

A. **Types:** Complex with upper left mainly crumb and granular; lower right mainly spongy, weakly to moderately developed subangular blocky and platy.

B. **Peds:** Four types with intergrades -

(a) Crumbs; moderately developed on average (weakly to strongly); 15% of area; mainly 0.2 to 2mm; generally rough surfaces; random distribution (occur as individuals and fused crumbs).

(b) Granules; moderately developed (range from weakly to strongly) 15% of area; 0.2 to 2mm; mainly rough, some smooth; random distribution.

(c) Subangular blocks; weakly to moderately developed; 10% of area; usually 2-5mm (narrow dimension); undulating to rugose; long dimension tends to be horizontal.

(d) Platy; moderately developed; 7% of area; 0.5 to 1mm wide by 12-15mm; undulating surfaces; moderately accommodated; parallel, to 20% inclined to surface.

C. **Voids:** Total porosity <30µm approx. 50%.

I. **Inter-aggregate Voids**

(a) Compound packing voids between crumbs, granules and plant fragments; wide range of sizes from 20 to 500µm; irregular shapes; 25% of area; mainly rough walls; random arrangement.

(b) Planar voids separating and partly separating platy and subangular blocky peds; 0.1 to 0.3mm wide and up to 20mm long; 5% of area; undulating walls; mainly horizontal to inclined but all orientations occur.

(c) Channels; definite channels, some with intact roots, others partly filled with debris; round to elongated; 0.3 to 4mm; 2% of area; walls undulating to rough; random distribution and orientation. (A large area near the top of the section was probably a channel; it was loosely occupied by plant debris and aggregates, and voids were considered as packing voids).

(d) Vughs; irregular shaped, more-or-less equant; 0.1 to 0.5mm; 8% of area; rough walls; random; interconnected (channel-vugh distinction is not obvious).

II. **Intra-aggregate Voids**

Packing voids between partially fused aggregates within peds and between grains in peds; irregular shapes; range of sizes up to 0.1mm; 10% of area.

2. **Basic mineral components**

Coarse/fine limit at 10µm; ratio of 75:25.

A. **Coarse fraction**

(a) **Single mineral grains** - all are randomly distributed; **Quartz**, approx. 80%; wide range of sizes 10-800µm; poorly sorted; mainly <200µm; inclusions common; mainly angular and subangular; **Feldspars**, approx. 10%; mainly plagioclases; similar sizes and shapes to quartz; fresh to weakly altered. A wide range of other mineral grains occur: green and brown hornblende, pyroxene (some grains with weathering rim), mica (largely muscovite) together with garnet, chlorite and some opaques; these grains are similar in size range and shape to quartz; mainly fresh to weakly weathered.

(b) **Compound grains** - these account for approximately 10% of the coarse fraction; they range in size from <1 to 8mm; the rock fragments include weakly to moderately metamorphosed granitic fragments and more basic metamorphosed fragments; major minerals in the former are quartz, K feldspar (moderately sericitized), some mica; in the more basic fragments are quartz, feldspar, chlorite, hornblende, pyroxenes, biotite; the ferro-magnesian grains are fresh to moderately altered; feldspars in rock fragments are more strongly altered than individual feldspar

grains.

B. **Fine fraction**

Most of the fine silt and clay is speckled brown in plain light due presumably to impregnation with organic-rich material. The fine material is isotropic.

3. **Basic organic components**

Coarse/fine limit at 10µm.

A. **Coarse fraction** - occupies 5% of area.

Plant residues (no animal, etc. seen): root sections ranging from <0.5 to 6mm diameter; some are living root sections with all cells visible, others have only dark brown to black cell walls remaining; leaf tissue fragments (no highly resistant cell wall); brown material, some birefringent, some isotropic, with cells at various stages of disintegration; sizes of fragments range widely, <0.1mm to >1cm long; common black mycorrhizal mantles with fungal hyphae, with a range of sizes; sclerotia and fragments thereof, relatively common (fungal debris is common); rare black fragments (charcoal?) up to 0.3mm.

B. **Fine material**

Occurs mainly as a component of micromass which it impregnates; small areas of fine organic segregations are described under Pedofeatures; fine material is yellow-brown to reddish-brown and isotropic; fragments of hyphae occur commonly.

