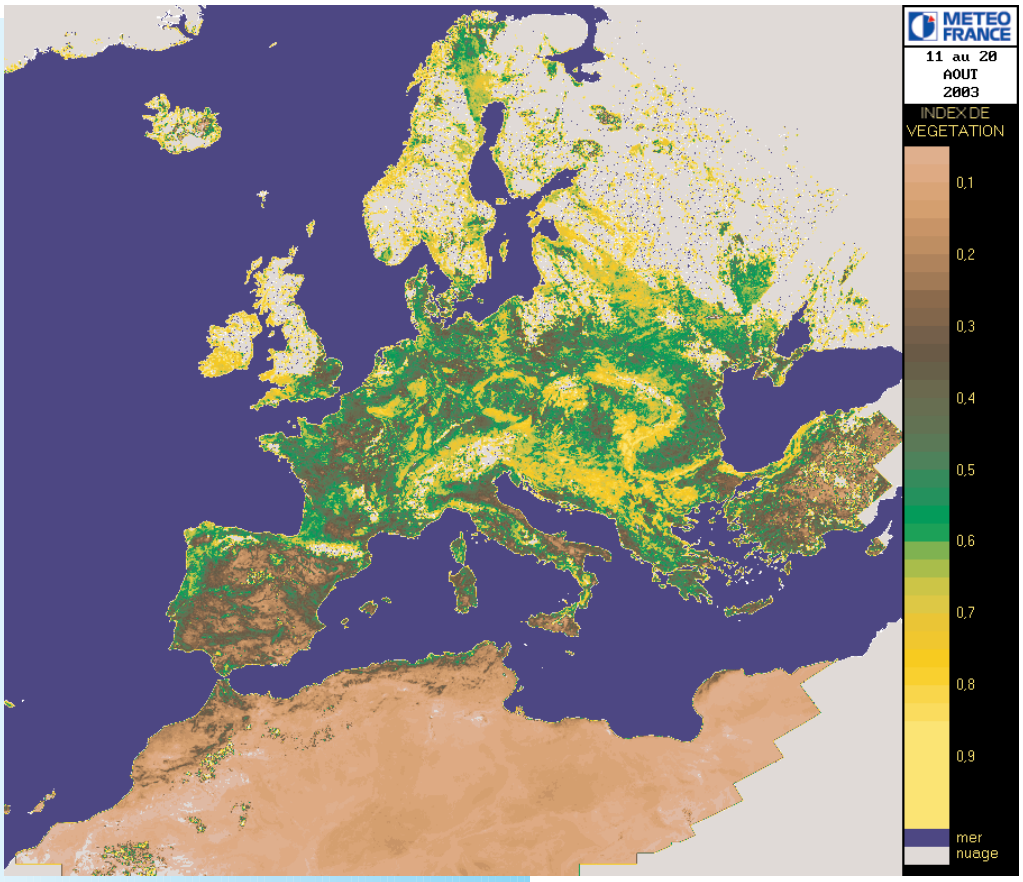
Centre de Météorologie Spatiale

METEO FRANCE

Vegetation index and ground temperature



Vegetation index: synthesis of the second ten-day period for August 2003

Different vegetation indexes can be obtained from satellite data, such as the standard “Normalised Difference Vegetation Index (NDVI). The NDVI is based on the difference in reflectance between channel 1 and channel 2 of the AVHRR imager of the NOAA satellites, or comparable instruments such as the Vegetation instrument on the SPOT-4 satellite. Variants of this index have been developed to account for atmospheric correction or the nature of the soil, for example. An AVHRR instrument onboard NOAA can observe each part of the earth at least once per 24 hours. This enables short-term variations in vegetation to be mapped on a planetary scale. Most areas can be viewed in clear conditions over a period of a few days, and it is possible to derive ten-day period vegetation index maps as shown above. Accumulated NDVI values can be used to estimate the yield of crops and anticipate food shortages. The instrument itself has a resolution of 1 km at the sub-satellite point. The NDVI images shown above have a resolution of 16 km; which nevertheless enables variations to be detected in the vegetative cover of the continents between the start of spring and the start of autumn.

The usefulness of the AVHRR instrument in detecting strong vegetation growth is a result of the way in which living plants reflect the solar radiation. Green leaves have a reflectance of less than 20% in the spectral band 0.5 to 0.7 µm, but around 60% in the 0.7 to 1.3 µm bracket. The difference in reflectance in the two bands has been used widely, with the LANDSAT satellite multispectral data, to classify vegetation, estimate crop surfaces and detect plant stress.

