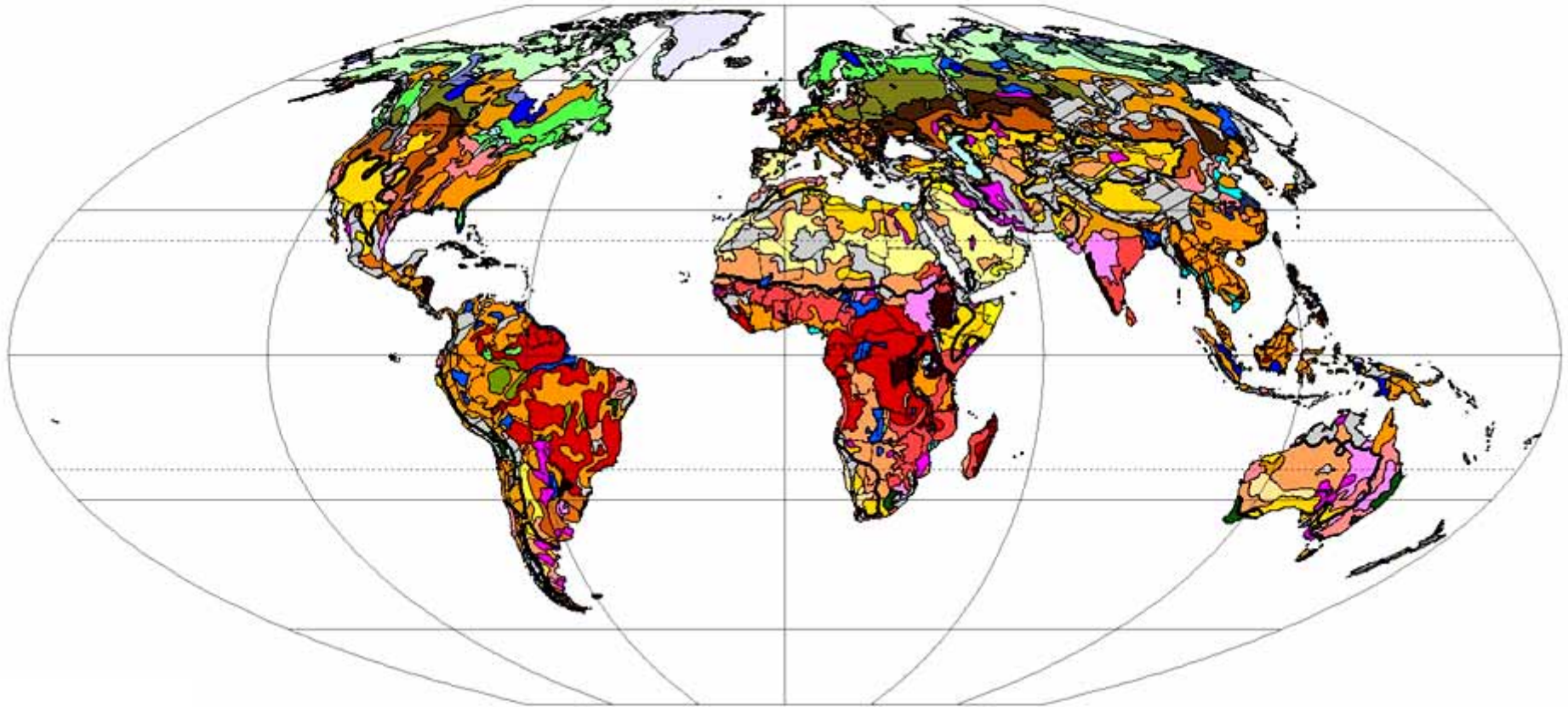


WORLD SOIL RESOURCES



**Suggestion for harmonized terminology
in soil classification**

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Classification, an applied area of soil science, lacks a common set of terminology.

Harmonization of the basic terminology of modern classification systems is suggested.

