Identification of the Taxonomic Class of a Soil

5

Abstract

In this chapter, key to soil taxonomy hierarchy of UAE, from order-suborder-great group-subgroups are described. Within the soil order Aridisols, the soil taxa have been described as suborders, great groups and subgroups, such as, Suborders (Salids, Gypsids, Calcids, Cambids), Great Groups (Petrocalcids, Haplocalcids, Petrogypsids, Haplocambids, Calcigypsids, Haplogypsids, Aquisalids, Haplosalids), and Subgroups (Salidic Lithic Haplocalcids, Lithic Haplocalcids, Salidic Haplocalcids, Sodic Haplocalcids, Typic Haplocalcids, Calcic Petrocalcids, Typic Petrocalcids, Sodic Haplocambids, Fluventic Haplocambids, Typic Haplocambids, Lithic Calcigypsids, Salidic Calcigypsids, Typic Calcigypsids, Salidic Lithic Haplogypsids, Lithic Haplogypsids, Salidic Leptic Haplogypsids, Leptic Haplogypsids, Salidic Haplogypsids, Typic Haplogypsids, Salidic Lithic Petrogypsids, Lithic Petrogypsids, Salidic Calcic Petrogypsids, Calcic Petrogypsids, Salidic Petrogypsids, Typic Petrogypsids, Gypsic Lithic Aquisalids, Lithic Aquisalids, Petrogypsic Aquisalids, Anhydritic Aquisalids, Gypsic Aquisalids, Typic Aquisalids, Petrogypsic Lithic Haplosalids, Gypsic Lithic Haplosalids, Calcic Lithic Haplosalids, Lithic Haplosalids, Petrogypsic Haplosalids, Anhydritic Haplosalids, Leptic Gypsic Haplosalids, Gypsic Haplosalids, Calcic Haplosalids, and Typic Haplosalids). Within the order Entisols, the soil taxa have been described as Suborders (Aquents, Psamments, Orthents), Great Groups (Psammaquents, Torriorthents, Torripsamments), Subgroups (Salidic Psammaquents, Salidic Lithic Torriorthents, Lithic Torriorthents, Salidic Torriorthents, Sodic Torriorthents, Typic Torriorthents, Salidic Lithic Torripsamments, Lithic Torripsamments, Oxyaquic Torripsamments, Salidic Torripsamments, Sodic Torripsamments, and Typic Torripsamments).

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Keywords
Soil order • Suborder • Great group • Sub group • Soil taxa

5.1 Introduction

In the United Arab Emirates, Aridisols and Entisols soil orders have been recognized (Soil Survey Staff 2010). Most of the natural desert landscapes are not in use (Fig. 5.1), in places agriculture has been established using smart irrigation systems (Fig. 5.2).

Fig. 5.1 Natural desert landscape with Aridisols (foreground) and Entisols (background)

5.2 Key to Soil Orders

The soils that:

1. Have:
   (a) An aridic soil moisture regime; *and*
   (b) An ochric epipedon; *and*
   (c) One or more of the following within 100 cm of the soil surface: a cambic horizon with a lower depth of 25 cm or more; an anhydritic horizon; a calcic, gypsic, petrocalcic, petrogypsic, or salic horizon; *or*
2. Have a salic horizon; *and*
   (a) Saturation with water in one or more layers within 100 cm of the soil surface for 1 month or more during a normal year; *and*

Fig. 5.2 Typical desert landscape with proper land management and irrigated agriculture

(b) A moisture control section that is dry in some or all parts at some time during normal years.

Aridisols, p. 53

or
Other soils that do not classify as Aridisols.

Entisols, p. 70

5.3 Key to the Suborders of Aridisols

Aridisols that have a salic horizon within 100 cm of the soil surface.

Salids, p. 63

Other Aridisols that have a gypsic or petrogypsic horizon within 100 cm of the soil surface and do not have a petrocalcic horizon overlying these horizons.

Gypsids, p. 57

Other Aridisols that have a calcic or petrocalcic horizon within 100 cm of the soil surface.

Calcids, p. 54

Other Aridisols that have a cambic horizon within 100 cm of the soil surface.

Cambids, p. 56

5.3.1 Calcids

Key to Great Groups
Calcids that have a petrocalcic horizon within 100 cm of the soil surface.

Petrocalcids, p. 55

Other soils that are the most extensive of the Calcids and do not have a petrocalcic horizon with its boundary within 100 cm of the soil surface.

Haplocalcids, p. 54

5.3.1.1 Haplocalcids

Key to Subgroups
Haplocalcids that have both:

1. An ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface: *and*
2. A lithic contact within 50 cm of the soil surface.

Salidic Lithic Haplocalcids

Other Haplocalcids that have a lithic contact within 50 cm of the soil surface (Fig. 5.3).

Lithic Haplocalcids

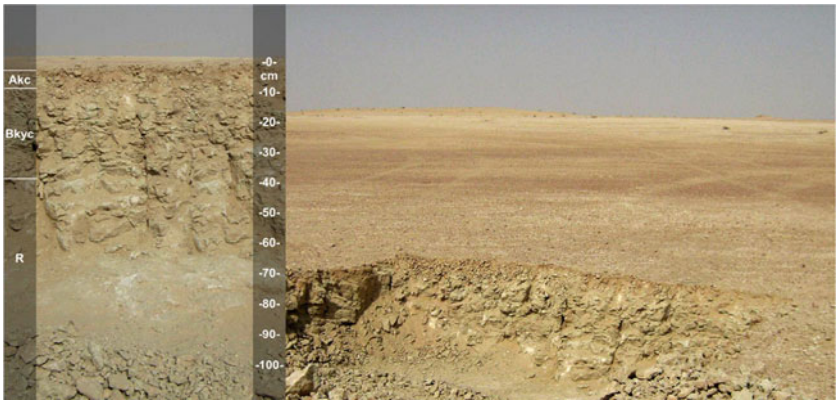

Fig. 5.3 Soilscape showing Lithic Haplocalcids (AD201)

Other Haplocalcids that have an ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface:

Salidic Haplocalcids

Other Haplocalcids that have, in a horizon at least 25 cm thick within 100 cm of the mineral soil surface, an exchangeable sodium percentage of 15 or more (or an SAR of 13 or more) during at least 1 month in normal years.

