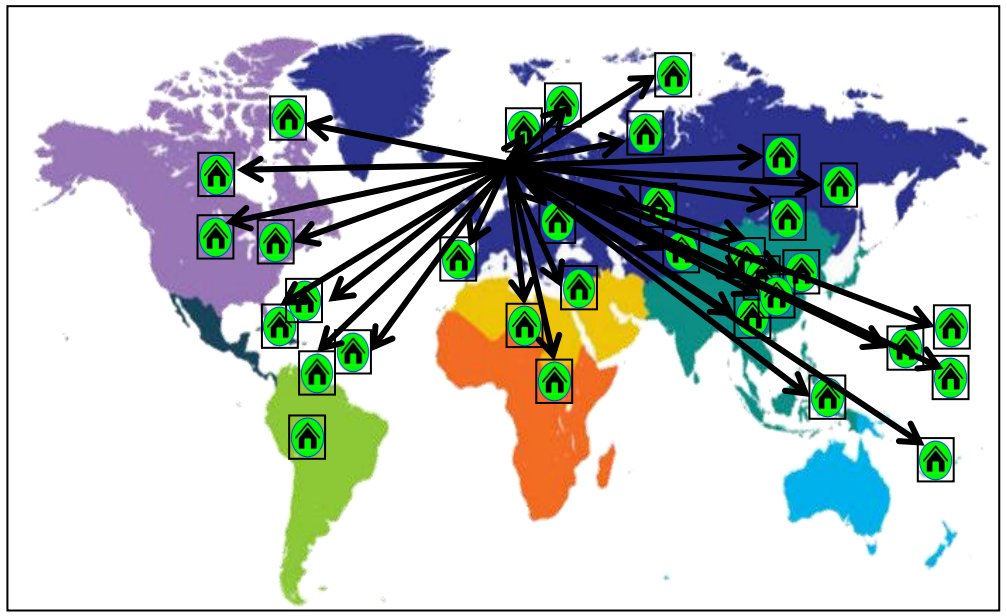


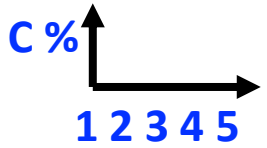
Walckley & Black method

(oxydation = wet chemistry)

160 labs

What is the worlwide situation?





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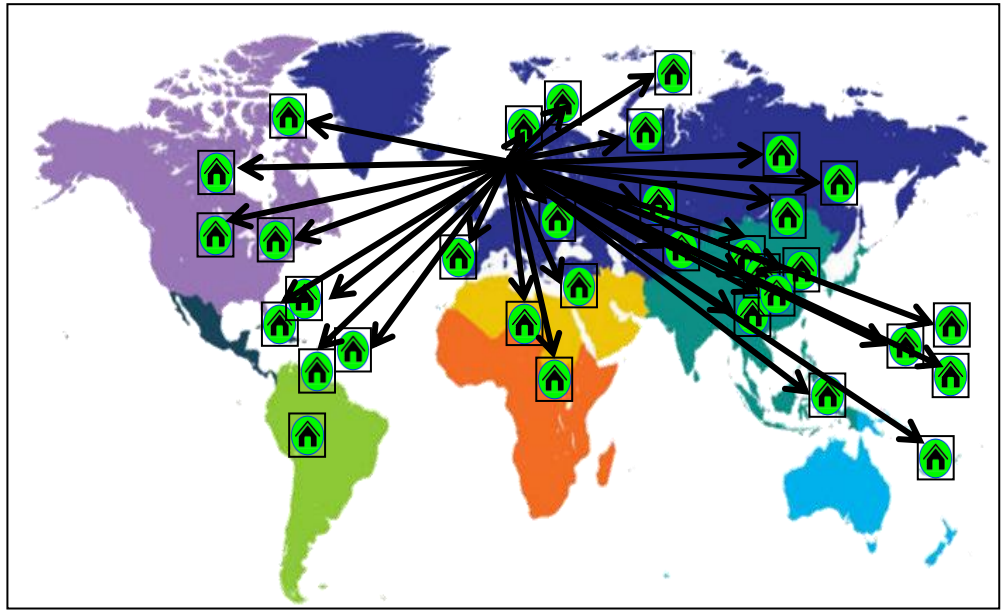