☀ Most early soil classification systems were based on the recognition of soil *forming processes*.

☀ The properties that result from soil processes are more easily quantifiable than soil processes themselves. Modern systems classify soils based on quantitative characteristics defined as *diagnostic* horizons, properties and materials.

☀ Soil-forming processes are de-emphasized, but remain in the background philosophy of classification.

☀ The two most widely used classification schemes are Soil Taxonomy(**ST**) and the World Reference Base for Soil Resources (**WRB**).

☀ In these two systems, and in several national classification systems many of the same diagnostic features are used, but often defined differently.

☀ In some cases, identical terms are used, but given different definitions.

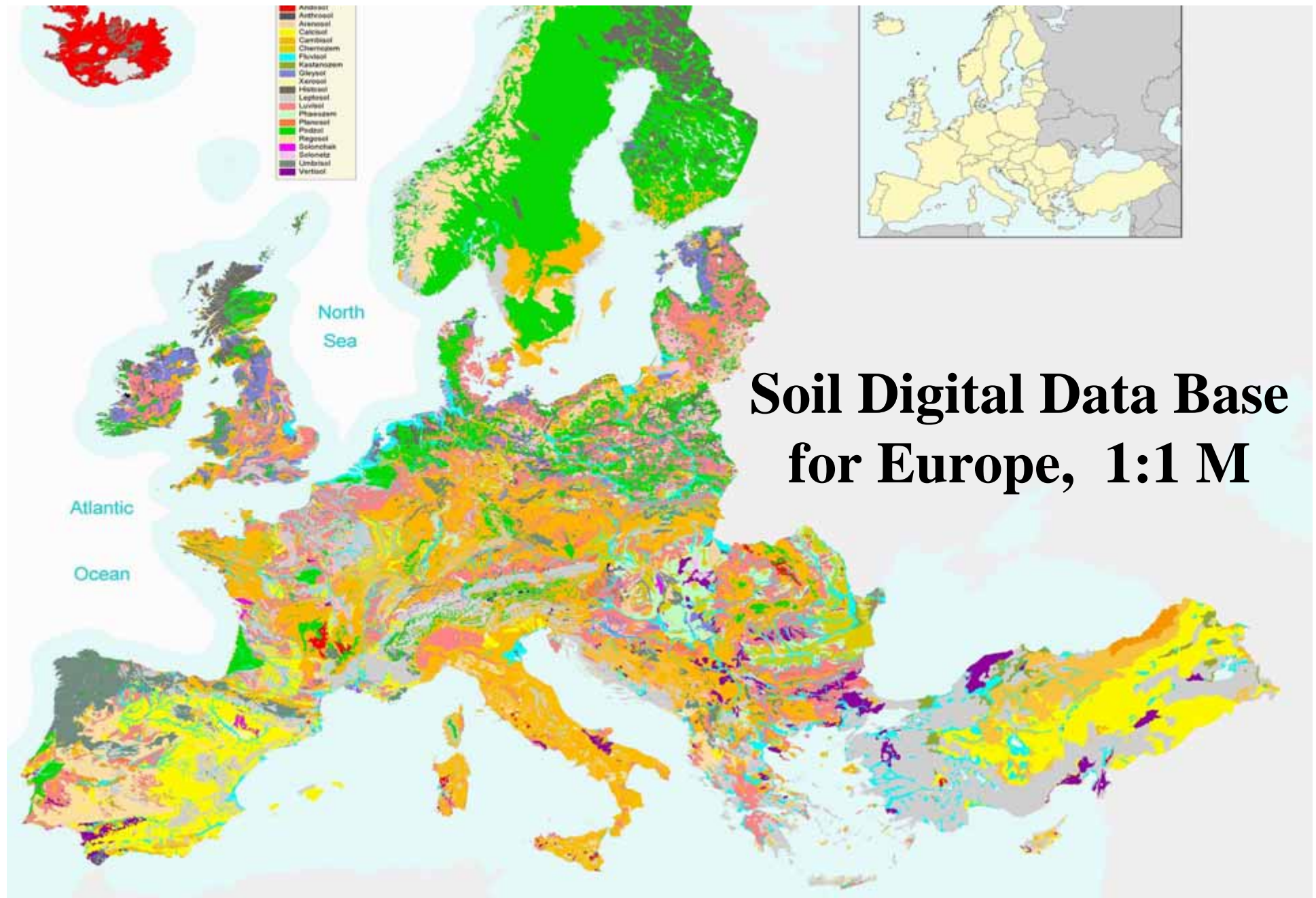
Is that a problem?