Sodic Haplocalcids

Other Haplocalcids that have a calcic horizon within 100 cm of the soil surface and lack all other characteristics of any other subsurface horizon (Fig. 5.4).

Typic Haplocalcids

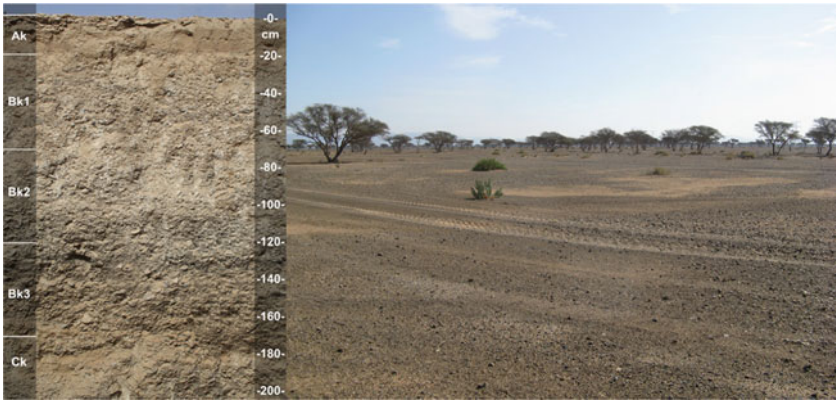

Fig. 5.4 Soilscape showing Typic Haplocalcids (NE015)

5.3.1.2 Petrocalcids

Key to Subgroups

Petrocalcids that have a calcic horizon overlying the petrocalcic horizon.

Calcic Petrocalcids

Other Petrocalcids that have a petrocalcic horizon within 100 cm of the soil surface and lack all other characteristics of any other subsurface horizon (Fig. 5.5).

Typic Petrocalcids

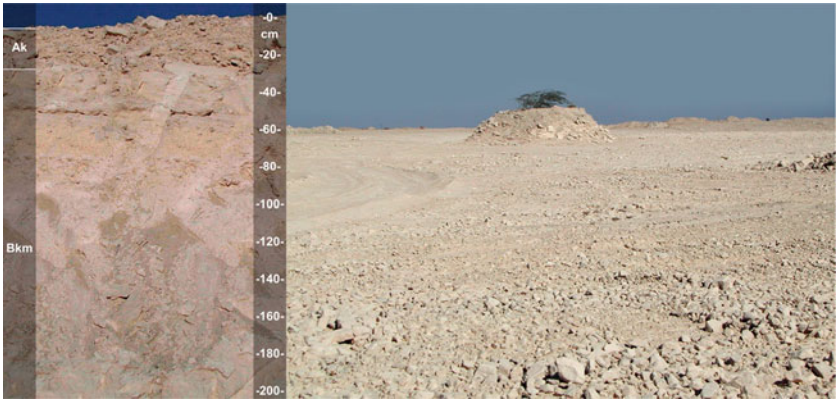

Fig. 5.5 Soilscape showing Typic Petrocalcids (AD106)

5.3.2 Cambids

Key to Great Groups
The soils that are the most extensive of the Cambids and do not have aquic conditions (within 100 cm of soil surface), a duripan or a petrocalcic or petrogypsic horizon within 150 cm of the soil surface, and do not have an anthropic epipedon.

Haplocambids, p. 56

5.3.2.1 Haplocambids

Key to Subgroups
Haplocambids that have, in a horizon at least 25 cm thick within 100 cm of the soil surface, an exchangeable sodium percentage of 15 or more (or an SAR of 13 or more) during at least 1 month in normal years.

Sodic Haplocambids

Other haplocambids that have an irregular decrease in organic-carbon content (Holocene age) between a depth of 25 cm and either a depth of 125 cm below the mineral soil surface or a densic, lithic, or paralithic contact, whichever is shallower.

Fluventic Haplocambids

Other Haplocambids that lack all other characteristics (Fig. 5.6).

Typic Haplocambids

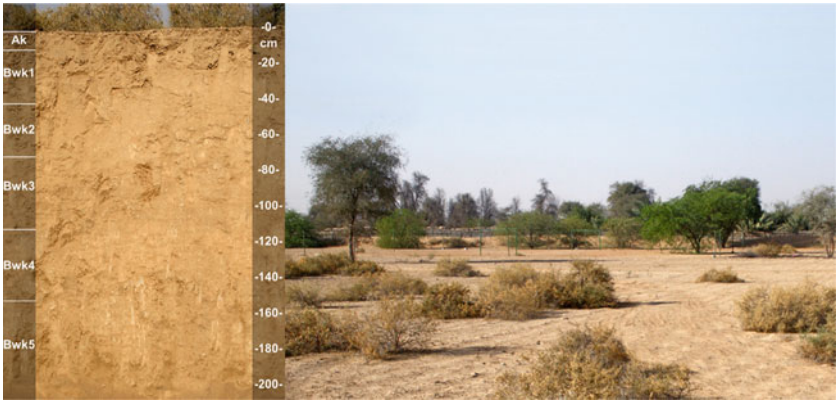

Fig. 5.6 Soilscape showing Typic Haplocambids (NE019)

5.3.3 Gypsids

Key to Great Groups

Gypsids that have a petrogypsic or petrocalcic horizon within 100 cm of the soil surface.

Petrogypsids, p. 61

Other Gypsids that have a calcic horizon within 100 cm of the soil surface.

Calcigypsids, p. 57

Other Gypsids that have only a gypsic horizon within 100 cm of the soil surface.

Haplogypsids, p. 59

5.3.3.1 Calcigypsids

Key to Subgroups

Calcigypsids that have a lithic contact within 50 cm of the soil surface (Fig. 5.7).

Lithic Calcigypsids

Other Calcigypsids that have an ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface (Fig. 5.8).