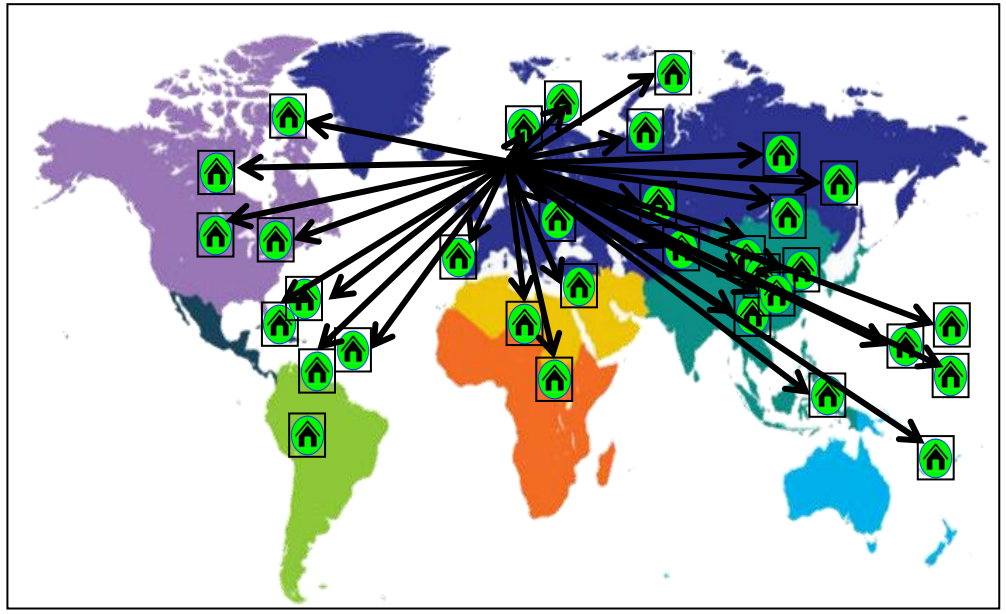
Walckley & Black method

(oxydation = wet chemistry)

160 labs

C %

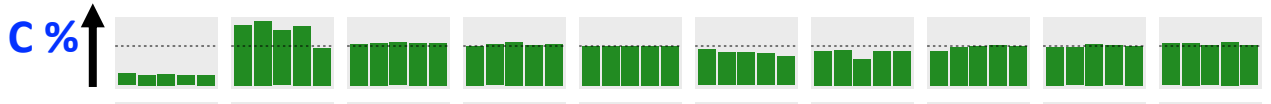
What is the worlwide situation?



Walckley & Black method

(oxydation = wet chemistry)

160 labs



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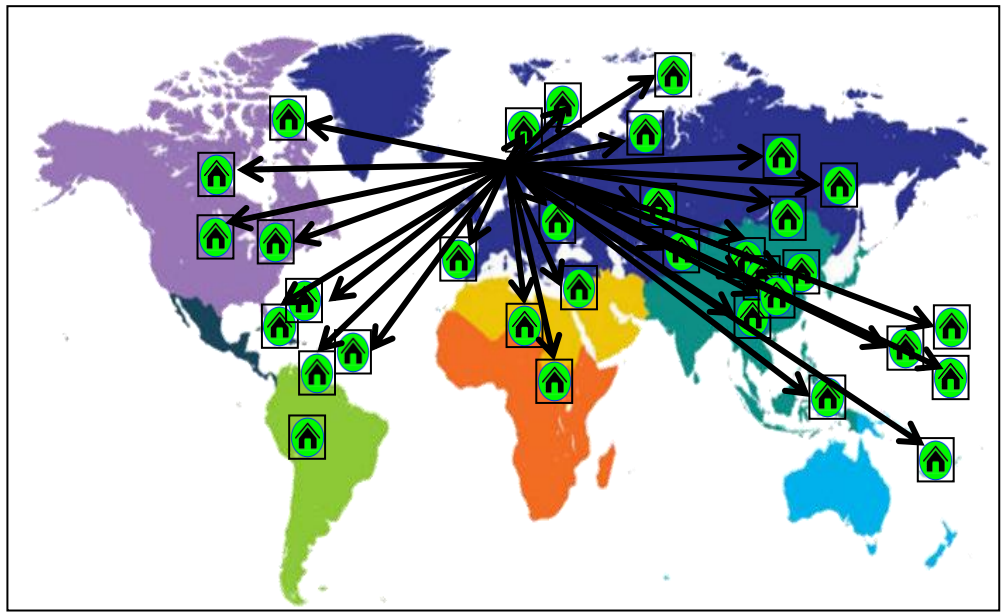

