



VEGETATION

PROGRAMME

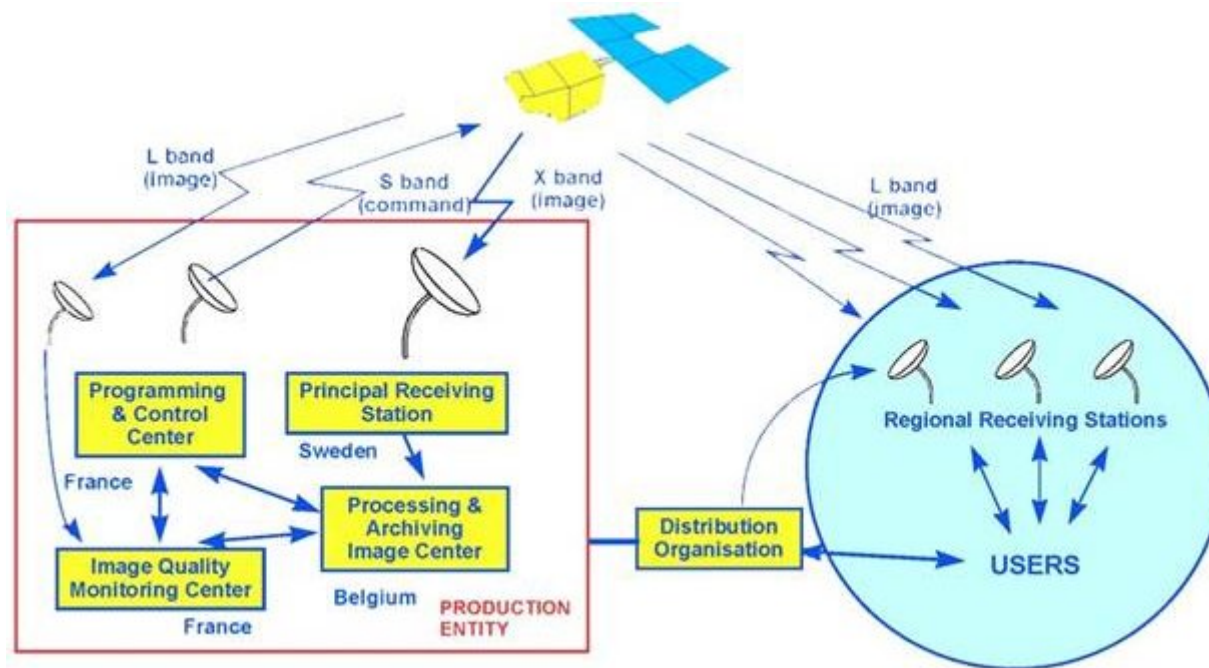
- ♦ Set up jointly by France, EC, Belgium, Italy and Sweden
- ♦ To provide accurate measurements of the main characteristics of the Earth's vegetation cover on an operational basis
 - for scientific studies involving regional and global scales experiments over long time periods
 - for systems designed to monitor vegetation resources, like crops, grasslands and forests
- ♦ To ensure autonomy of access and effective use of data from a European instrument
- ♦ Has fulfilled its role by offering the international community continuous high quality time series of the entire terrestrial surface, of critical importance to monitor environmental change at global scale
- ♦ The continuity of the mission should be guaranteed by the Proba-V satellite
 - could be ready for launch by 2011-2012
 - should fill the gap between the end of service of SPOT 5 and the launch of the ESA Sentinel 3 satellite



BELGIAN SCIENCE POLICY

VEGETATION SYSTEM

- The 1st satellite component, VEGETATION 1 was launched in 1998 onboard SPOT-4 satellite
- The mission was completed by the launch of the 2nd instrument onboard SPOT-5 satellite in 2002
- Data are downloaded at the Kiruna receiving station and transferred to the Image Processing Centre (Belgium) for processing, distribution and archival





