The Earth – Climate Zones, Ocean Currents

The term Climate comprises all meteorological features responsible for the average state of the atmosphere on a certain place. The climate is influences by a wealth of factors. The geographic position influences the temperature – the longer the distance from the equator and the higher the altitude, the lower the temperature. The distance from the ocean, the continality is of similar importance – land masses heat up and cool down faster than the water of the ocean, which makes the temperature variations in the continent larger than at the coasts. Therefore in coastal regions the summers usually are cooler and the winters milder.
Regions with similar climatic conditions are assigned to the same climate zone. The classification of climates by Lauer and Frankenberg (1987) defines in a first approach four climate zones: tropical, sub-tropical, temperate and polar climates. With the exception of tropical climates, they are further characterized by their degree of continentality.
The climate system of the Earth is highly complex – weather satellites are of high value for measuring atmospheric conditions and extrapolating the development based on these measurements. This covers measuring cloud cover, temperatures and humidity as well as the concentration of ozone and greenhouse gases with their long-term impact on the development of the climate.

Map Descriptions

Map 1: Global climate zones
Satellite/Sensor: -
Acquisition Date: -
Band Combination: -
Map Information: climate Zones acc. Lauer/Frankenberg with shaded relief and main sea currents over the sea floor topography.

Description: The map presents the climate zones according to the model by Lauer and Frankenberg, combined with a shaded relief to assist the interpretation of topographical influence on the locations and separation of the zones (some important landscapes and barriers to atmospheric currents are indicated on the map). Sea currents caused by the system of planetary winds are displayed, as they are a part of the global climate system that stores and transports energy and thus also causes deviations from the latitudinal sequence of climate zones.

Map 2a: El Niño conditions, December 1997
Satellite/Sensor: NOAA AVHRR
Acquisition Date: Dec. 1997
Band Combination: Sea Surface Temperature
Map Information: SST with shaded relief.

Map2b: La Niña conditions, December 1998
Satellite/Sensor: NOAA AVHRR
Acquisition Date: Dec. 1998
Band Combination: Sea Surface Temperature
Map Information: SST with shaded relief.

Description: The maps show the sea surface temperatures in the equatorial region of the Pacific Ocean during El Niño (Map 2a) and La Niña (Map 2b) conditions. In normal years the trade winds push warm surface water westward towards New Guinea. As a consequence, nutrient-rich cold water wells up along the west coast of South America, supporting the growth of the fish population. During an El Niño event the trade winds are weaker than normal, and warm, nutrient-poor water remains near

Central America. During a La Niña event the trade winds are stronger than normal, and cold, nutrient-rich water is transported westward along the equator.

Map 3: Sea surface temperature of the Gulf Stream
Satellite/Sensor: NOAA-AVHRR
Acquisition Date: May 2002, 2003, 2004
Band Combination: Sea Surface Temperature
Map Information: SST with shaded relief.

Description: The sea surface temperature distribution in May, averaged over three consecutive years, shows the influence of the Gulf Stream, which transports warmer water to Iceland and the Scandinavian coast (the Baltic Sea remains cold). Averaging has been done to reduce the errors introduced by cloud cover, nevertheless the inhomogeneities remain visible. The map shows the source of the warm water near the equator and in the Caribbean Sea as well as the influence of the cold Labrador Current, which leads to a relatively large temperature differences in the region south to Newfoundland.

Map 4: Mountain climate – Kilimanjaro
Satellite/Sensor: Landsat ETM
Acquisition Date: 21.02.2000
Band Combination: near natural colours
Map Information: satellite map, national park borders, land cover classes, isohypses.

Description: The volcanic massif of Kilimanjaro, at 5895m the highest mountain in Africa, shows distinct vegetation zones as a consequence of the differences in temperature and humidity at different heights (mountain climate; mean precipitation decreases from 2300mm in the forest belt at 1800m to less than 200mm at 4630m), as in the climate zones defined by geographical latitude. In lower regions the vegetation is massively influenced by cultivation, mainly plantations of banana and coffee up to 2000m. The National Park and the Forest Reserve have been declared a UNESCO World Heritage Site.