

Africa – Seasonal Changes, Niger Inland Delta

The geographical situation of a continent on the globe, and the resulting climatic conditions with their seasonal variation of sunshine, temperatures and precipitation, is the most important factor that defines the distribution of life and therefore also the conditions for human existence.

The page provides a collection of maps with weather satellite images, precipitation maps and vegetation index maps under summer and winter conditions. Motivation:

- to assess the climatic characteristics of the continent
- to demonstrate seasonal differences
- to show the relationship between climate and vegetation
- to explain the impact of climate on living conditions.

Map Descriptions

Map 1a: Africa, Meteosat image 12 December 2002

Satellite/Sensor: METEOSAT
Acquisition Date: 12. 12. 2002, 12:00 UTC
Band Combination: near real colour
Map Information:-

Description: In Africa rainfall is distributed extremely unevenly. The Meteosat satellite image as a snapshot shows the cloud cover at a specific moment. South of the equator, corresponding to the location of the ITC, a band of clouds is visible. North of the equator, over the Sahel and Sahara, no clouds appear. Furthermore, an area of high pressure can be found over Namibia, parts of South Africa and Botswana. The region around the North Pole appears in a blue tone, because no information from the visible band is obtained from there.

Map 1b: Africa, Meteosat image 18 July 2002

Satellite/Sensor: METEOSAT
Acquisition Date: 18.07.2003, 12:00 UTC
Band Combination: near real colour
Map Information: -

Description: During summer time, as the ITC travels north, the cloud belt also moves in this direction. As in wintertime, the Sahara remains cloudless. The areas surrounding the equator receive rainfall. The region around the South Pole appears in a blue tone, since no information from the visible band is obtained from there.

Map 2a: Average precipitation December to February

Satellite/Sensor: -
Acquisition Date: -
Band Combination: -
Map Information: Average precipitation Dec.-Feb., main wind directions

Description: The distribution of the precipitation is strongly influenced by the Intertropical Convergence Zone, where the trade winds from north-east and south-east flow together. This belt of low pressure is characterised by strong upward motion and heavy rainfall. During winter, when the ITC moves southwards, the area between the Congo Basin and the Kalahari Basin receives large amounts of rainfall. During the rainy season Madagascar, to the east of Africa's coast, is prone to tropical cyclones.

Map 2b: Average precipitation June to August

Satellite/Sensor: -
Acquisition Date: -
Band Combination: -
Map Information: Average precipitation June-Aug., main wind directions.

Description: In the summer months the ITC travels northwards, bringing rainfall to an area stretching in a band from Guinea on the west coast to Ethiopia and Eritrea in the east. Parts of Sierra Leone, Liberia and Cameroon receive up to 2,000 mm of rain.

Map 3a: Vegetation -January 2004

Satellite/Sensor: SeaWiFS
Acquisition Date: January 2004
Band Combination: -
Map Information: NDVI

Description: The NDVI reflects the vegetation density and is related to the distribution of the precipitation (Map 2a) and the surface relief as well as the average temperatures (Atlas p. 30). In northern Africa only the Atlas Mountains, Cyrenaica and the Nile Delta have significant vegetation cover. As a consequence of the precipitation distribution, the western part of the island of Madagascar and the eastern part of South Africa are greener during winter.

Map 3b: Vegetation -July 2004

Satellite/Sensor: SeaWiFS
Acquisition Date: July 2004
Band Combination: -
Map Information: NDVI

Description: During summer time the vegetation cover again corresponds to the distribution of the precipitation. As the ITC travels north, the southern parts of the Sahel zone receive rainfall, and therefore appear green. Dense vegetation cover, represented in dark green, appears in parts of the Central African Republic and the Democratic Republic of the Congo. As in winter time, the Sahara and the Namib deserts appear in yellow to brown colours, indicating a lack of vegetation.

Map 4a: Niger Inland Delta in June (2003)

Satellite/Sensor: Envisat MERIS
Acquisition Date: 06.06.2003
Band Combination: near natural colours
Map Information: -

Description: The satellite map shows the Niger Inland Delta during the dry season. The Niger, the third longest river (4.200 km) in Africa, originates in the mountains of Guinea near the borders of Sierra Leone and Liberia. It flows north-east to the semi-arid Sahel zone, takes a sharp turn, heads south-east, and discharges into the Gulf of Guinea.

The Niger Inland Delta is a vast area of 40.000 km² which is seasonally flooded. Local rainfall has a negligible impact on the flooding regime. The inner delta is dependent on rainfall in the Niger and Bani headwaters during the rainy season (May -September). The water reaches the delta in October.

In the satellite image the bifurcation of the rivers in the delta can be recognised. Furthermore north of the delta long sand dunes, displayed as stripes, again force the river into multiple branches. The form

of the delta can be easily distinguished from the surroundings by its shape. During the dry season a low vegetation cover is shown.

Map 4b: Niger Inland Delta in October (2003)

Satellite/Sensor: Envisat MERIS
Acquisition Date: 12.10.2003
Band Combination: near natural colours
Map Information: -

Description: During the rainy season the appearance of the Niger Inland Delta changes as the catchment areas of both rivers receive high amounts of rain (map 2 b). It now appears in dark green, indicating lush vegetation. The surrounding areas of the delta are also covered in vegetation. The rivers appear as broad lines. The bifurcation can be recognised easily.

Map 4c: Land cover classification of the Niger Inland Delta

Satellite/Sensor: based on Envisat MERIS
Acquisition Date: June/October 2003
Band Combination: -
Map Information: Land cover classes, major geographical features.

Description: The map shows the differences between the dry and wet seasons in the Niger Inland Delta. During the wet season large areas are flooded. Only small water surfaces can be seen during the dry season. To obtain a thematic map of the Niger delta the satellite images from the dry and the rainy seasons have been combined and interpreted, with a selection of 11 land cover classes important for the region.

Map 5: Tsetse fly species spread over humid regions

Satellite/Sensor: -
Acquisition Date: -
Band Combination: -
Map Information: Number of tsetse fly species, shaded relief.

Description: Thematic map showing the distribution of the various tsetse fly species, superimposed onto a shaded relief. The number of different tsetse fly species is a measure of how favourable the living conditions for the flies are. In Africa, tsetse flies mainly occur in a band stretching from the Sahara to the Kalahari Desert. The distribution of the fly correlates with the humidity; areas with high annual precipitation (and intensive vegetation cover) are severely affected. The tsetse fly represents a risk to human health. They transmit diseases which can lead to infection of the central nervous system.

Map 6a: Niger Inland Delta, outflow of the Niger from lake Debo in June (2001)

Satellite/Sensor: Landsat ETM
Acquisition Date: 10.06.2001
Band Combination: near natural colours
Map Information: -

Description: The satellite image shows the bifurcation, a feature of the Niger Inland Delta, during the dry season. Only small watercourses and water bodies can be recognised. Outside the flooded areas the vegetation cover is sparse.

Map 6b: Niger Inland Delta, outflow of the Niger from lake Debo in October (2001)

Satellite/Sensor: Landsat ETM

Acquisition Date: 16.10.2001

Band Combination: near natural colours

Map Information: -

Description: When the headwaters from the Niger and Bani arrive, the spatial extent of the delta as well as the vegetation cover (displayed in red) change enormously.