Walckley & Black method

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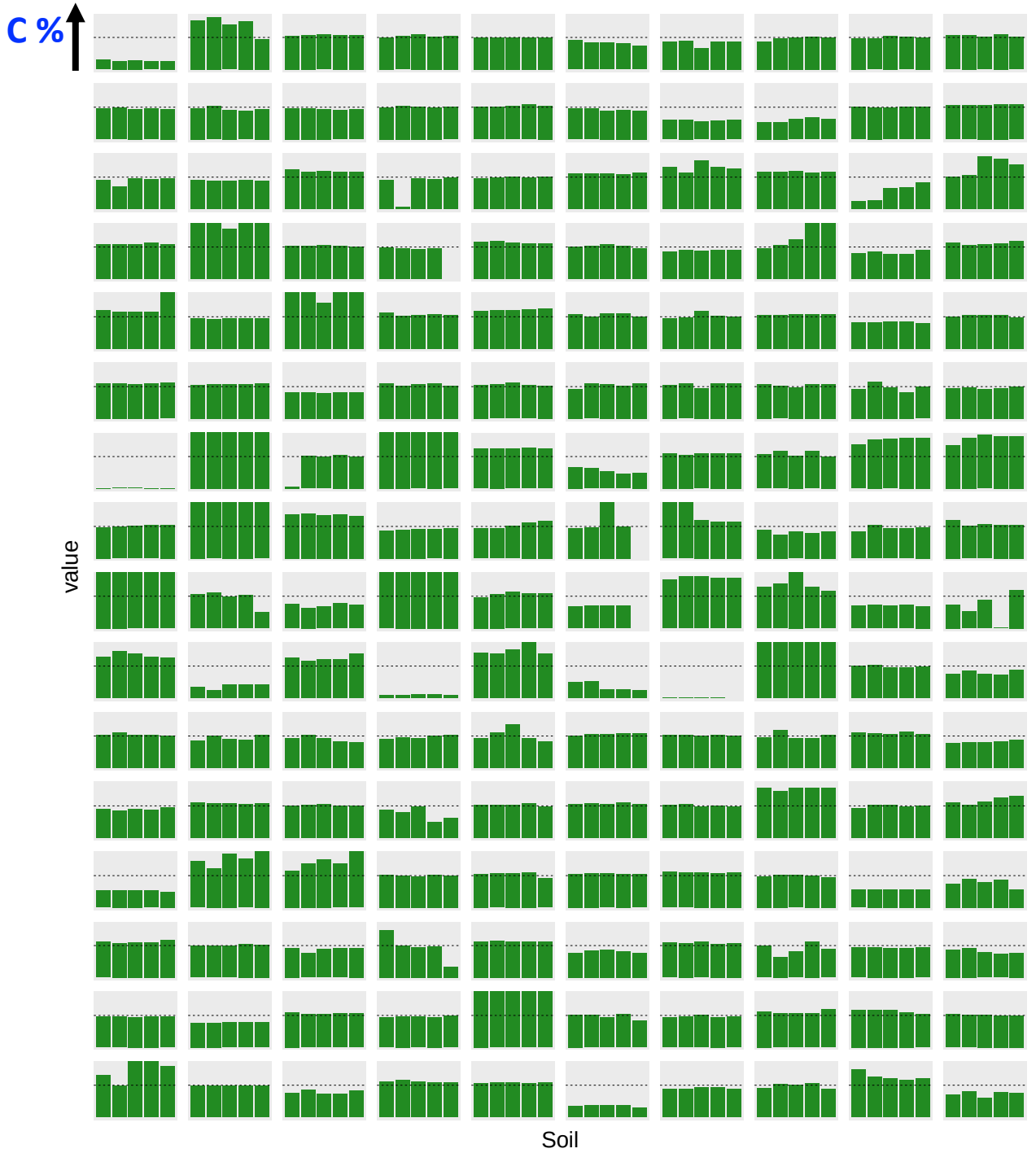