Altitude 830 km / 14 revolutions a day



« P » PRODUCTS
SEGMENTS



S1 - DAILY SYNTHESIS

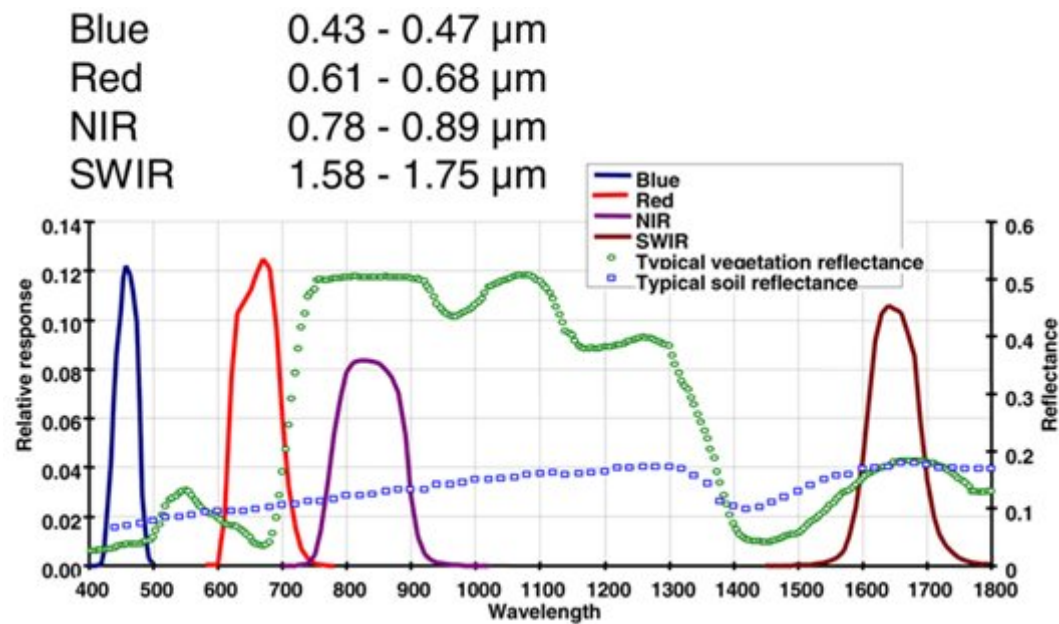


S10 - 10 DAYS SYNTHESIS

VEGETATION

INSTRUMENTS

- ♦ Spatial resolution of the instruments: 1 km
- ♦ Recordings available in 4 spectral bands useful to study vegetation:



- ♦ Passive sensors : large portions of images often unsuitable for the observation of land surfaces

THE MOSAIC IMAGE

- ♦ Produced by the Geomatics unit at the University of LLN
- ♦ Temporal synthesis method
 - Takes advantage of the high temporal resolution of the sensors to overcome the cloud cover problem
 - Based on a strict quality control of each image pixel of the time series
 - Pixels without cloud and sensor artifact are averaged in order to recreate an image which preserves the spatial coherence of the start images
 - Specific algorithm so that only permanent snow appear
- ♦ Composite of all daily global images recorded by the VEGETATION instruments since 1998 :
 - More than 3500 images, each of them being made of almost 600 million pixels for each wavelength
 - Overall amount of data : 24 Terabytes !
- ♦ Thanks to this very large number of images and to the radiometric consistency of the instruments, this global composite is one of the very first being really haze and cloud free

