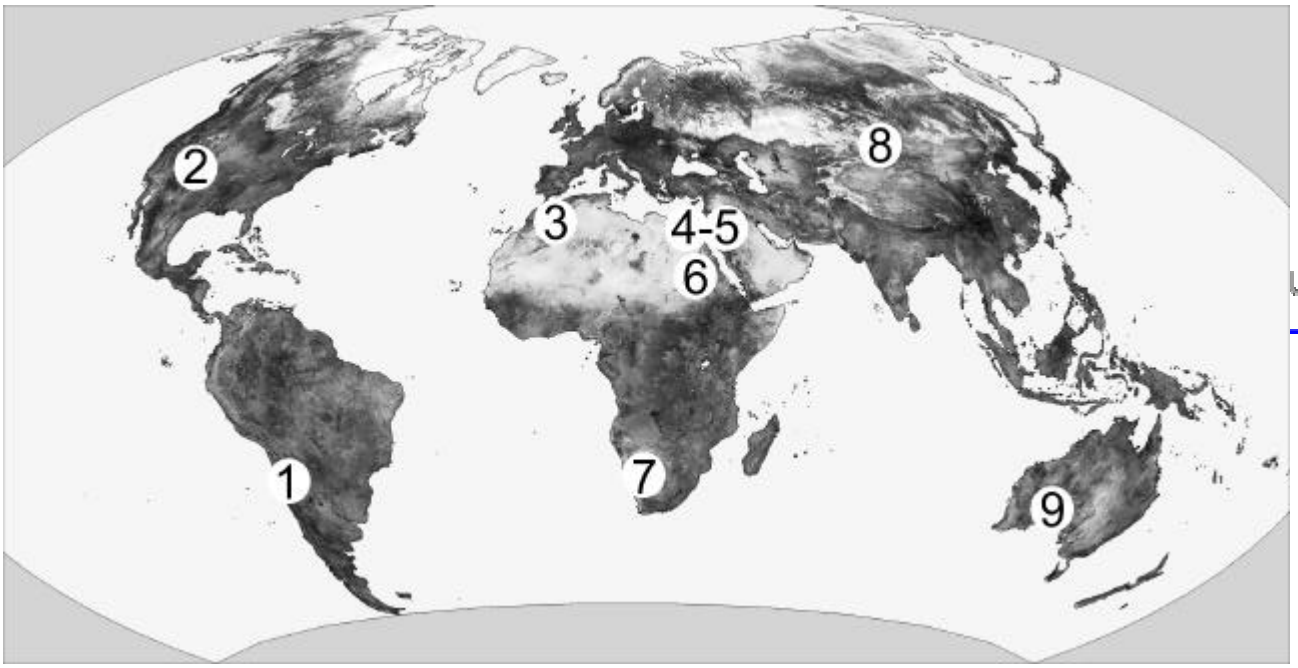
DESERTS OF THE WORLD



GENERAL INFORMATION

Deserts cover one-fifth of our Earth's land surface. The Sahara, the world's largest unbroken desert region, extends from the Atlantic Ocean to the Red Sea, covering a total surface area of 9 million km^2. Deserts are among the very dry areas which, according to the Köppen climatic classification, receive less than 25 mm of precipitation per year. There are hot and cold deserts. A desert will be colder the closer it is to the poles and the higher the altitude at which it lies. This poster deals with the deserts lying between the tropics of Cancer and Capricorn. One also distinguishes between stony or rocky deserts and sandy deserts.
The dry desert areas are home to a surprisingly wide diversity of inhabitants: plants, animals and people who, over the course of time, have optimally adapted to the extreme living conditions. Deserts are continually subject to changes for which both human beings and nature are responsible. Human activities can contribute to converting areas with sparse vegetation cover into desert-like conditions. This can be caused, for example, by the cutting or burning of vegetation, or overgrazing of livestock. The surface is exposed to wind, rain and direct sunlight, allowing erosion and dehydration to readily gain the upper hand. Dunes can move many meters per year, and in a short time cover cultivated areas with sand.
In the context of an increasing loss of arable land due to desertification, with all the attendant socio-economic consequences, the UN Convention to Combat Desertification was drafted in 1994 , and starting in 1999 a World Desert Day is being organised each year on June 17th.
In several countries (e.g. in Egypt, Israel and Southern California), efforts are being made to win back arable land from the deserts using fertilisers, soil structure improvers and intensive irrigation.

THE USEFULNESS OF SATELLITE IMAGES

Satellite images make it possible to study a large surface area in its totality. Both natural and anthropogenic phenomena can be mapped out. The images allow scientists to study the different types of desert and their evolution, and to analyse their general geomorphological characteristics. Using a time series of satellite images, one can follow a desert's expansion or land reclamation from the desert, estimate the dangers and plan out measures for combating desertification or for sustainable management of fragile regions.
The sensors with which satellite images are taken are more sensitive than the human eye. Thus, it is possible to observe reflected infrared light (IR), which is typical for healthy vegetation. On the images, such IR is coloured in red, which allows vegetation-covered areas to be distinguished.

BRIEF COMMENTS ON MAIN MAPS AND INSETS

Main Map - On this world map, made **on the basis of SPOT – Vegetation satellite images,** the deserts are coloured in ochre yellow. Dark parts within these areas correspond to higher-relief and higher-altitude areas. The location of the 9 insets is indicated.

Precipitation map - The precipitation map shows the connection between the average annual precipitation and the desert areas. This small map also gives the sites which correspond to the different inset maps.