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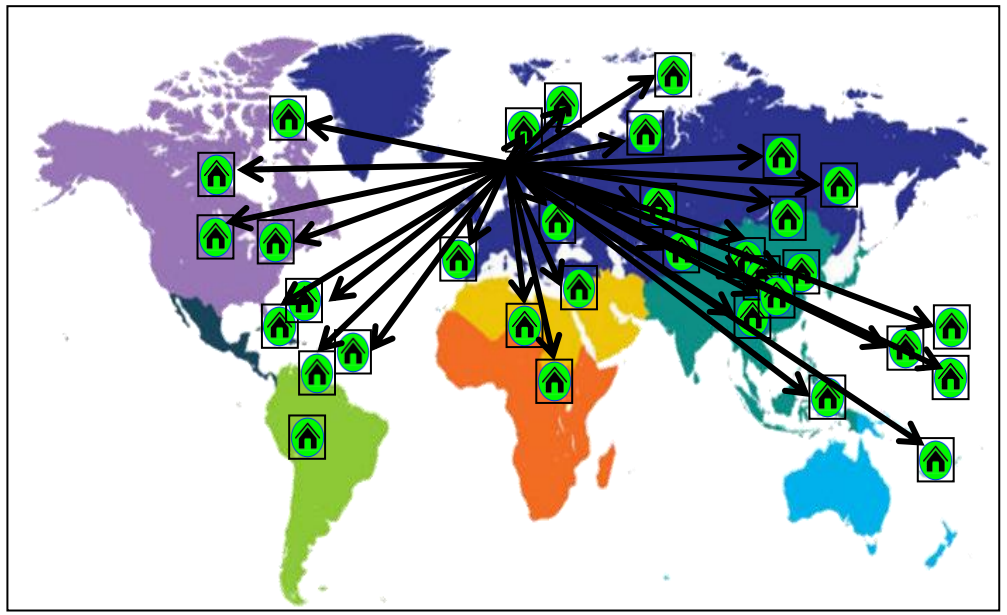


Walckley & Black method

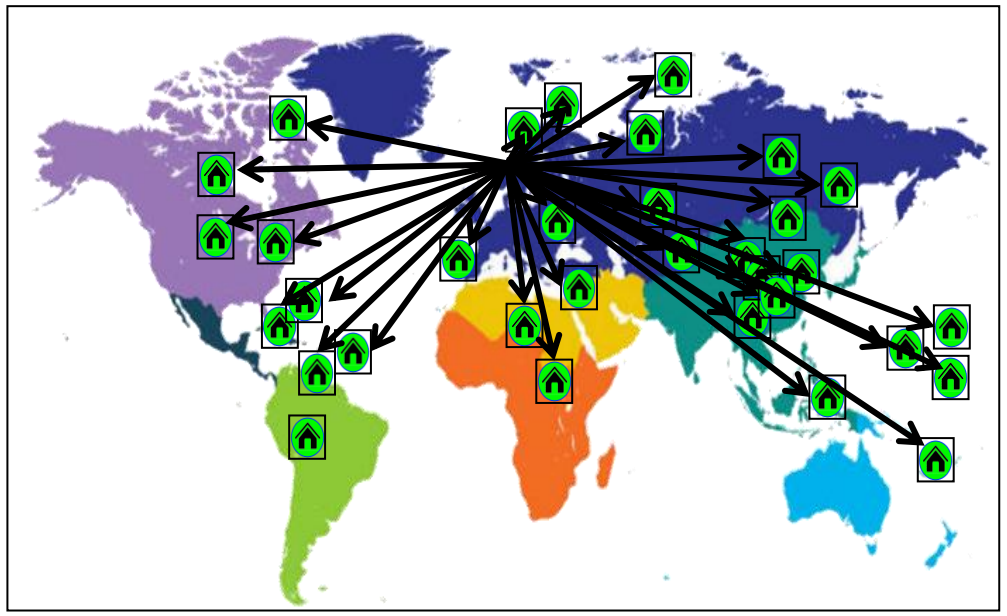
(oxydation = wet chemistry)

160 labs

problem

ir-relevant decision

What is the worlwide situation?