Salidic Calcigypsids

Fig. 5.7 Soilscape showing Lithic Calcigypsids (AD207)

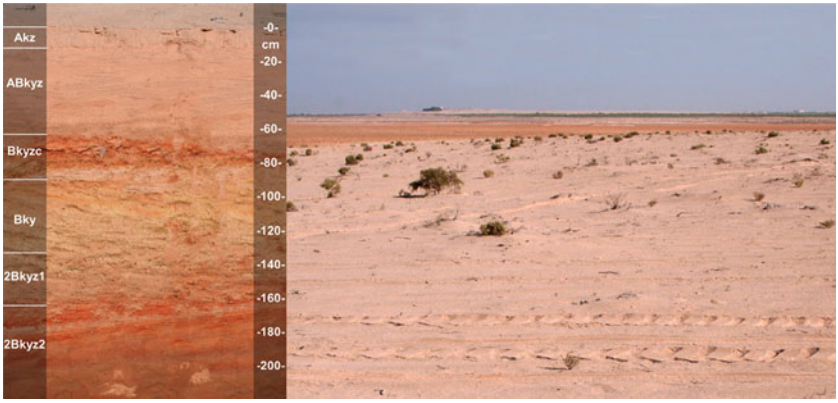

Fig. 5.8 Soilscape showing Salidic Calcigypsids (AD232)

Other Calcigypsids that lack all other diagnostic characteristics. These soils represent the central concept of the great group.

Typic Calcigypsids

5.3.3.2 Haplogypsids

Key to Subgroups
Haplogypsids that have:

1. An ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface: *and*
2. A lithic contact within 50 cm of the soil surface.

Salidic Lithic Haplogypsids

Other Haplogypsids that have a lithic contact within 50 cm of the soil surface (Fig. 5.9).

Lithic Haplogypsids

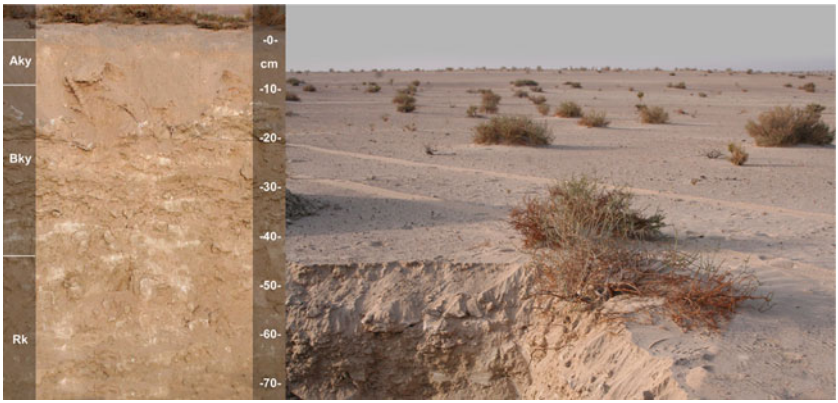

Fig. 5.9 Soilscape showing Lithic Haplogypsids (AD215)

Other Haplogypsids that have:

1. An ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface: and
2. A gypsic horizon within 18 cm of the soil surface.

Salidic Leptic Haplogypsids

Other Haplogypsids that have a gypsic horizon within 18 cm of the soil surface (Fig. 5.10).

Leptic Haplogypsids

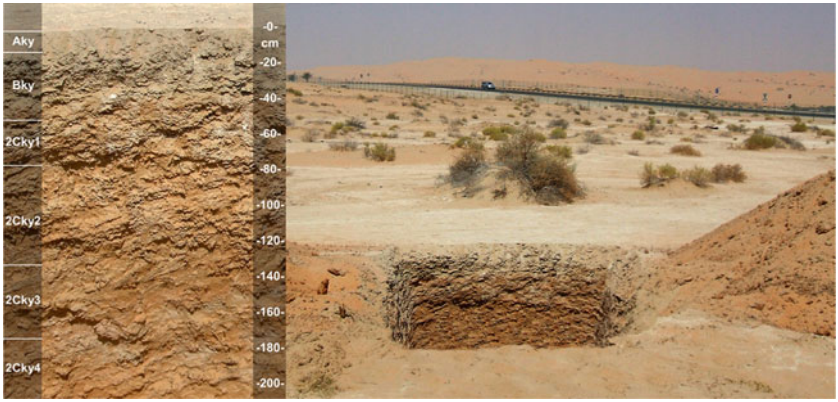

Fig. 5.10 Soilscape showing Leptic Haplogypsids (AD112)

Other Haplogypsids that have an ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface.

Salidic Haplogypsids

Other Haplogypsids that have only a gypsic horizon and lack all other characteristics. These soils represent the central concept of the great group (Fig. 5.11).

Typic Haplogypsids

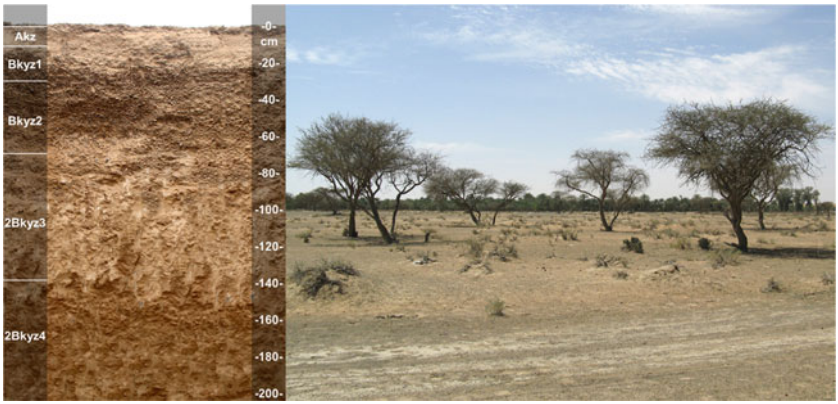

Fig. 5.11 Soilscape showing Typic Haplogypsids (NE022)

5.3.3.3 Petrogypsids

Key to Subgroups
Petrogypsids that have both:

1. An ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface: *and*
2. A lithic contact within 50 cm of the soil surface.

Salidic Lithic Petrogypsids

Other Petrogypsids that have lithic contact within 50 cm of the soil surface.

Lithic Petrogypsids

Other Petrogypsids that have both:

1. An ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface: *and*
2. A calcic horizon overlying the petrogypsic horizon (Fig. 5.12).