Channel Red
Representation Red

Near IR
Green

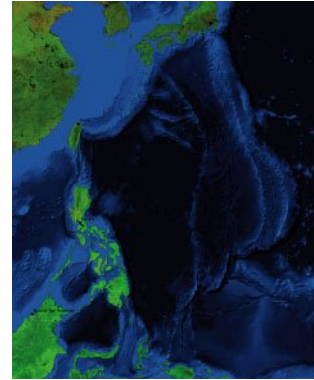
Short Wave IR
Blue



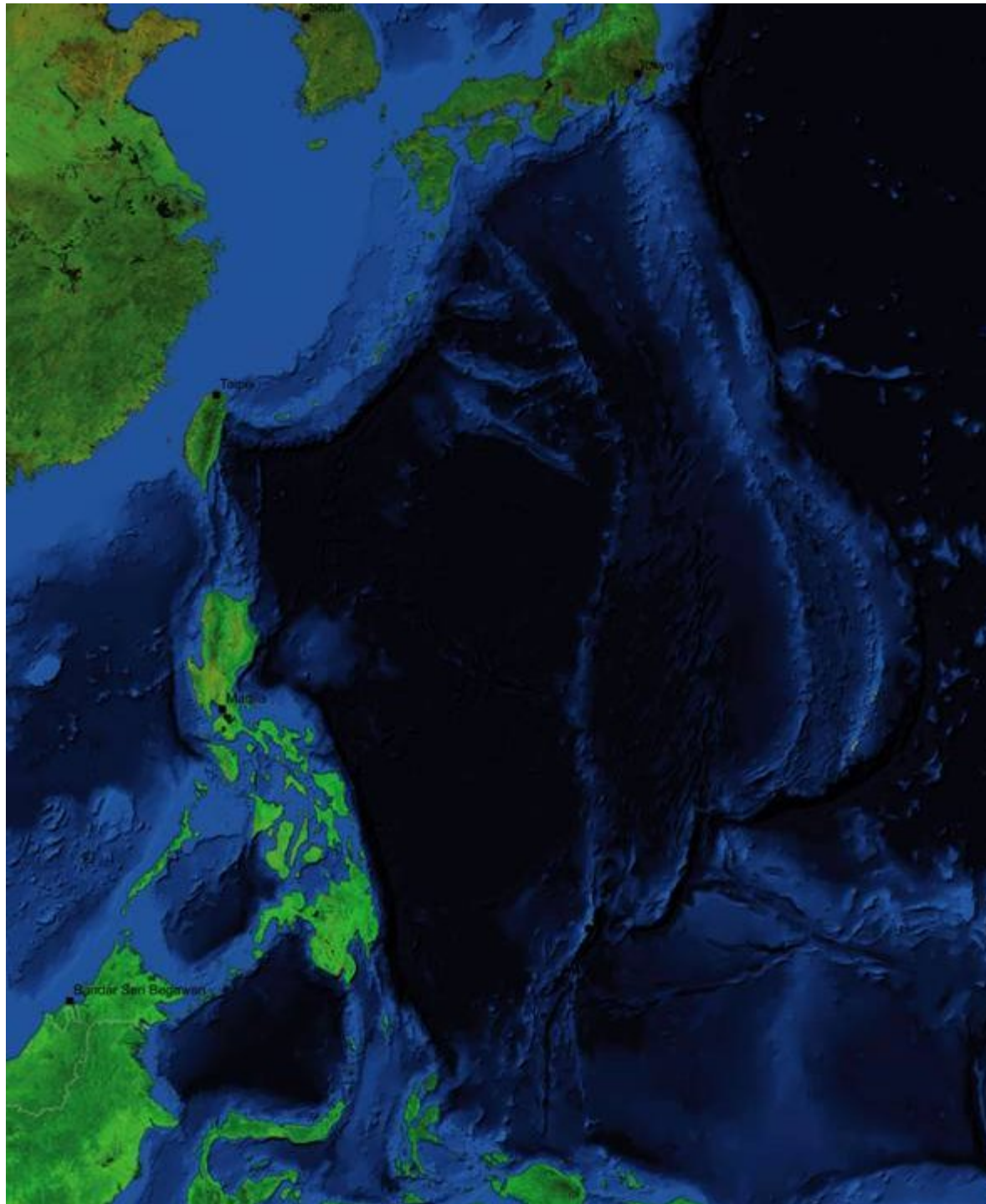
BELGIAN SCIENCE POLICY

OTHER ELEMENTS

- ♦ Bathymetry and polar areas derived from the NASA Blue Marble next generation project



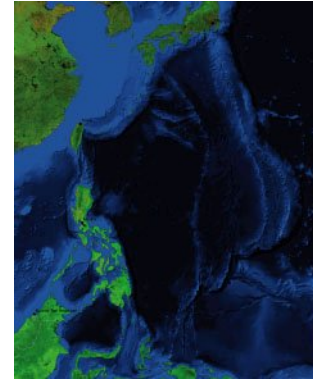
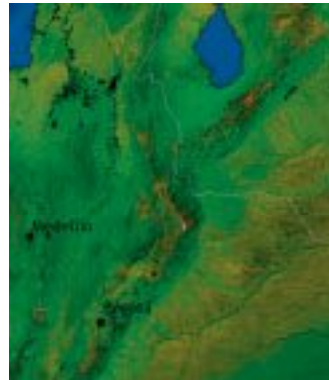
Mariana Trench