- ✿ Any science needs a consistent and precise terminology.
- ✿ The lack of consistency makes correlation difficult.
- ✿ Other disciplines have difficulty using our information.
- ✿ Respect from other disciplines?
- ✿ Confusions in teaching soil classification.

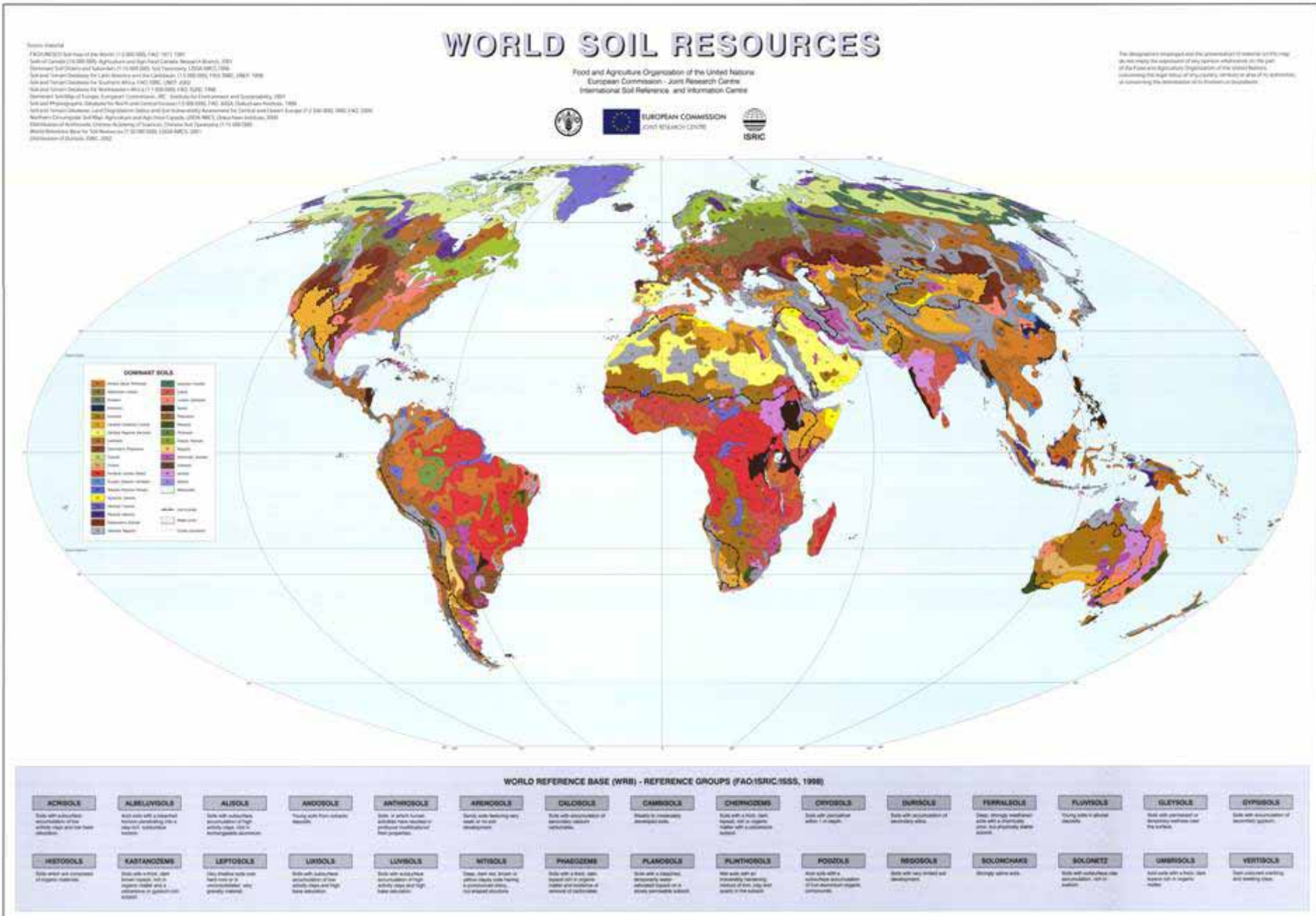
The World Reference Base for Soil Resources (WRB)