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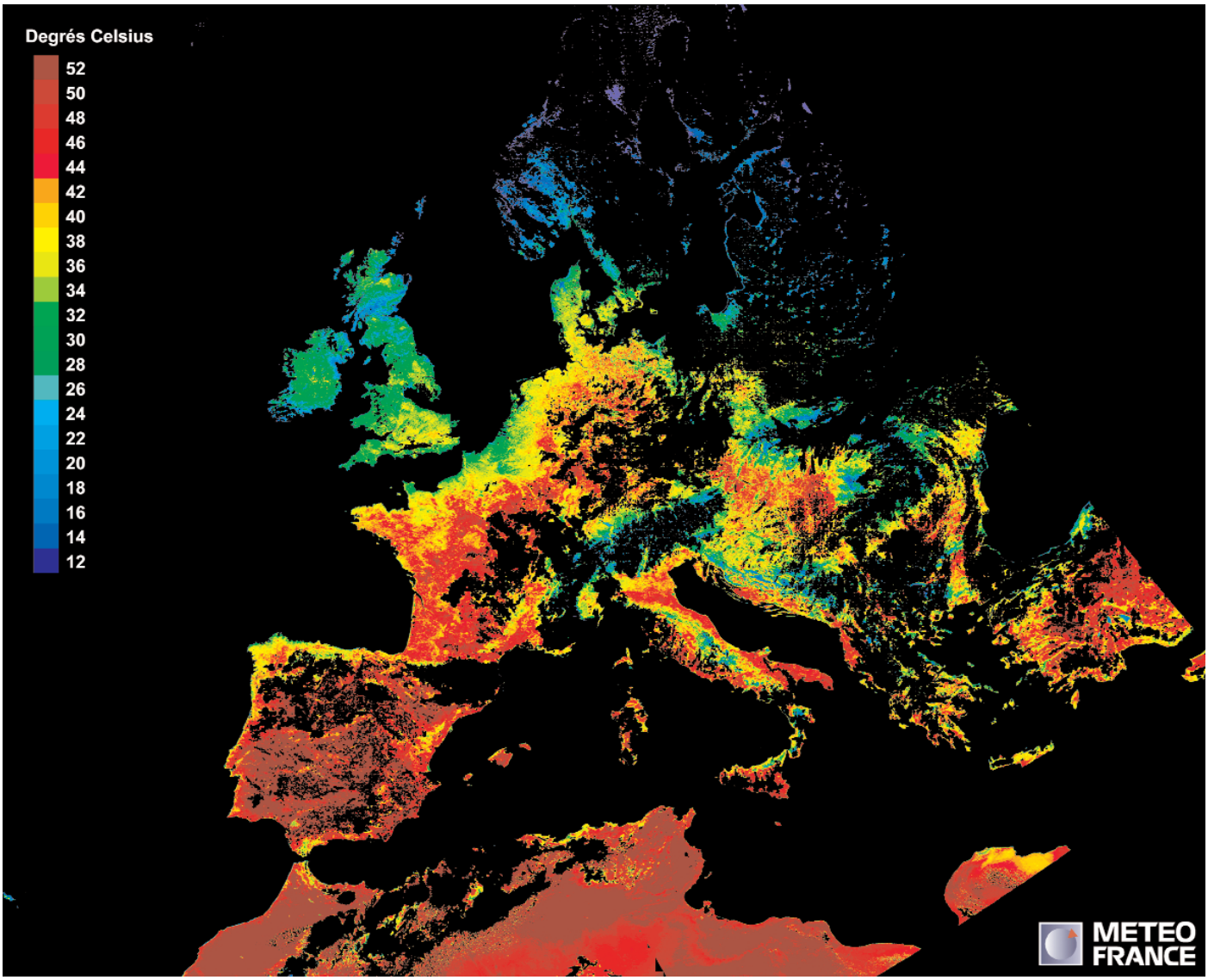

Surface temperatures recorded by NOAA 16 on 8 August 2003

The infrared sensors on weather satellites measure the heat emitted by the scene observed. Hot surfaces emit more than cold surfaces, enabling the temperatures to be derived. This is essential for many aspects of meteorology, climatology, and environment monitoring. However, its transformation from raw observation into a temperature is far from obvious. The first requirement is to have an accurate calibration of the radiometer. This is obtained using meticulous measurements taken before the launch together with continuous measurements in flight of one or more onboard black bodies whose temperatures are carefully controlled. The effects of the atmosphere must also be taken into account, as they can reduce or increase the thermal radiation before it reaches the satellite. Moreover, the emissivity of the radiating surface must be accounted for in the computations before the temperatures can be used as objective measurements. As stated above, all these factors can be taken into account to provide useful values for this fundamental parameter.