OTHER ELEMENTS

- ♦ Bathymetry and polar areas derived from the NASA Blue Marble next generation project

- ♦ Boundaries very lightly drawn



Colombia -Venezuela border

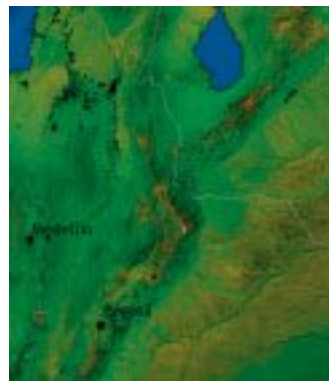


OTHER ELEMENTS

- ♦ Bathymetry and polar areas derived from the NASA Blue Marble next generation project



- ♦ Boundaries very lightly drawn



- ♦ Capital cities and most densely populated cities
Minimum number of people depends on the continent
100 000 inhabitants for Oceania - 1 million for Europe
1.5 million for North America - 2 million for South America / 3 million for Africa / 5 million for Asia



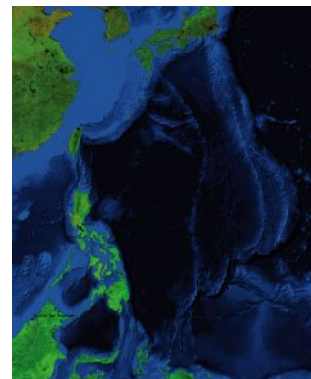
*Egypt's capital-city
& 2d largest city*



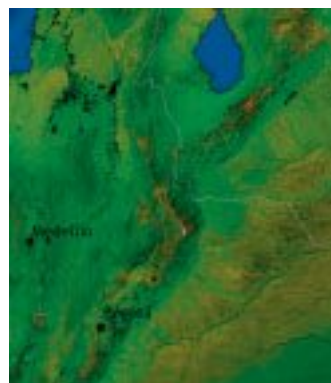


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- ♦ For each continent some of the main processes experienced the last 10 years are underlined through 5 very visual insets, which invite the reader to do a more detailed study of the subjects via the website <http://eoedu.belspo.be/vgt10>



10 YEARS OF IMAGING AFRICA SPOT VEGETATION



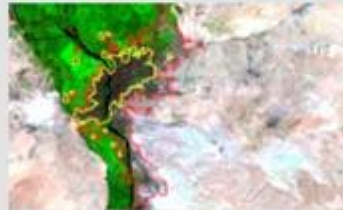
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Water stress

In arid and semi-arid areas, 300 million people face frequent water shortages, causing health problems and hampering economic development.

© 2005-2008 [Portrait of the Earth](#)



Population Boom

The annual demographic growth in Africa - twice as high as the world average - goes hand in hand with an explosive urbanization and poor living conditions.

Cairo's expansion seen by Landsat and MODIS. Source: [USGS EROS](#)



The Uprooted Legions

In addition to the more than 8 million people who are running from political turmoil, ethnic strife and war, many more Africans are ecological refugees.

Darfur refugee camp in Chad. Source: [www.supportdarfur.com](#)



Food Security

Despite many efforts to fight difficult conditions in sub-Saharan Africa, 200 million people still suffer from malnutrition.

©Ray Witlin/World Bank



The Encroaching Desert

Drylands unsuitable for sustainable agriculture cover 42% of Africa. In addition, desertification threatens another 15% of the continent.

Source: [www.mauritania-jp.com](#)

10 YEARS OF IMAGING ASIA

SPOT VEGETATION



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Thaw of the permafrost

Permafrost at present covers 20% of the Earth's land surface. Its thawing due to global warming releases great amounts of ice-trapped methane, a very powerful greenhouse gas.