Salidic Calcic Petrogypsids

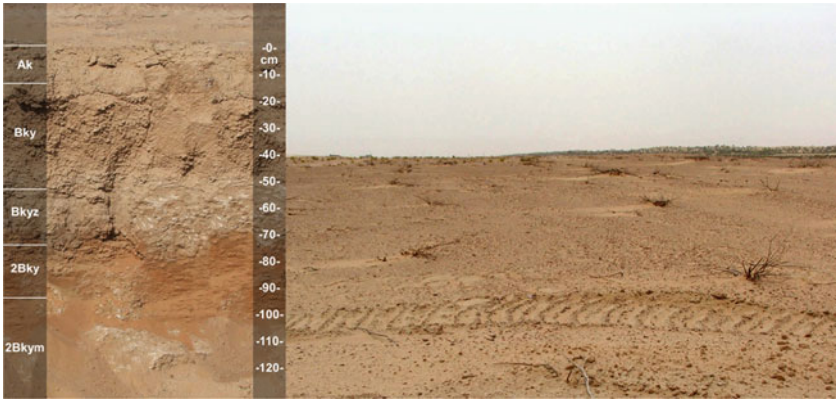

Fig. 5.12 Soilscape showing Salidic Calcic Petrogypsids (AD119)

Other Petrogypsids that have a calcic horizon overlying the petrogypsic horizon (Fig. 5.13).

Calcic Petrogypsids

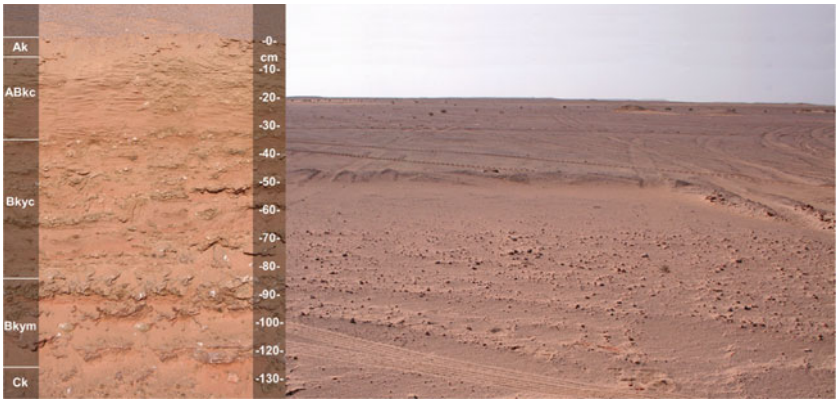

Fig. 5.13 Soilscape showing Calcic Petrogypsids (AD221)

Other Petrogypsids that have an ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface (Fig. 5.14).

Salidic Petrogypsids

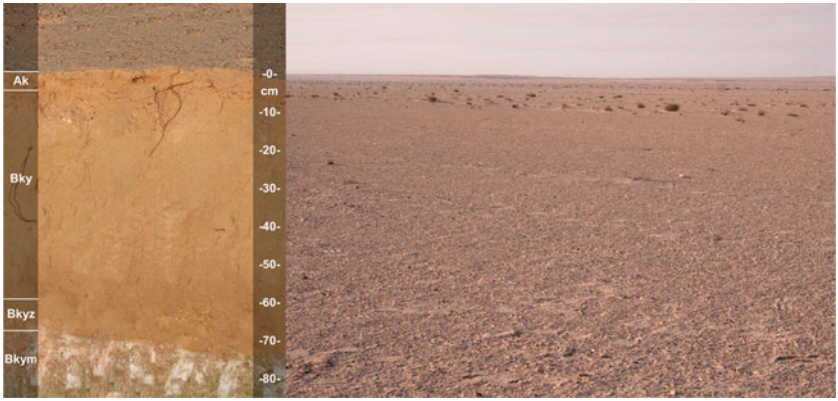

Fig. 5.14 Soilscape showing Salidic Petrogypsids (AD227)

Other Petrogypsids that have only a petrogypsic horizon and lack all other diagnostic subsurface horizons or characteristics. These soils represent the central concept of the great group (Fig. 5.15).

Typic Petrogypsids

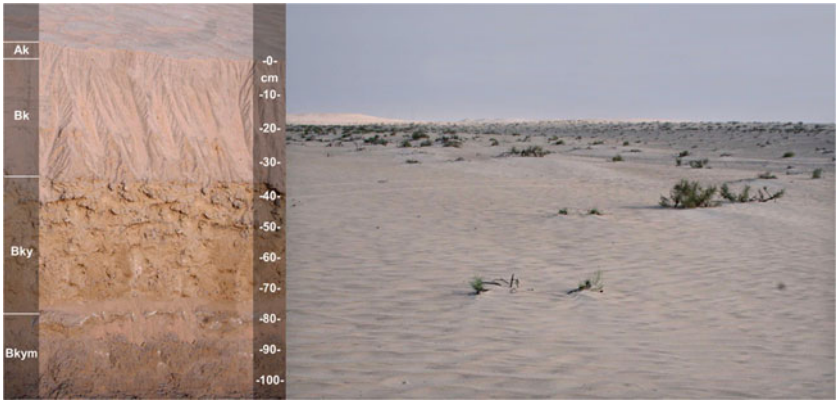

Fig. 5.15 Soilscape showing Typic Petrogypsids (AD226)

5.3.4 Salids

Key to Great Groups

Salids that are saturated with water in one or more layers within 100 cm of the mineral soil surface for 1 month or more in normal years.

Aquisalids, p. 63

Other Salids that are not saturated with water in one or more layers within 100 cm of the mineral soil surface for 1 month or more in normal years.

Haplosalids, p. 66

5.3.4.1 Aquisalids

Key to Subgroups

Aquisalids that have both:

1. A gypsic or petrogypsic horizon with its upper boundary within 100 cm of the soil surface, *and*

2. Lithic contact within 50 cm of the soil surface.

Gypsic Lithic Aquisalids

Other Aquisalids that have a lithic contact within 50 cm of the soil surface (Fig. 5.16).

Lithic Aquisalids

Fig. 5.16 Soilscape showing Lithic Aquisalids (NE 026)

Other Aquisalids that have a petrogypsic horizon with its upper boundary within 100 cm of the soil surface (Fig. 5.17).