4. **Groundmass**

c/f limit at 10µm; ratio of 75:25.

Undifferentiated b-fabric.

Fine material occurs as:

(a) partial to complete coats on grains, mainly within porous aggregates of a range of sizes and shapes.

(b) bridges between grains in aggregates.

(c) aggregates in intergranular space.

Complex c/f related distribution patterns of chitonic-gefuric with minor enaulic and single spaced porphyric.

5. **Pedofeatures**

**Textural** - Silt and clay (minor very fine sand) coatings on rock fragments and some sand grains; the coating is usually on only one or two sides but some grains are completely coated; no particular side is preferentially coated; coatings are single spaced porphyric with very low porosity and speckled b-fabric; thickness ranges from 0.7mm to <0.1mm; colour is greyer than micromass generally; these coatings occupy <1% of the area of the section.

**Amorphous** - Brown, speckled, randomly distributed isotropic nodules (organic rich) occupy approx. 1% of area; sizes range from 10-200µm; shapes are rounded to irregular; also rarer black, presumably organic, nodules.

**Fabric** - upper parts of a few plates and blocky peds have closer packed fabric than the ped generally; the thickness of this feature is 0.1 to 0.2mm.

Described by: J.A. McKeague,

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### *Aeric Ochraqualf*

GENERAL:

**Code Number:** 74252

**Location:** Heumen II, East Netherlands.

**Horizon:** Btg.

**Depth:** 50-65cm.

**References:** Miedema R., van Engelen, E. and Pape, Th., 1978. Micromorphology of a toposequence of Late Pleistocene fluvial soils in the eastern part of the Netherlands. In: M. Delgado (Ed), *Micromorfologia de Suelos*, Universidad de Granada, Spain, pp. 107-113.

## THIN SECTION DESCRIPTION (See Figure 4c).

## 1. Microstructure

Weakly developed medium (sub) angular blocky with undulating irregular ped faces partially accommodated with incompletely separated planar voids; size range of peds is considerable (500 $\mu$ m - 5mm); some parts show a vughy, channel or chamber microstructure, others a massive microstructure.

Interaggregate pores consist of few smooth planar voids and common irregular vughy to planar voids; their width is generally about 200 $\mu$ m with some up to 2mm; intra-aggregate pores consist of channels as dominant mesovoids; some partially infilled large trans-aggregate channels up to some mm. occur; all voids occur randomly distributed, the smaller ones have smooth regular walls whereas the larger ones have irregularly shaped walls. Total estimated porosity: 10-15%.

## 2. Basic Mineral Components

c/f limit at 5 $\mu$ m; c/f ratio 60:40.

**Coarse mineral components (>5 $\mu$ m):** Dominantly rounded to angular, poorly sorted single mineral grains with variable sphericity; composition dominated by quartz with commonly occurring, generally weakly weathered, feldspars (orthoclase and plagioclase) and acicular micas; heavy minerals are rare.

**Compound mineral grains and rock fragments are few;** they include medium- and coarse-sand sized chert fragments, polycrystalline quartz and quartz-rich metamorphic rocks, and seldomly volcanic fragments.

**Fine mineral material (<5 $\mu$ m):** This consists of strongly speckled and dotted clay with fine, often micaceous, silt and iron oxides with a strongly variable degree of impregnation giving colours ranging from grey to brownish red.

## 3. Basic Organic Components

These form a very minor part of the thin section.

**Organic coarse material (>10 $\mu$ m):** Very few intact plant root residues, part of which are impregnated with iron oxides, some epidermis remnants of plant roots and some dark coloured cell lumina.

**Organic fine material (<10 $\mu$ m):** In the bottom part of the thin section organic fine material is found in relatively unsorted textural pedofeatures as punctuations and organic pigment; apart from this occurrence the ground mass has no organic fine material.

## 4. Groundmass

The thin section shows a complex well developed striated b-fabric with grano-, mono-, random- and porostriated partial fabrics which are medium and thick continuous and 30-300 $\mu$ m long; locally strial partial b-fabrics occur whilst other parts show an undifferentiated partial b-fabric.

The ground mass shows a very clear single and double spaced porphyric c/f related distribution.