- ✿ In 1998 the International Union of Soil Science endorsed the WRB as the recommended soil correlation system for all soil scientists.
- ✿ The European Commission selected WRB as correlation scheme for harmonized soil maps and databases for Europe.

The 1st official maps published with WRB units (1)



The 1st official maps published with WRB units (2)



The WRB is designed as...

- ✿ an *easy means of communication* among scientists to identify, characterize and name major types of soils.
- ✿ It is not meant to replace national soil classification systems, but be a tool for better *correlation between national systems*.
- ✿ It aims to *help in improving national systems*.

Current structure and principles....1

- ✿ The taxonomic units of the WRB are based on *diagnostic (reference) horizons, soil properties and/or soil materials*.
- ✿ First level: ***30 Reference Soil Groups*** (defined by key).
- ✿ Lower levels are defined by sets of prefixes as unique *qualifiers* added to the reference soil groups.

Current structure and principles...2

- ✿ **Qualifiers** are listed in priority sequence for each reference soil group.
- ✿ Two qualifiers may be used in soil unit names. If additional qualifiers are needed, those follow the Reference Soil Group name between brackets.
- ✿ e.g.: *Sapri-Cryic Histosol (Dystric)*

The 30 Reference Soil Groups

HISTOSOLS	PLINTHOSOLS	ALBELUVISOLS
CRYOSOLS	FERRALSOLS	ALISOLS
ANTHROSOLS	SOLONETZ	NITISOLS
LEPTOSOLS	PLANOSOLS	ACRISOLS
VERTISOLS	CHERNOZEMS	LUVISOLS
FLUVISOLS	KASTANOZEMS	LIXISOLS
SOLOCHAKS	PHAEZEMS	UMBRISOLS
GLEYSOLS	GYPSISOLS	CAMBISOLS
ANDOSOLS	DURISOLS	ARENOSOLS
PODZOLS	CALCISOLS	REGOSOLS

Histic or Folic horizon > 40 cm deep

yes
→

HISTOSOLS

↓ **no**

Cryic horizon

yes
→

CRYOSOLS

↓ **no**

Human modifications

yes
→

ANTHROSOLS

↓ **no**

Depth < 25 cm

yes
→

LEPTOSOLS

↓ **no**

> 35% clay, vertic horizon

yes
→

VERTISOLS

↓ **no**

Fluvic materials

yes
→

FLUVISOLS

↓ **no**

Salic horizon

yes
→

SOLONCHAKS

↓ **no**

Gleyic properties

yes
→

GLEYSOLS

↓ **no**

Andic or vitric horizon

yes
→

ANDOSOLS

↓ **no**

Spodic horizon

yes
→

PODZOLS

The 30 Reference Soil Groups

HISTOSOLS	PLINTHOSOLS	ALBELUVISOLS
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ANDOSOLS	DURISOLS	ARENOSOLS
PODZOLS	CALCISOLS	REGOSOLS