Petrogypsic Aquisalids

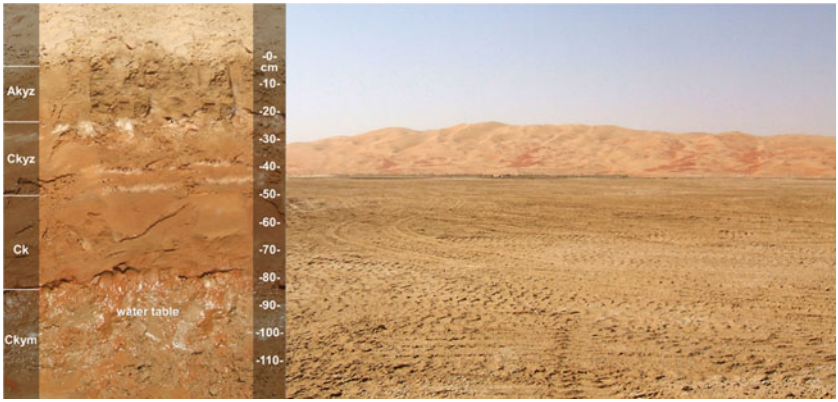

Fig. 5.17 Soilscape showing Petrogypsic Aquisalids (AD143)

Other Aquisalids that have an anhydritic horizon with its upper boundary within 100 cm of the soil surface (Fig. 5.18).

Anhydritic Aquisalids

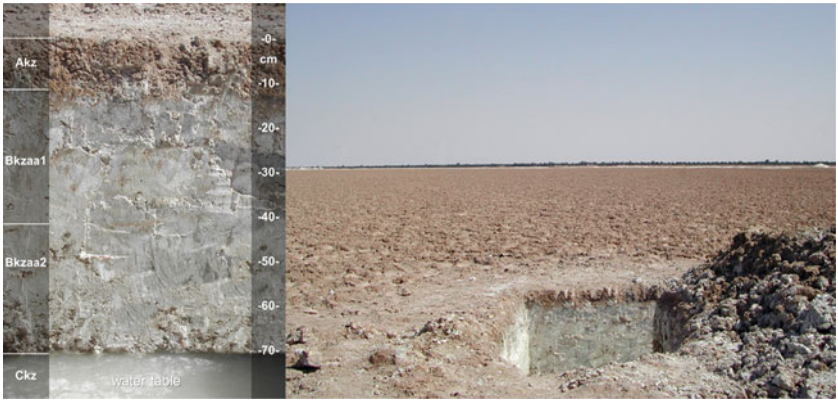

Fig. 5.18 Soilscape showing Anhydritic Aquisalids (AD125)

Other Aquisalids that have a gypsic horizon with its upper boundary within 100 cm of the soil surface (Fig. 5.19).

Gypsic Aquisalids

Fig. 5.19 Soilscape showing Gypsic Aquisalids (NE025)

Other Aquisalids that only have a salic horizon and do not have lithic contact within 50 cm of the soil surface or an anhydritic, calcic, gypsic, petrocalcic, or petrogypsic horizon that has its upper boundary within 100 cm of the soil surface. These soils represent the central concept of the great group (Fig. 5.20).

Typic Aquisalids

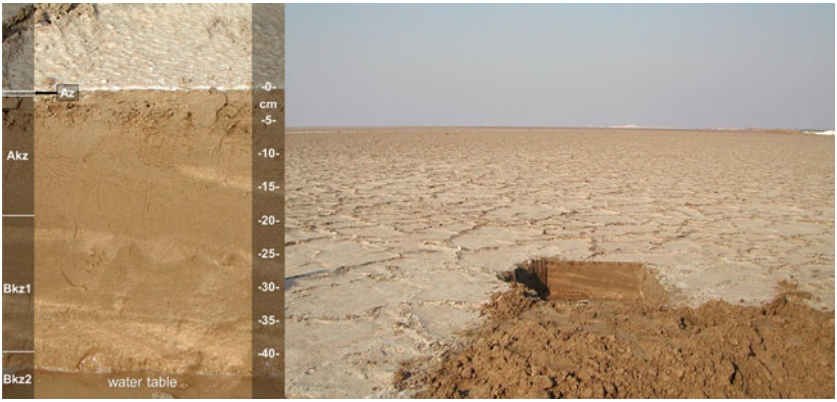

Fig. 5.20 Soilscape showing Typic Aquisalids (AD128)

5.3.4.2 Haplosalids

Key to Subgroups
Haplosalids that have both:

1. An overlying petrogypsic horizon: *and*
2. A lithic contact within 50 cm of the soil surface (Fig. 5.21).

Petrogypsic Lithic Haplosalids

Other Haplosalids that have *both*:

1. An overlying gypsic horizon: *and*
2. A lithic contact within 50 cm of the soil surface (Fig. 5.22).

Gypsic Lithic Haplosalids

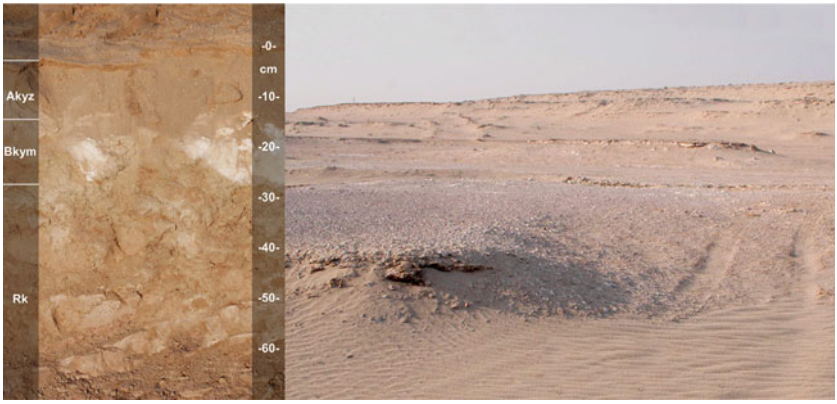

Fig. 5.21 Soilscape showing Petrogypsic Lithic Haplosalids (AD235)

Fig. 5.22 Soilscape showing Gypsic Lithic Haplosalids (AD234)

Other Haplosalids that have *both*:

1. An overlying calcic horizon: *and*
2. A lithic contact within 50 cm of the soil surface (Fig. 5.23).

Calcic Lithic Haplosalids

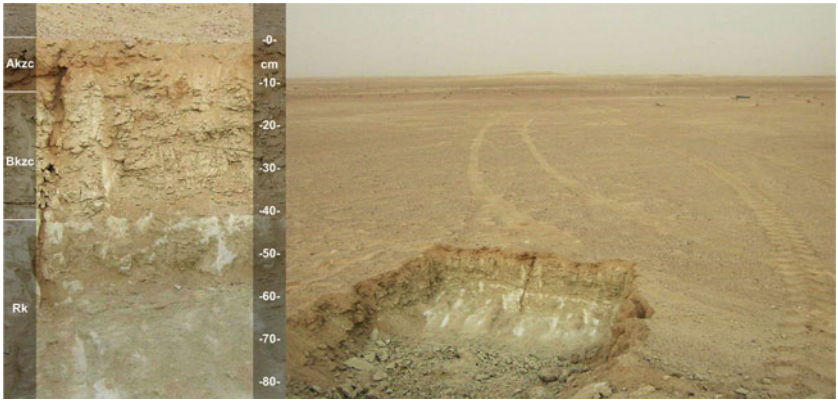

Fig. 5.23 Soilscape showing Calcic Lithic Haplosalids (AD230)

Other Haplosalids that have a lithic contact within 50 cm of the soil surface (Fig. 5.24).

Lithic Haplosalids

Fig. 5.24 Soilscape showing Lithic Haplosalids (AD239)

Other Haplosalids that have a petrogypsic horizon within 100 cm of the soil surface (Fig. 5.25).

Petrogypsic Haplosalids

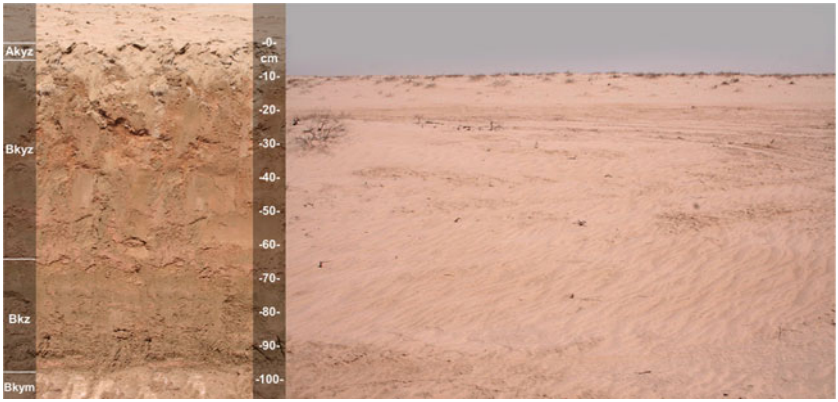

Fig. 5.25 Soilscape showing Petrogypsic Haplosalids (AD236)

Other Haplosalids that have an anhydritic horizon within 100 cm of the soil surface.

Anhydritic Haplosalids

Other Haplosalids that have a gypsic horizon within 18 cm of the soil surface.

Leptic Gypsic Haplosalids

Other Haplosalids that have a gypsic horizon at a depth of more than 18 cm to less than 100 cm from the soil surface (Fig. 5.26).

Gypsic Haplosalids

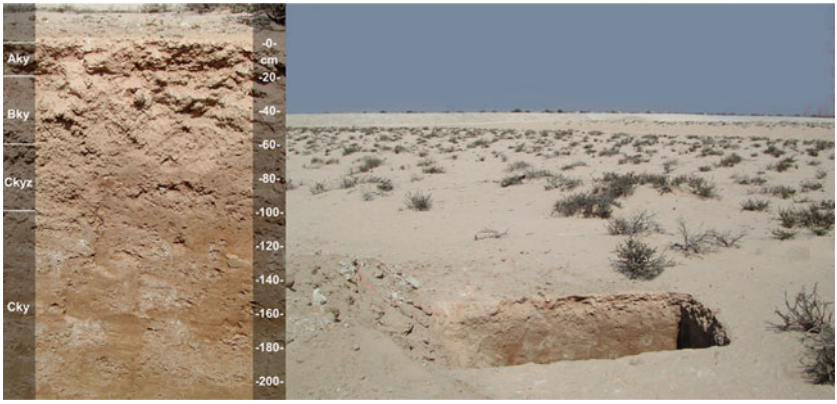

Fig. 5.26 Soilscape showing Gypsic Haplosalids (AD110)

Other Haplosalids that have a calcic horizon within 100 cm of the soil surface.

Calcic Haplosalids

Other Haplosalids that have only a salic horizon. These soils represent the central concept of the great group (Fig. 5.27).

Typic Haplosalids

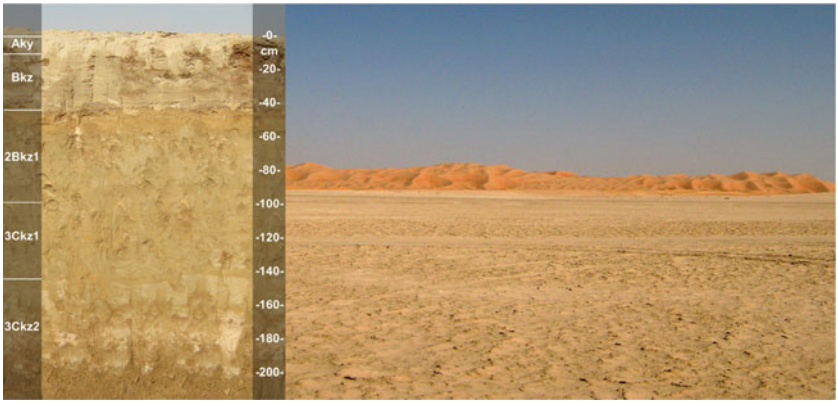

Fig. 5.27 Soilscape showing Typic Haplosalids (AD145)

5.4 Key to the Suborders of Entisols

Entisols that have permanent saturation with water and a reduced matrix in all horizons below 25 cm from the mineral soil surface.