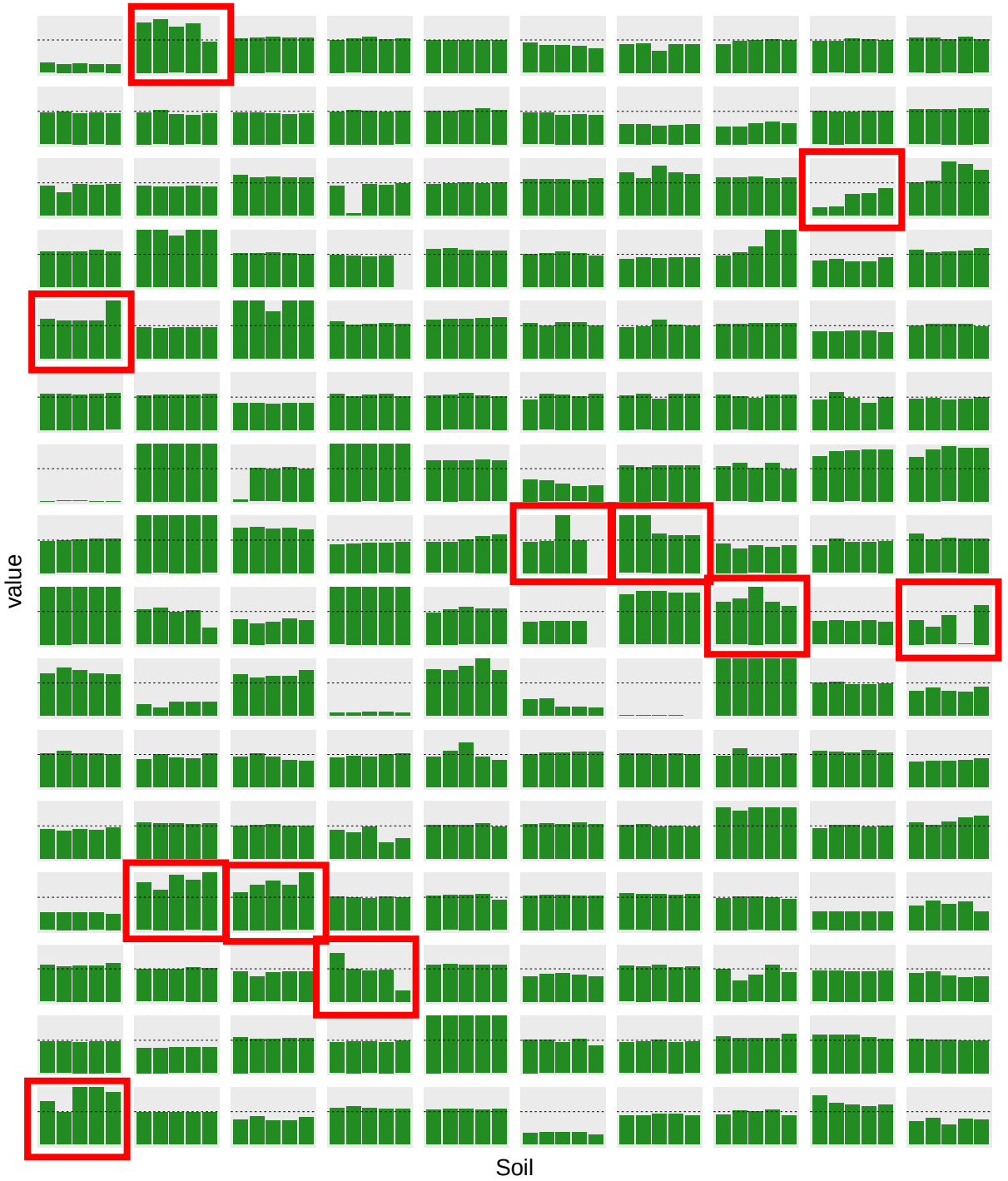
Walckley & Black method

(oxydation = wet chemistry)

160 labs

problem □ **40 %**

➡ **ir-relevant decision**



Some laboratories Have low reproducibility: not acceptable!