## 5. Pedofeatures

**Textural pedofeatures:** (a) About 4-7% undifferentiated, sometimes microlaminated, limpid and speckled clay coatings and derived intrapedal clay concentrations (quasi-coatings, infillings and fragments of coatings); the thickness and sizes of these features range from 50-200 $\mu$ m.

(b) About 1-2% of impure clay and silty clay coatings thickness ranging from 100-500 $\mu$ m.

(c) About 1-4% grey coloured, usually laminated, coatings or infillings of clay and silt and fine sand with a thickness of 500-1000 $\mu$ m occurring in large channels and vughs; some contain some organic fine material as pale brownish pigmentation agent.

**Depletion pedofeatures:** About 5-10% grey hypo-coatings, 200-2000 $\mu$ m thick, and mottles of variable size depleted of iron oxides; these features are normally

associated with planar voids and channels; boundaries with adjacent ground mass are normally very sharp and with prominent contrast; depletion of iron oxides is also present in textural pedofeatures.

## 6. Cryptocrystalline and amorphous pedofeatures

Mottles of iron and iron-manganese oxyhydrates occur in many forms normally as impregnative features; the most commonly occurring types are hypo-, quasi-coatings and nodules; the boundaries are very sharp to diffuse with prominent to weak contrast; units of ground mass with clearly different iron oxide impregnation create a (strongly) mottled appearance.

## Excrement pedofeatures

In some channels smooth orthic mineral excrements about 200 $\mu$ m in size are found; densely packed aggregated excrements of about 500 $\mu$ m size observed in an infilled worm channel.

Described by: R. Miedema,  
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*Dystrochreptic Fraguidalf*

## GENERAL:

**Code Name:** I.N.A.P-G 1983;

**Location:** Normandy, France;

**Horizon:** A3/b Cambic;

**Depth:** 35-55cm.

**References:** Chauvet E. (1984). Contribution a l'etude de la degradation des sols: caracterisation et evolution, sans l'influence de contraintes hydriques, de la structure micro-agregée d'un sol acide. Thèse de Docteur-Ingenieur, I.N.A.P.G.

## THIN SECTION DESCRIPTION (See Figure 4d).

## 1. Microstructure

**Types:** crumb - granulat; spongy aspect.

**Aggregates** are (a) granules; strongly to moderately developed; 50-150 $\mu$ m, ultra fine; 60%; undulating to rough; unaccommodated; random to clustered; unreferrred in channels.

(b) crumbs; moderately (ultrafine) to weakly (fine) developed; 40%; 250- 2000 $\mu$ m, ultrafine to fine; undulating to rough; unaccommodated; random, unreferrred.

**VOIDS** are (a) loose compound packing voids; 50-100 $\mu$ m; 30%; moderately serrate; unoriented; random; unreferrred.

(b) interconnected vughs; very irregular; 200 $\mu$ m-2mm; 45%; moderately serrate; unoriented; random; unreferrred.

(c) channels; round to elongated; regular; 200 $\mu$ m-2mm; 20%; smooth to moderately serrate; unoriented; random; unreferrred.

(d) intrapedal vughs; polyconvex; 10-20 $\mu$ m; 5%; moderately serrate; unoriented; random; unreferrred.

Total void space: 30%.

## 2. Basic mineral components

c/f limit at 10 $\mu$ m; ratio of 75:25.

**Coarse fraction (a)** quartz: 10-150 $\mu$ m; average 50-100 $\mu$ m; moderately sorted; subangular to elongate; sometimes subrounded; 80%; often undulating extinction; unweathered; sometimes inclusions of mica.

(b) feldspars: orthoclases and plagioclases; 10-100 $\mu$ m; poorly sorted; subrounded with often rough surfaces; 10%; weakly altered; dotted.

(c) Hornblendes/pyroxenes: 2%; quasi-unweathered.

(d) Mica: 10-75 $\mu$ m; platy; moderately weathered, pellicular; yellow birefringence.

(e) Opaques: 0.5%.

(f) Quartzite: 500 $\mu$ m-1cm; 1%; gneiss: 500 $\mu$ m-1cm; 1%; micas and feldspars moderately altered; rare flints.

**Fine fractions:** Clay to fine silt; light yellow (transmitted light) to reddish yellow (oblique incident light); speckled b-fabric.