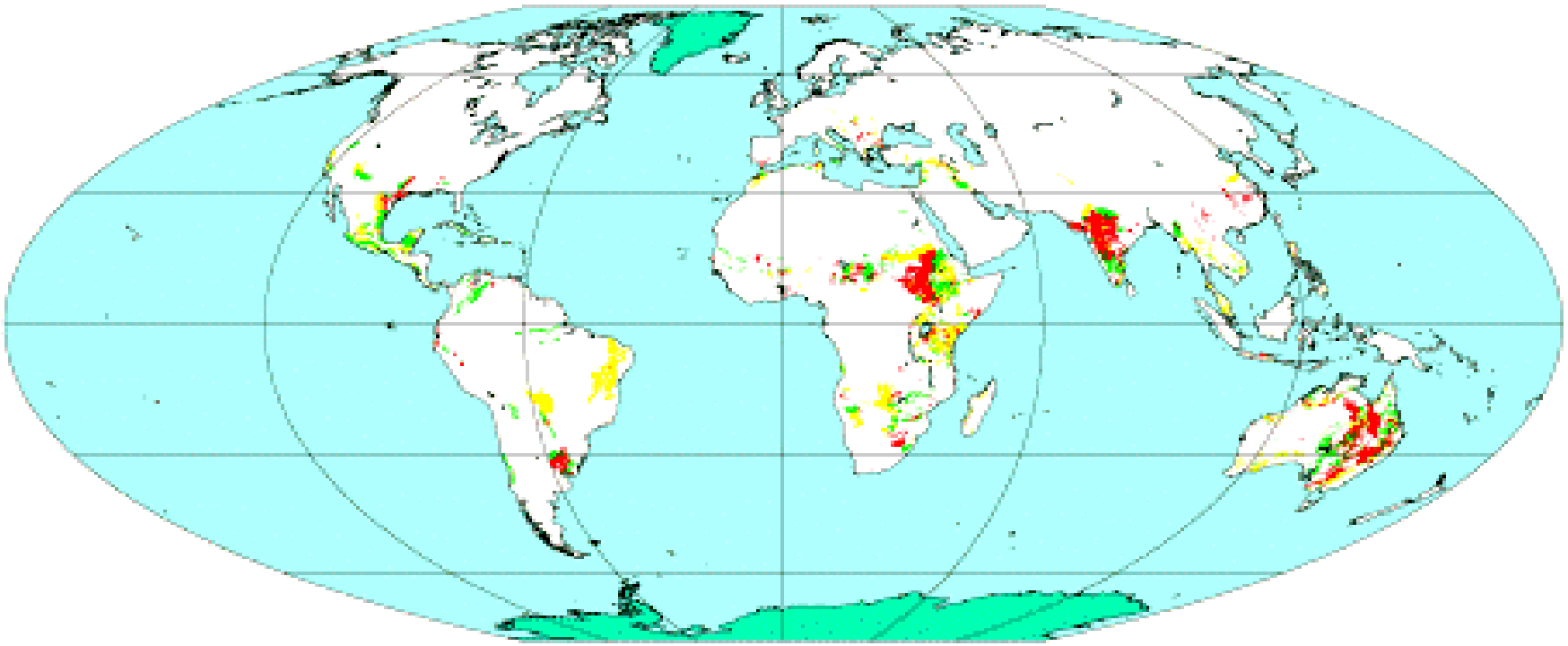
VERTISOLS


VERTISOLS
Churning heavy clay soils;
from L. vertere, to turn.

VERTISOLS

- Soil materials whose properties are dominated by an abundance of expanding 2:1 lattice clays are associated with specific soils that show signs of **seasonal swelling (wet) and shrinking (dry).**
- Such soils can occur in many landscape elements.
    1. (Former) sedimentary lowlands,
    2. Denudation plains on Ca-, Mg- and Na-rich parent rock, and
    3. Erosive uplands with limestone, claystone, marls or shale.