Map of the vegetation types - The locations of the deserts in the intertropical area are plotted on this map.

For more information related to the poster, please consult the following Web site: www.geo.ulg.ac.be/eduweb.
For more information related to satellite images and their applications, please consult the website http://telsat.belspo.be

1 - Atacama Desert (source: Landsat TM, 15/01/87, colour composite) - The Atacama Desert extends along the west coast of South America in northern Chile. This desert lies at a great elevation and is - after Antarctica - the driest area on earth. The altitude is a contributing cause of the desert climate. Orographic precipitation falls on the west flank of the Andes Mountains before ever reaching the altitude of the Atacama Desert. This desert is a typical rocky desert (rough structures with numerous incisions) with salt deposits in the closed depressions (white colour). It is characterised by typical fault structures. Thus one can make out primary faults, with numerous transverse faults, looking like criss-crossing linear structures in the picture. The many colour shades in the image are due to differences in the structure and composition of the Earth's surface.
The desert yields the largest open cupper mine found in the world as well as a unique sodium nitrate reserve The very clear sky above the deserts ,with stars that seem close enough to touch, it is no surprise that several astronomic observatories are located here. The desertic landschape has been selected to test the prototype of a future lunar rover.

2 - Great Salt Lake (source: Landsat MSS 24/07/92, false colour composite) - Salt Lake is a typical salt desert, located in the state of Utah (USA), west of Salt Lake City. The area consists of a dried lake where salt has been deposited by evaporation. This salt forms a white crust on the earth's surface (extensive salt plain, visible on the image as a white spot). A shallow depression filled with water can be observed in light blue colour. A railway and a highway cross the plain and have an impact on the soil drainage system.

3 - Draa Valley (source: Spot Multispectral (XS) 30/03/98, false colour composite) - The Draa River originates in the Atlas mountains in Morocco and forms an inland delta in the Sahara. The Draa Valley suffers from intense sand-drifts. Numerous oases with date palms, which serve as a major source of income for the population in the region, are threatened by silting, which takes place from west to east. On the image, the oases with the palm gardens are reproduced in red, while the light pink colour (low IR reflection) represents those being already partially buried by the advancing sands (sand encroachment). The line structures which all runs to the river are ephemeral stream beds, which, in the event of torrential rains, carry the water to the Draa.

4-5 - Ismailia (source: ERS Radar of 01/11/95 - Landsat TM 25/04/1994, false colour composite) - Two different types of images (a radar and an optical one) cover neighbouring areas in Egypt. In the ERS-image we recognise a 'speckle', a typical noice in radar images. The radar signal penetrates the earth's surface to a certain depth, making such images suitable for representing relief structures and different soil moisture conditions. The dark lines at the bottom of the image represent an ancient river network, covered with wind-blown sand. In the optical Landsat image we recognise in the middle an alluvial depression where vegetation grows continuously. In the northwestern part one can see the agriculture of the Nile delta. In the south, on the basis of irrigation systems, called *'pivots'* (circular structures*)*, arable land reclaimed from the desert is overgrown with vegetation (in red) the colour differences between the various circles are due to differences in crops or the state of irrigation.

6 – Sai (source: Spot Multi Spectral (XS) 16/01/98, false colour composite) - Sai is an island in the Nile. The Nile forms here a sharp border between the Libyan sandy desert to the West and the Nubian stony desert to the East. In the Libyan Desert, crescent-shaped 'barchan' dunes can be observed. The centre of the island is dominated by the mountain 'Djebel Adu', a residual hill, visible on the image as a darker spot. The red colour represents the vegetation along the banks of the Nile. The north of the island consists of fertile land where arable farming is possible on a silted-up arm of the Nile.

7 – Namib (source: Landsat 7 26/08/99, false colour composite) - The Namib Desert extends along the west coast of Africa, at a longitude similar to the Kalahari Desert's. The Kuiseb is an ephemeral river which forms the clear border between the sandy desert and the stony desert in the North. The parallel structures in the sandy desert are linear dunes which are moving inland. Some of the sand ends up in the sea, where it is then carried along by the ocean current and deposited back along the coast. This is how the coast evolves, and the two extensions are formed in the sea. The inset picture shows Walvis Bay, a major city on the Atlantic coast located at the interface point between sandy and stony desert. The panchromatic image (with a resolution of 15 m) shows more details than the colour composite. (30 m resolution) The street pattern of Walvis Bay is clearly recognisable.

8 – Taklamakan (source: Landsat 7 25/06/99, false colour composite) - The Takla Makan Desert extends over central Asia in Mongolia and China. The image shows the landscape near the Chinese city of Kashi, located on the edge of the Takla Makan Desert, which is part of the *'Silk road'*. It is situated at the interface between the mountains and the plateau, where there are scores of talus. Along the streambeds one finds vegetation (in red), corresponding to the agriculture activity of the local population.

9 - Great Victoria (source: Landsat MSS 24/10/82, false colour composite) - Great Victoria is a semi-desert covering a great part of central Australia. Australia is relatively the most arid continent after Antarctica. About 70% of the continent is unable to support agriculture in any form and much of it can be used only for the grazing of a limited number of sheep or cattle.
A relatively large amount of precipitation falls in the Great Victoria Desert, so that it still supports steppe vegetation in the form of xerophytic plants (in orange). The lines we observe are ephemeral rivers crossing the area. The colour shades indicate differences in the structure and composition of the surface. In the southwestern part of the image a cloud floats over the desert landscape.

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