Aquents, p. 71

Entisols that have less than 35 % (by volume) rock fragments and a texture class of loamy fine sand or coarser in all layers (sandy loam lamellae are permitted) within the particle-size control section.

Psamments, p. 74

Other Entisols that occur on recent erosional surfaces. As such they typically represent soils that display a high content of rock fragments or, as in some cases in the UAE, shell fragments. The soils are sandy or loamy in texture, are well drained, and in some places overlie calcified bedrock.

Orthents, p. 71

5.4.1 Aquents

Key to Great Groups
Aquents that have less than 35% (by volume) rock fragments and a textural class of loamy fine sand or coarser in all layers (sandy loam lamellae are permitted) within the particle-size control section.

Psammaquents, p. 71

5.4.1.1 Psammaquents

Key to Subgroups
Psammaquents that have an ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface.

Salidic psammaquents

Psammaquents that represent central concept of great group, and lack the characteristics of other psammaquents (Lithic, sodic, spodic, humaqueptic, mollic).

Typic psammaquents

5.4.2 Orthents

Key to Great Groups
Orthents that have an aridic (or torric) soil moisture regime.

Torriorthents, p. 71

5.4.2.1 Torriorthents

Key to Subgroups
Torriorthents that have a lithic contact within 50 cm of the soil surface and an ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface (Fig. 5.28).

Salidic Lithic Torriorthents

Other Torriorthents that have a lithic contact within 50 cm of the soil surface (Fig. 5.29).

Lithic Torriorthents

Other Torriorthents that have an ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface (Fig. 5.30).

Salidic Torriorthents

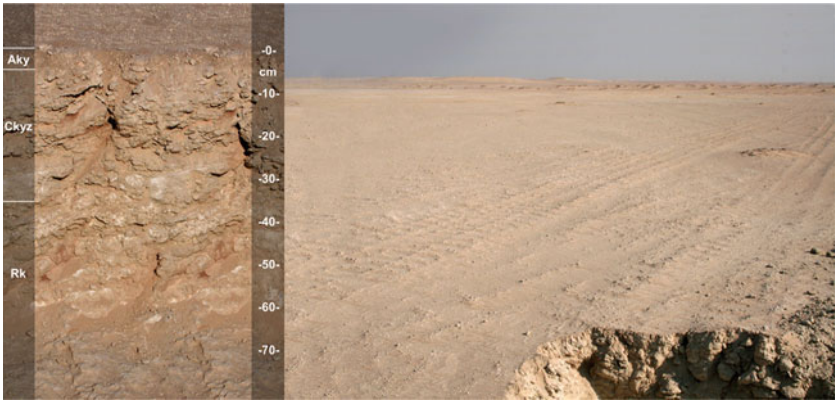

Fig. 5.28 Soilscape showing Salidic Lithic Torriorthents (AD240)

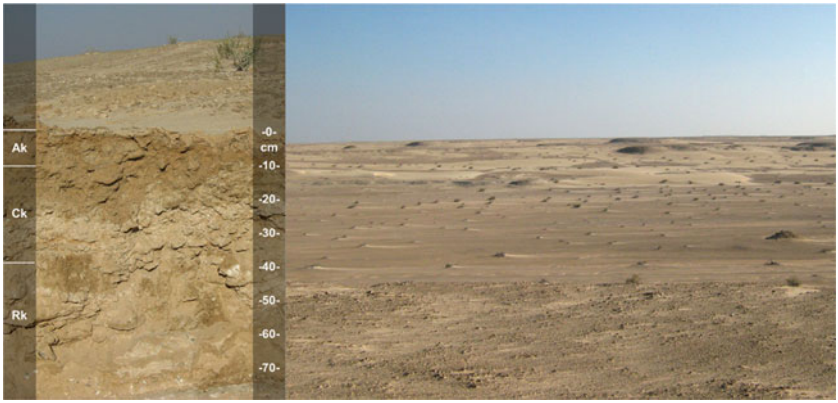

Fig. 5.29 Soilscape showing Lithic Torriorthents (AD150)

Other Torriorthents that have, in a horizon at least 25 cm thick within 100 cm of the mineral soil surface, an exchangeable sodium percentage of 15 or more (or an SAR of 13 or more) during at least 1 month in normal years.

Sodic Torriorthents

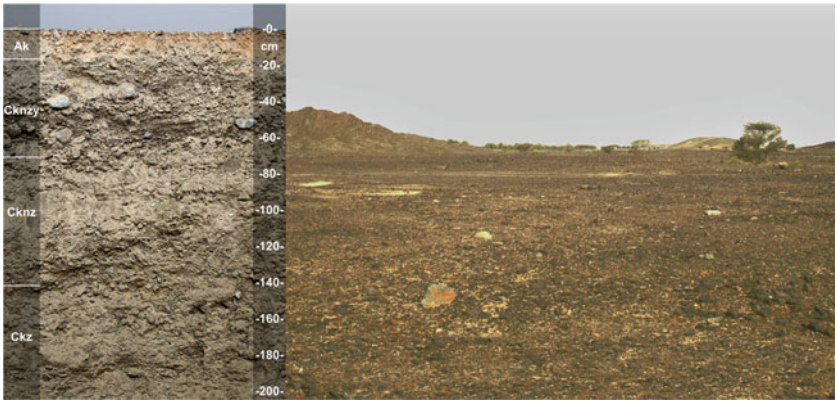

Fig. 5.30 Soilscape showing Salidic Torriorthents (NE005)

Other Torriorthents that lack all other diagnostic characteristics. These are the soils that represent the central concept of the great group. They are typically moderately deep or deep, well drained, gravelly soils (Fig. 5.31).