QUALITY CONTROL must be the rule In ALL labs

WHY

quality certificate should be quickly implemented…

now you know that:

‘dirty data’ are produced on a regular basis

and we should not use them!

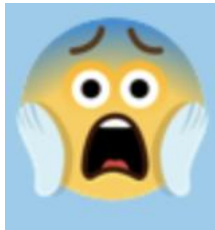
But…

now you know that:

‘dirty data’ are produced on a regular basis

and we should not use them!

But… cannot be extracted after release



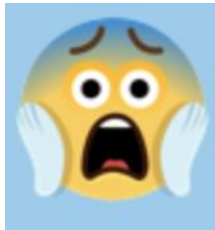
now you know that:

‘dirty data’ are produced on a regular basis

so we are currently using dirty data…

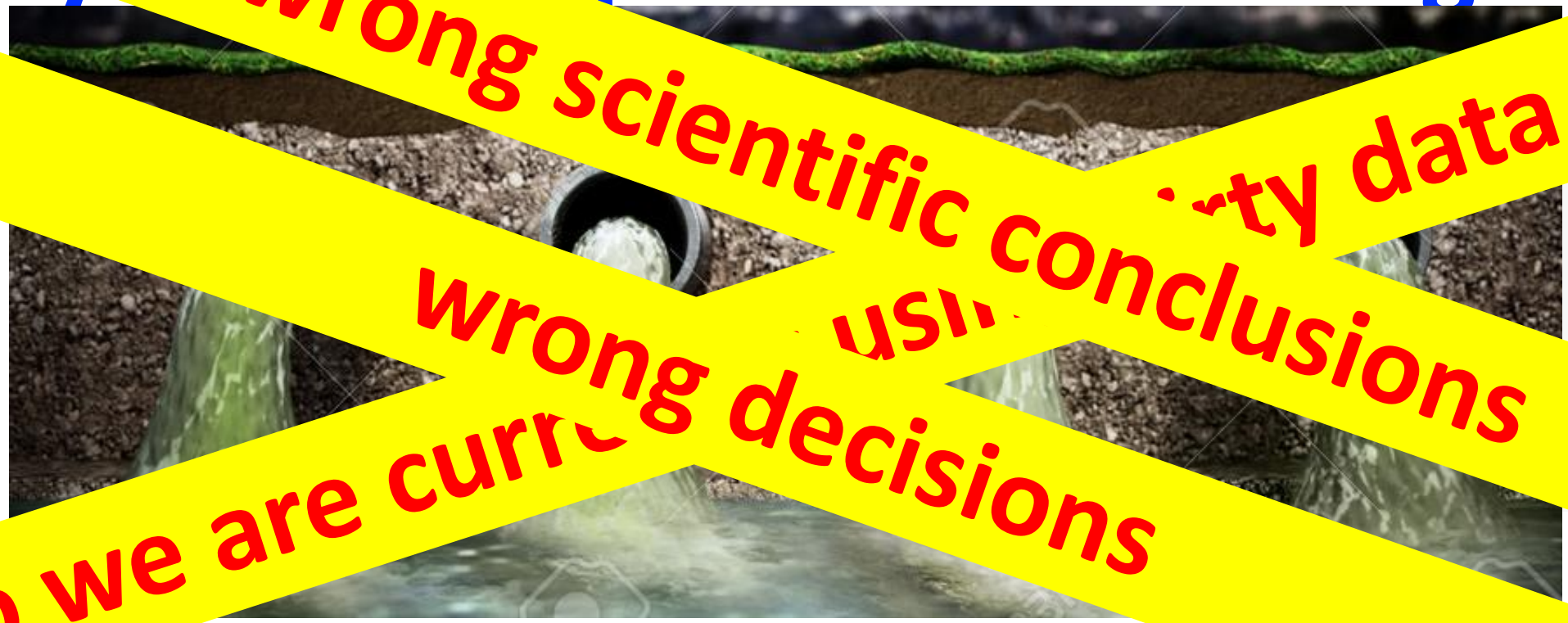
and we should not use them!

But… cannot be extracted after release



now you know that:

‘dirty’ [illegible] produced on a regular basis



wrong scientific conclusions

[illegible]ty data…

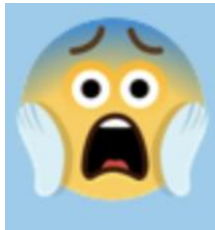
[illegible]

so we are curr[illegible]

wrong decisions

and we should not use them!