VERTISOLS



Dominant
Associated
Inclusions
Miscelanneous lands
(Inland waterbodies, Glaciers, No data)

Flat Polar Quartic Projection

FAO-GIS, February 1998

Definition of Vertisols

Soils having

1. **a vertic horizon within 100 cm** from the soil surface, **and**
2. **30 % or more clay** in all horizons **to a depth of 100 cm** or more, **or** to a contrasting layer between 50 and 100 cm (e.g. a lithic or paralithic contact, petrocalcic, petroduric or petrogypsic horizons, or a sedimentary discontinuity), and
3. **cracks**, which open and close periodically.

Vertic horizon

A *vertic* horizon must:

- 1. contain **30 percent or more clay** throughout; ***and***
- 2. have **wedge-shaped or parallelepiped structural aggregates** with the longitudinal axis tilted between 10^{o} and 60^{o} from the horizontal; ***and***
- 3. have **intersecting slickensides** ; ***and***
- 4. have a **thickness of 25 cm** or more.


> 30% Swelling clays


Cracks


wedge-shaped
structural aggregates


IN.
CM.
intersecting slickensides

Genesis of Vertisols

- **Formation of smectite-rich parent material**
- **Wet and dry periods**

↓

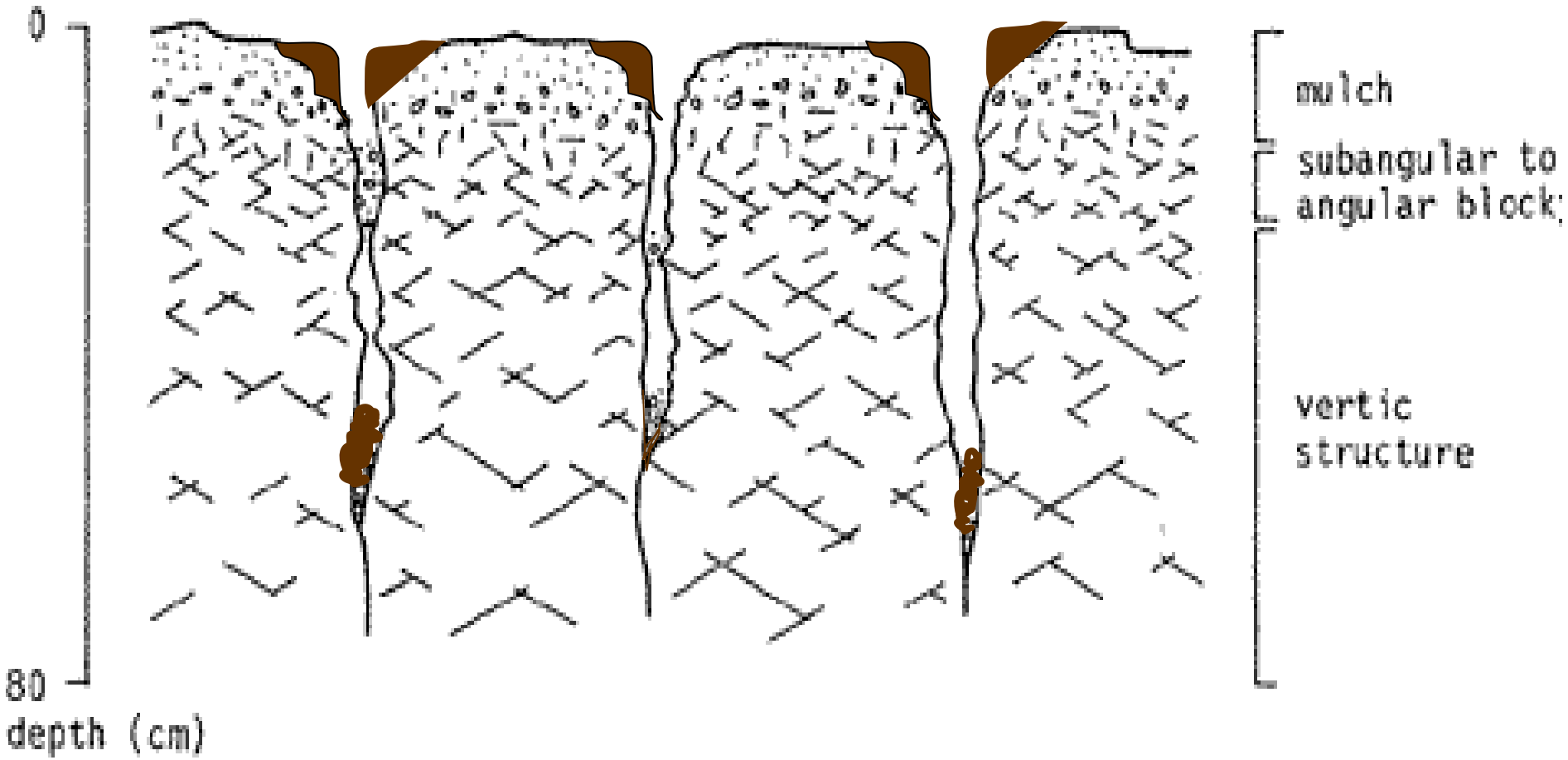