HISTOSOLS	CRYOSOLS	ANTHROSOLS	LEPTOSOLS	VERTISOLS
Cryic	Histic	Hydragric	Lithic	Thionic
Glacic	Lithic	Irragric	Gleyic	Salic
Salic	Leptic	Terric	Rendzic	Natric
Gelic	Turbic	Plaggic	Umbric	Gypsic
Thionic	Salic	Hortic	Yermic	Duric
Folic	Natric	Gleyic	Aricic	Calcic
Fibric	Gleyic	Stagnic	Vertic	Alic
Sapric	Andic	Spodic	Gelic	Gypsiric
Ombric	Mollic	Ferralic	Hyperskeletal	Pellic
Rheic	Gypsic	Luvic	Mollic	Grumic
Alcalic	Calcic	Arenic	Humic	Mazic
Toxic	Umbric	Regic	Gypsiric	Chromic
Dystric	Yermic		Calcaric	Mesotrophic
Eutric	Aridic		Dystric	Hyposodic
	Glacic		Eutric	Eutric
	Thionic		Haplic	Haplic
	Oxyaquic			
	Stagnic			
	Haplic			

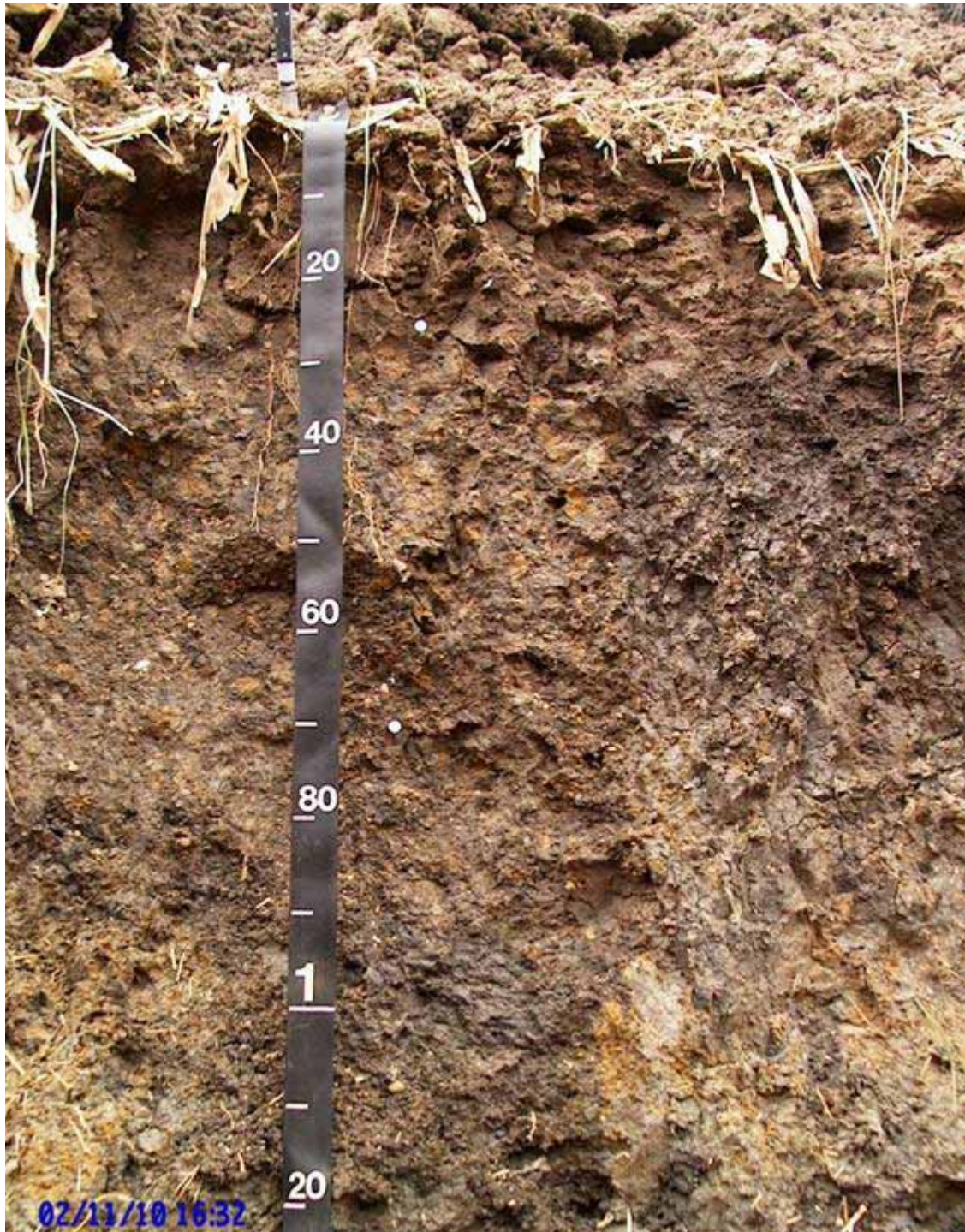
Sapri-Cryic Histosol (Dystric)