Typic Torriorthents

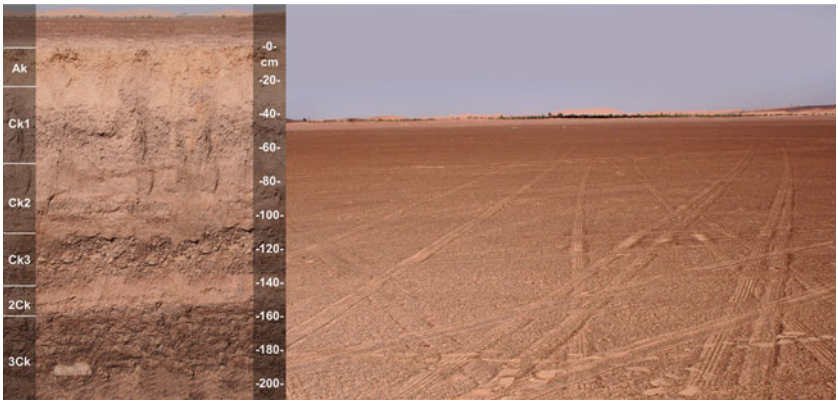

Fig. 5.31 Soilscape showing Typic Torriorthents (AD151)

5.4.3 Psamments

Key to Great Groups
Psamments that have an aridic (or torric) soil moisture regime and do not have moisture available for plants for long periods.

Torripsamments, p. 74

5.4.3.1 Torripsamments

Key to Subgroups
Torripsamments that have *both*:

1. An ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface: *and*
2. A lithic contact within 50 cm of the soil surface.

Salidic Lithic Torripsamments

Other Torripsamments that have a lithic contact within 50 cm of the soil surface (Fig. 5.32).

Lithic Torripsamments

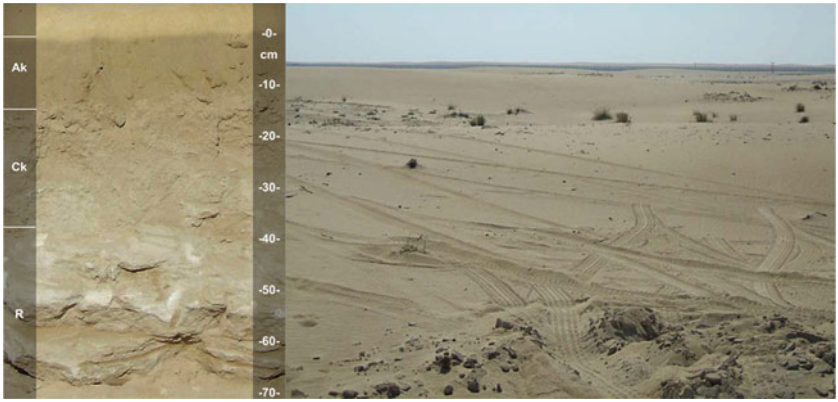

Fig. 5.32 Soilscape showing Lithic Torripsamments (AD152)

Other torripsamments that are saturated with water in one or more layers within 150 cm of the mineral soil surface in normal years for *either or both*:

1. 20 or more consecutive days; *or*
2. 30 or more cumulative days.

Oxyaquic Torripsamments

Other Torripsamments that have an ECe of more than 8 to less than 30 dS m^{-1} in a layer 10 cm or more thick, within 100 cm of the soil surface (Fig. 5.33).

Salidic Torripsamments

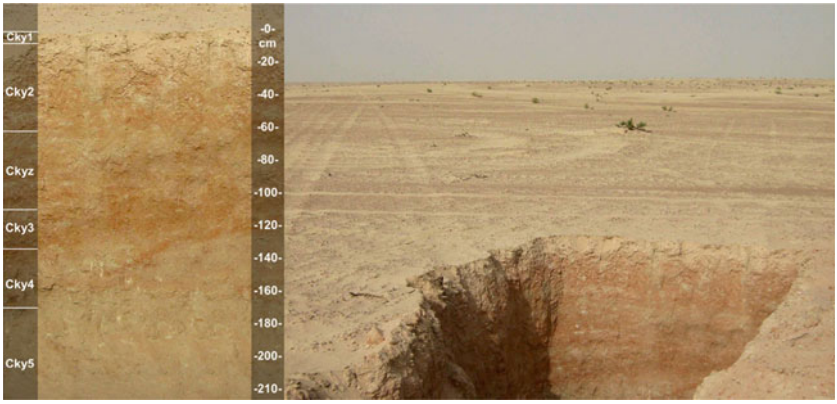

Fig. 5.33 Soilscape showing Salidic Torripsamments (AD246)

Other torripsamments that have, in a horizon at least 25 cm thick within 100 cm of the mineral soil surface, an exchangeable sodium percentage of 15 or more (or an SAR of 13 or more) during at least 1 month in normal years.

Sodic Torripsamments

Other Torripsamments that lack all other diagnostic characteristics. These are the soils that represent the central concept of the great group. They are deep and have a texture of sand or loamy sand throughout the top 100 cm of the profile. They are nonsaline and are always calcareous to various degrees but do not have enough pedogenic carbonate accumulation to form a calcic horizon. They are the most extensive soils in the United Arab Emirates (Fig. 5.34).

Typic Torripsamments

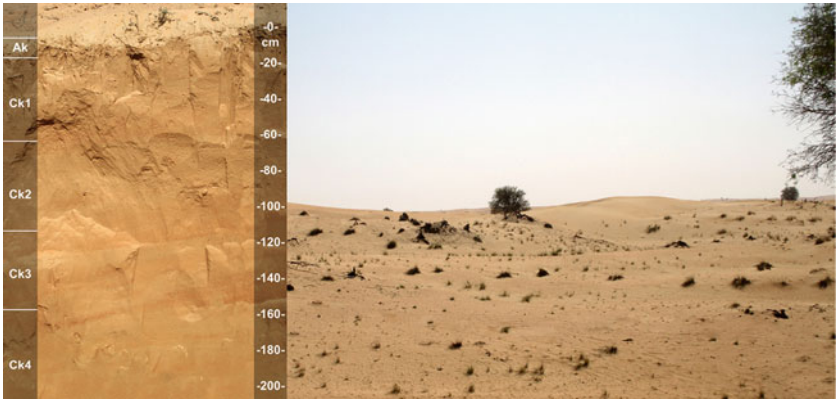

Fig. 5.34 Soilscape showing Typic Torripsamments (NE011)

Reference

Soil Survey Staff. (2010). *Keys to soil taxonomy* (11th ed.). Washington, DC: U.S. Department of Agriculture, Natural Resources Conservation Service, U.S. Government Printing Office.

Investigation of shallow water table and strongly crusted saline scald (aquisalids) in the coastal area

Laboratory soil analysis supports final establishment of soil taxa