Shrinking ↔ Swelling

Cracking

Development of shear forces →

Slickensides

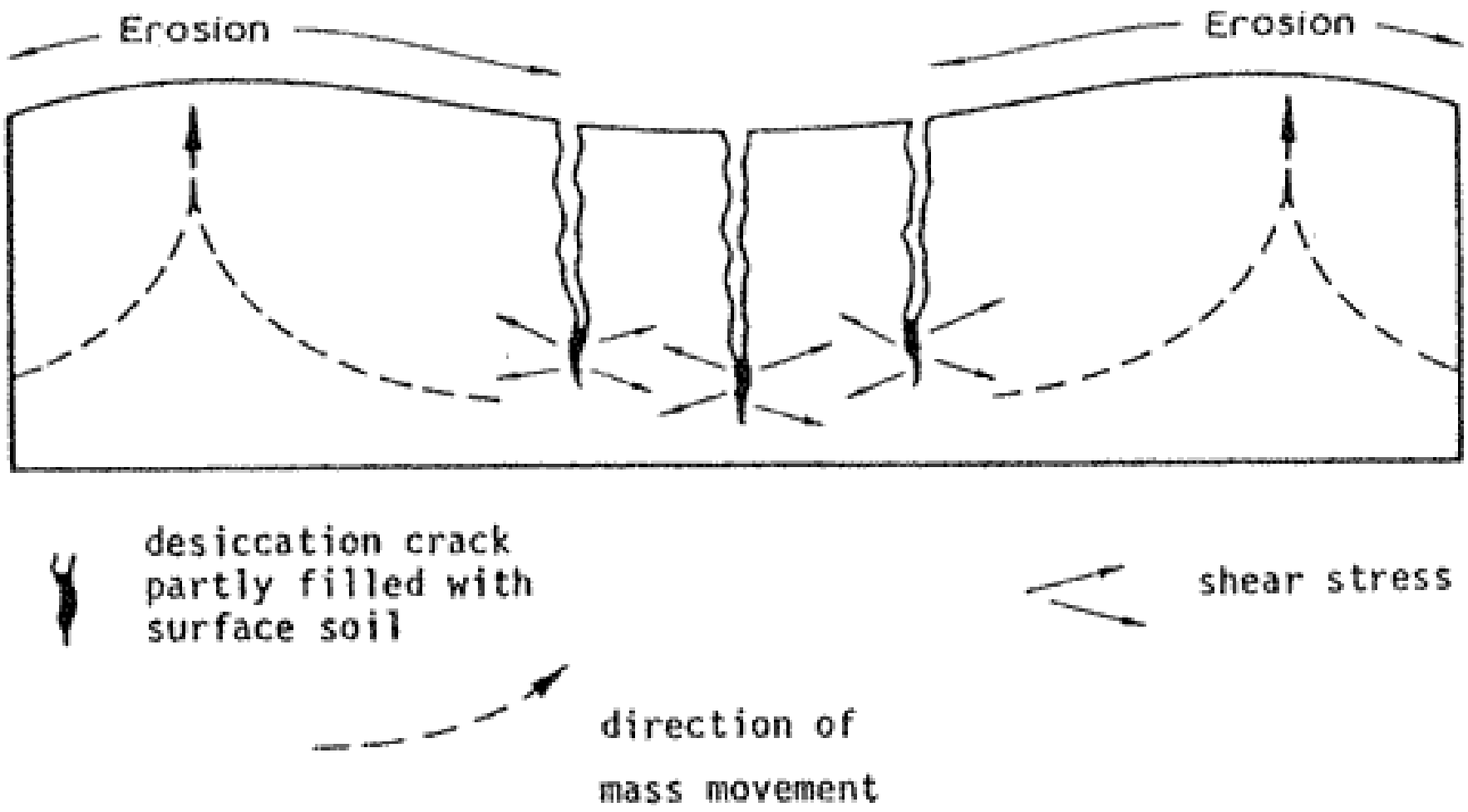
Gilgai relief



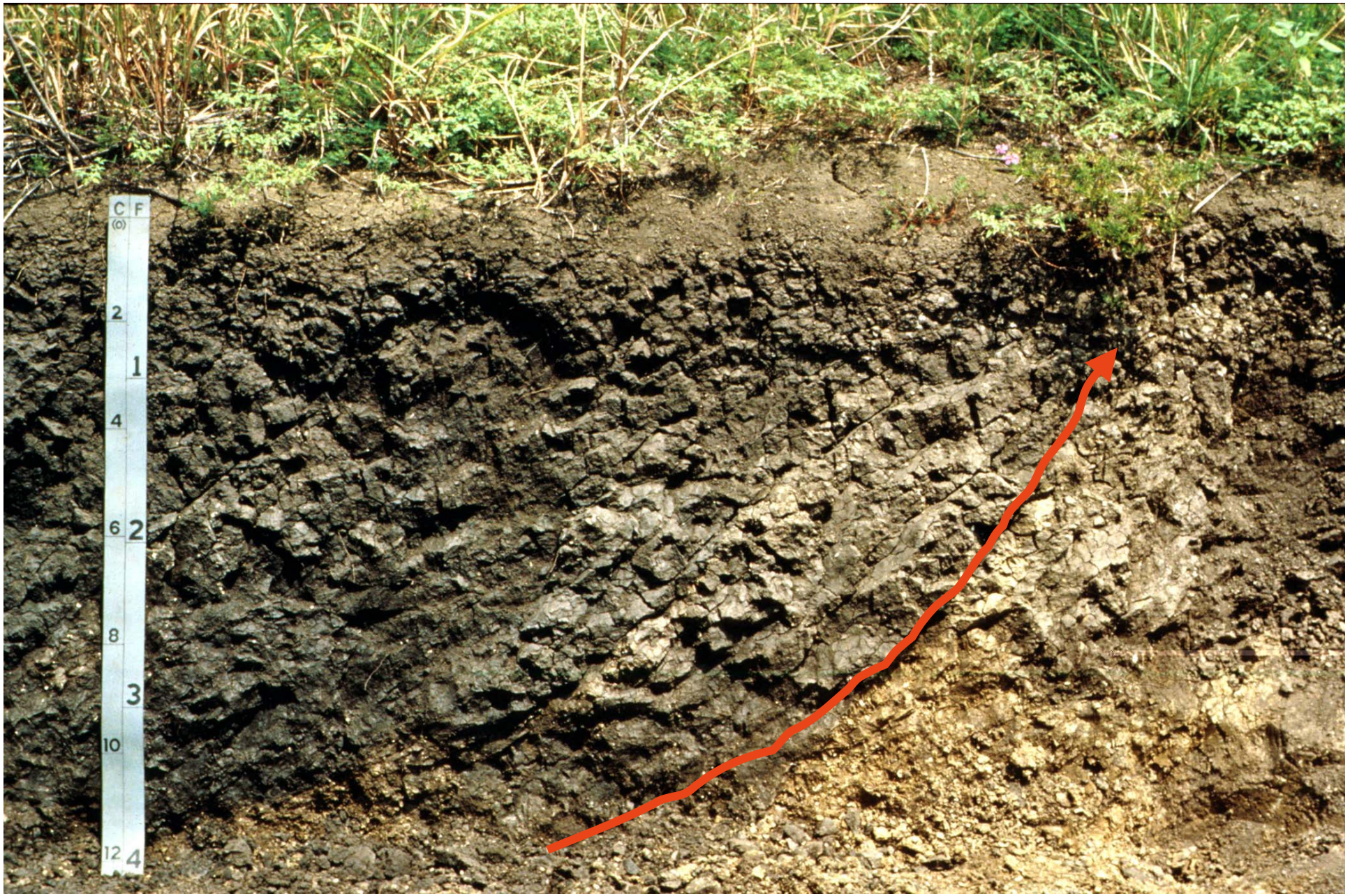
Wet and dry periods

↓

Shrinking ↔ Swelling



Development of shear force



Development of shear forces → Slickensides

Development of shear forces → Slickensides

Bowl shape formations

Gilgai relief

Use of Vertisols:

Vertisols become very hard in the dry season and are sticky in the wet season.

Tillage is difficult, except for a short period at the transition between the wet and dry seasons.

Vertisols are productive soils if properly managed (High CEC, high moisture storage)

Example

Analytical data

Genetic layer	Depth (cm)	pH H_2O	OC (%)	$CaCO_3$ (%)	CEC meq/100g	B%	% Clay <0.002	BD (g cm^{-3})
Ap	0-25	6.8	2.1	0	36.2	82	44.6	1.32
ABssg	30-55	7.6	1.3	0.5	39.1	94	45.0	1.41
Bssk	55-85	8.1	-	15.3	38.4	100	45.7	1.49
Cg	85-	8.1	-	7.3	28.9	100	40.9	1.49

VERTISOLS

Thionic
Salic
Natric
Gypsic
Duric
Calcic
Alic
Gypsiric
Grumic
Mazic
Mesotrophic
Hyposodic
Eutric
Pellic
Chromic
Haplic

Having a *calcic* horizon or concentrations of *secondary carbonates*, between 50 and 100 cm from the soil surface.