Correlation problems

Example



Southern Indiana Soils-Geomorphology Tour,
9-10 November, 2002.



Cyclone

Soil Taxonomy:

Mollic epipedon

Aquic moisture regime

Argillic horizon

WRB:

Mollic horizon

Stagnic properties

Argic horizon

PHAEOZEMS

Chernic

Leptic

Vertic

Gleyic

Vitric

Andic

Luvic

Tephric

Stagnic

Abruptic

Greyic

Pachic

Glossic

Calcaric

Albic

Skeletal

Sodic

Siltic

Vermic

Dystric

Chromic

Haplic

having an *argic* horizon, with CEC equal to or greater than $24 \text{ cmol}(+) \text{ kg}^{-1}$ clay and BS% of 50 or more to a depth of 100 cm from the soil surface.

having *stagnic* properties within 50 cm from the soil surface.

Stagnic Luvic Phaeozem

Cyclone

**Soil Taxonomy:
Typic Argiaquoll**

**WRB:
Stagnic Luvic Phaeozem**

Soil Taxonomy:

Mollic epipedon

Aquic moisture regime

Argillic horizon

WRB:

Mollic horizon

Stagnic properties

Argic horizon

Differences in the diagnostic criteria

Differences (?) in the concept

☀ **ST - Argillic Horizon**

An argillic horizon is normally a subsurface horizon with a significantly higher percentage of phyllosilicate clay than the overlying soil material. It shows evidence of clay illuviation.

☀ **WRB - Argic horizon**

The argic horizon is a subsurface horizon which has a distinctly higher clay content than the overlying horizon. The textural differentiation may be caused by an illuvial accumulation of clay, **OR** by predominant pedogenetic formation of clay in the subsoil, destruction of clay in the surface horizon, or by selective surface erosion of clay, by biological activity, or by a combination of two or more of these different processes.

ST

Textural differentiation in soils with argillic horizons results from one or more processes acting simultaneously or sequentially, affecting surface horizons, subsurface horizons, or both. Not all of the processes are completely understood. The ones thought to be most important are summarized in the following paragraphs

Clay eluviation and illuviation.

Clay dissolution in the epipedon.

Selective erosion.

In situ clay formation.

Clay destruction in a subsurface horizon

Regardless of the process responsible for textural differentiation, clay illuviation in one form or another is common to all argillic horizons.