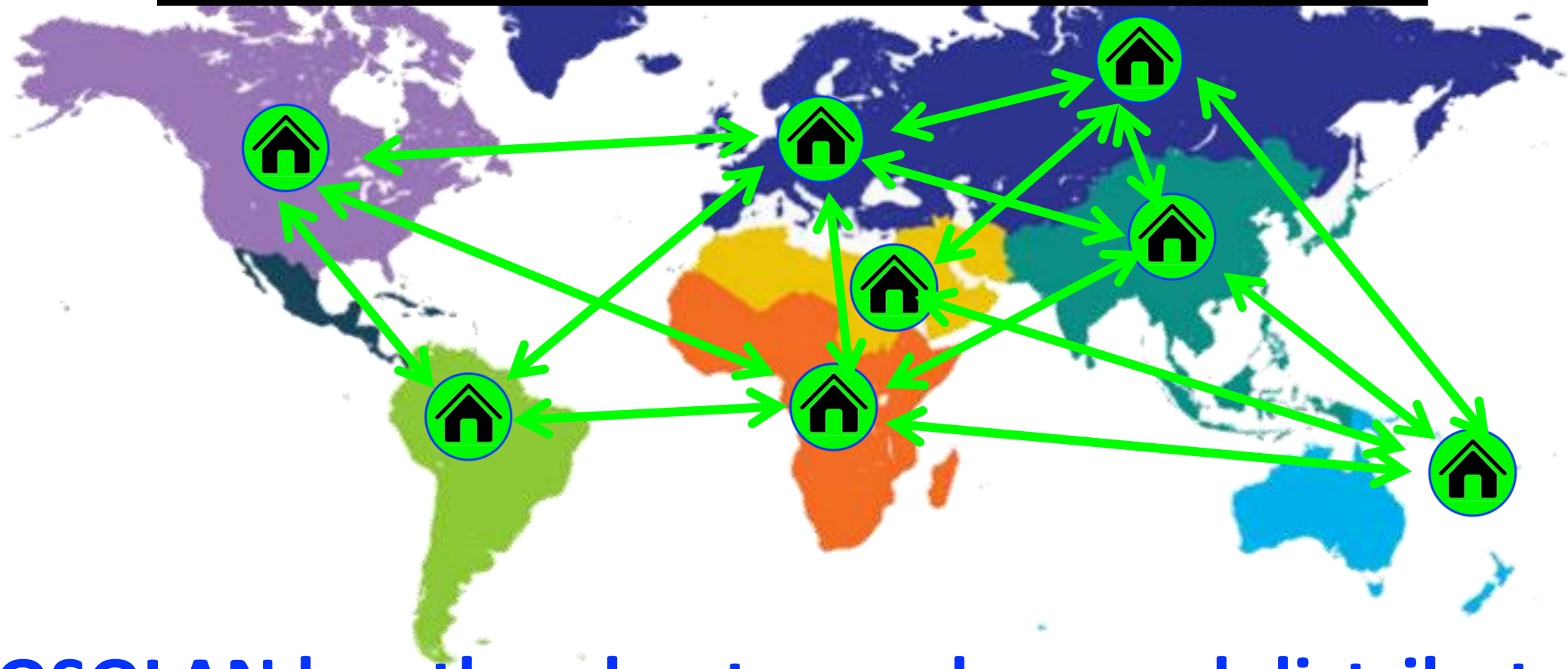
But… cannot be extracted after release



tentative AGENDA

- Nov 2024: submission to GLOSOLAN plenary assembly
- June 2025: submission to GSP plenary assembly
- Nov 2025: finalise the process
- 2026: launching of certification process

Inter-calibration BETWEEN Regions



GLOSOLAN has the plan to produce and distribute soil reference samples accessible to laboratories…

THAT HAVE IMPLEMENTED QUALITY CONTROL (QC) !

Final comment:

GLOSOLAN
GLOBAL SOIL LABORATORY NETWORK

wants laboratories to improve

and it is giving them the means to change

Open access multi lingual documents, webinars, face to face trainings , many more

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Thank you very much for your attention