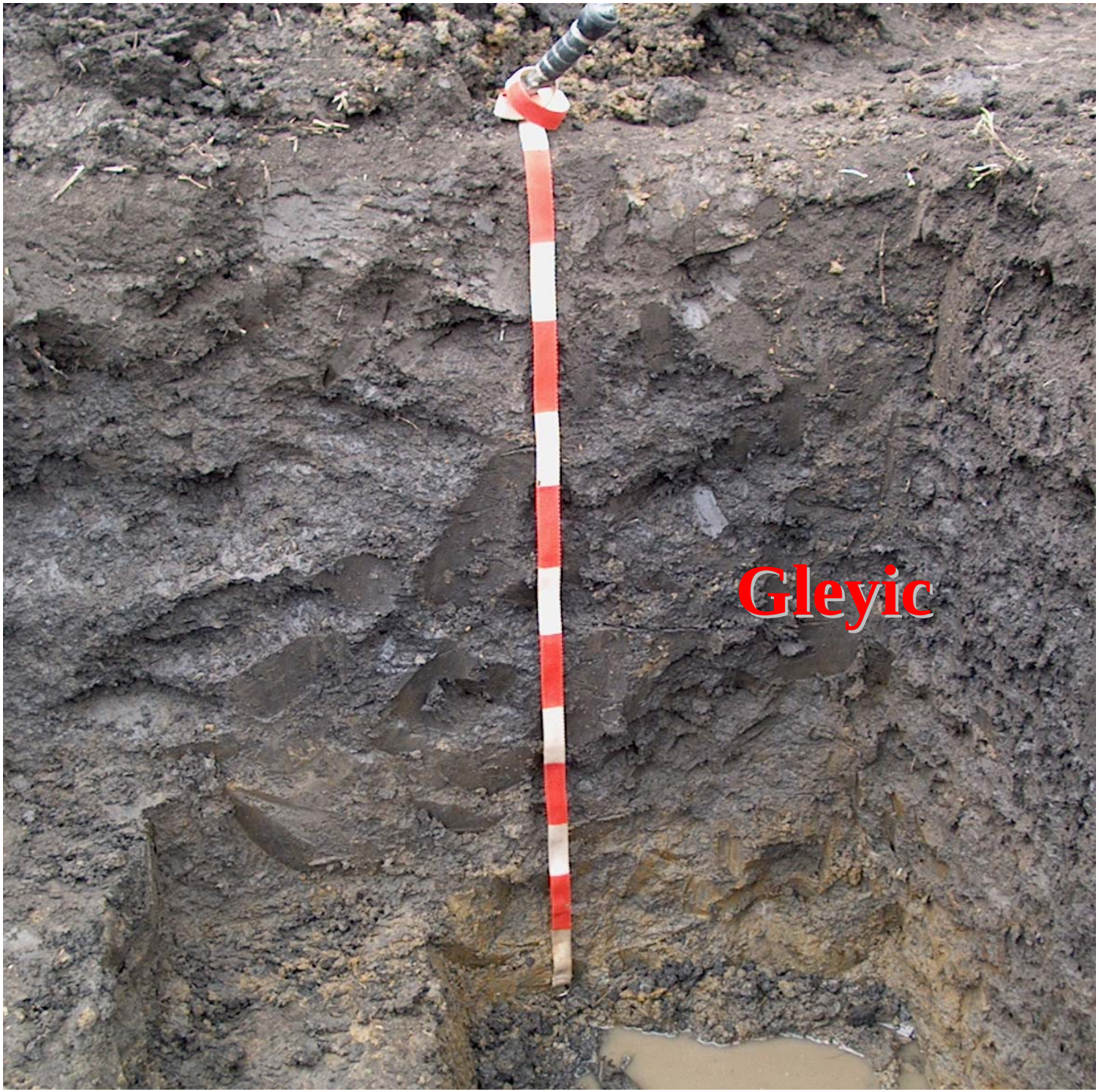
Having a surface layer with >3 cm with a strong structure finer than very coarse granular

At least between 20 and 100 cm from the soil surface, a B% of 50 percent or more.

Munsell value of 3.5 or less and a chroma of 1.5 or less in the upper 30 cm

Gleyic?

Grumi-Calcic Vertisol (Pellic, Gleyic?)


Gleyic


Grumic

Common soil units:

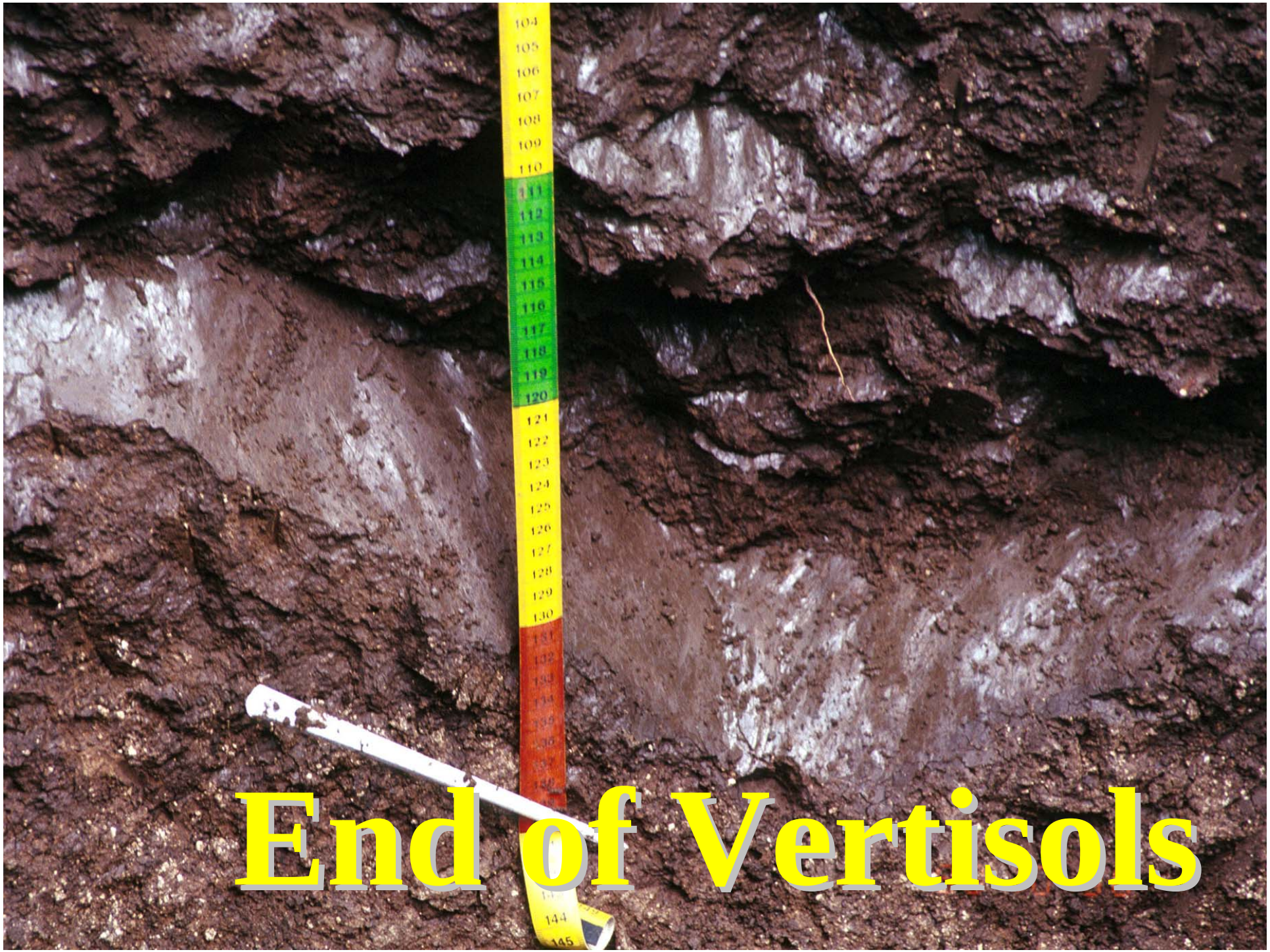
Thionic, Salic, Natric, Gypsic, Duric, Calcic, Alic, Gypsiric, Grumic, Mazic

Associations with other Reference Soil Groups:

Vertic units of other Reference groups : having, within 100 cm from the soil surface, a *vertic* horizon or *vertic* properties.

VERTIC PROPERTIES

- After the upper 20 cm are mixed, **30 % or more clay throughout upper 50 cm**, ***and***
- **intersecting slickensides**, ***and/or***
- **cracks,** which open and close periodically, extend **down to 50** cm from the soil surface or deeper and are **1cm** or more **wide** at the surface.


End of Vertisols