ST

Mollic epipedon

Aquic moisture regime

Natric horizon



Natraquoll

WRB

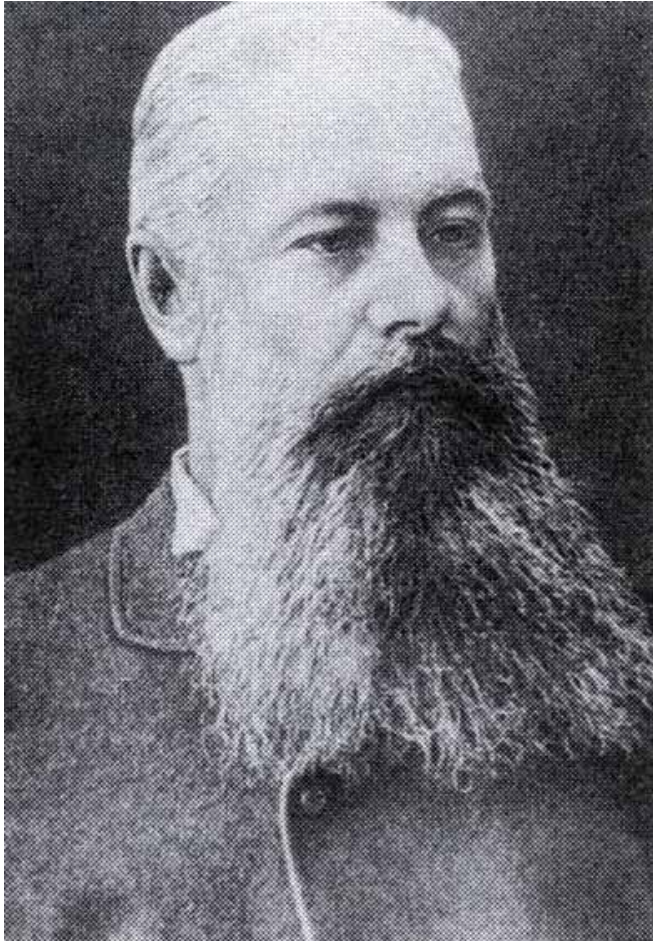
Mollic horizon

Gleyic properties

Natric horizon



Molli-Gleyic Solonetz



“ The name Podzols is given to by no means identical or even similar formations so that discussing the problem of these soils it is probably best to consider them historically and to take account of factual data...”

Dokuchaev, 1879

History

1960

Publication of the 7th approximation of USDA Soil Taxonomy (USDA, 1960)

Decision by the International Soil Science Society to compile the World Soil Map (ISSS Congress, Wisconsin, 1960) →

Development of the FAO legend (FAO, 1968)

Major causes of problems

- ✿ FAO (later the WRB) adopted some terms from ST, but gave different definitions and/or criteria.
- ✿ In WRB several terms were modified compared to the FAO terms.
- ✿ Some of the terms that had been adopted without change in the WRB were later modified in ST.
- ✿ Some terms in ST are used differently at the various taxonomic levels.
- ✿ Some terms and definitions need to be reviewed in both systems.

**„Good” example
for harmonized changes**

Intergrades of
Cambisols (Inceptisols)
and Podzols (Spodosols):

Soils having a B horizon with high concentration of aluminium in the soil solution, weak sesquioxide translocation without organic matter traslocation, fluffy structure, ochre yellow colour.

NOT satisfying the requirements of spodic horizons.

Dystri-endoskeletal Cambisol



☀ **ST: Spodic Subgroups:**

- ✓ „..having B horizon 5 cm or more thick with a base saturation of less than 50% and:
- ✓ **or** Al plus $\frac{1}{2}$ Fe percentages totalling 0.25% or more and half that amount or less in an overlying umbric, ochric, albic or anthropogenic horizon
- ✓ **or** an ODOE value of 0.12 or more and a value half in an overlying horizon”

☀ **WRB:** Introducing **sesquic qualifier** with same criteria → **correlates with ST spodic modifier**

☀ → Sesquic Cambisols

Conclusion

- Harmonization of basic terminology is needed and has to be carried out to the extent possible.

Suggestions

- ✿ Joint committee from ST and WRB (from national systems?) should be established to explore the ways and extent of harmonization.
- ✿ In meetings and fieldtrips with international participation both ST and WRB should be used.
- ✿ That is strongly recommended for the planning of fieldtrips of the 8th WCSS.