Thawing permafrost along the Kolyma River, Siberia. © Mikhail Al. Anisimov.



Dark Skies

Exposure to fine particles kills 2.4 million people a year, half of which in Asia. Urban air pollution, forest fires and indoor pollution by traditional cooking fuels are to blame.

Polluted sunset in Shanghai- Source: www.wikimedia.org



The Neverending Battle with Nature

Asia tops the lists of major natural disasters. The 10 most deadly natural disasters all occurred in Asia, with floods, earthquakes and cyclones causing the greatest havoc.

Beichuan after the 2008 earthquake - Source: houston.china-consulate



An irreplaceable habitat

Forests in Indonesia are being cleared at a rate of 5 football fields a minute. Their conversion to oil palm monocultures causes a 83% loss in biodiversity.

From 1998 to 2008, 80% of orangutan habitat has been lost - Source: Fauna Keltim



Facing seaward hazards

Growing populations and booming economies are threatening Asia's coastal ecosystems. With half of the mangrove gone, inland areas are more vulnerable to storms and erosion.

Agriculture (pink) encroaching upon mangrove (green) - Source: NASA Earth Observatory

10 YEARS OF IMAGING EUROPE SPOT VEGETATION



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Marine pollution

Of all oil and refined products, 90% transit through European seas. However agricultural, domestic and industrial discharges still contribute more to marine pollution than oil spills.

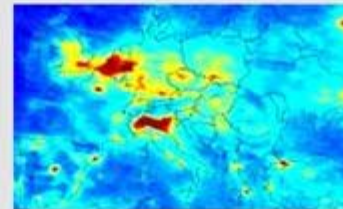
2007 Black Sea oil spill killed 30,000 birds. Source: wikimedia.org



Forest fires

Each year, about 500,000 hectares of forest are burned down. These fires not only cause casualties, but also a yearly economic loss between 500 and 2,500 million EUR.

The 2007 forest fires in Greece killed 87 people. Source: wikimedia.org



Air pollution

Since 1990 Europe has put great effort in lowering atmospheric pollution. The concentration of air pollutants, with the exception of fine particles and ozone, is diminishing steadily.

Above world average NO2 density in 2003-2004. Source: Heidelberg University



Emerging diseases

Due to climate change and globalisation, the incidence of vector-borne diseases such as bluetongue, chikungunya, malaria and tick-borne encephalitis is likely to rise in Europe.

Asian tiger mosquito can transmit dengue. Source: Susan Ellis, Bugwood.org



People on the move

Europe is the second destination of choice after America for people longing for a better life. In 2005, 1.8 million migrants accounted for 85% of Europe's population growth.

Over 500,000 illegal migrants enter Europe each year. © REUTERS/JUAN Medina

10 YEARS OF IMAGING NORTH AMERICA

SPOT VEGETATION



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Arctic Sea Ice Decline

In 2007, the sea ice extent dropped to a historical minimum, 38 % below the average of the last thirty years, and a whopping 24 % less than the previous record low of 2005.

Sea ice minimum in 2007, compared to 1979 - Source: [NASA](#)



Floods

The North American continent is regularly affected by floods. In the USA alone the 30 biggest floods of last century caused more than 8,830 deaths and 57 billion dollars worth of damage.

Spring flood in New Hamburg, Ontario, Canada in April 2008 -

Source: [Dave Bender, New Hamburg Independent](#)



Leaving town

Americans are increasingly moving away from big urban centres to exurbs, fast growing commuter communities on the metropolitan fringe with more space and more affordable housing.

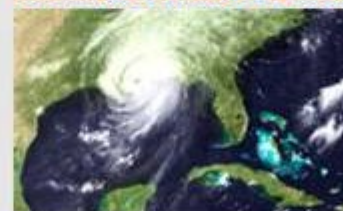
Albuquerque, New Mexico, USA - Source: [Woods Hole Massachusetts](#)



Genetically modified crops

have been widely adopted by American farmers. In 2007, half of the world's 120 million hectares of genetically engineered crops was located in the USA.

More than 80% of US cotton and soybean are genetically modified - Source: [www.wikipedia.org](#)



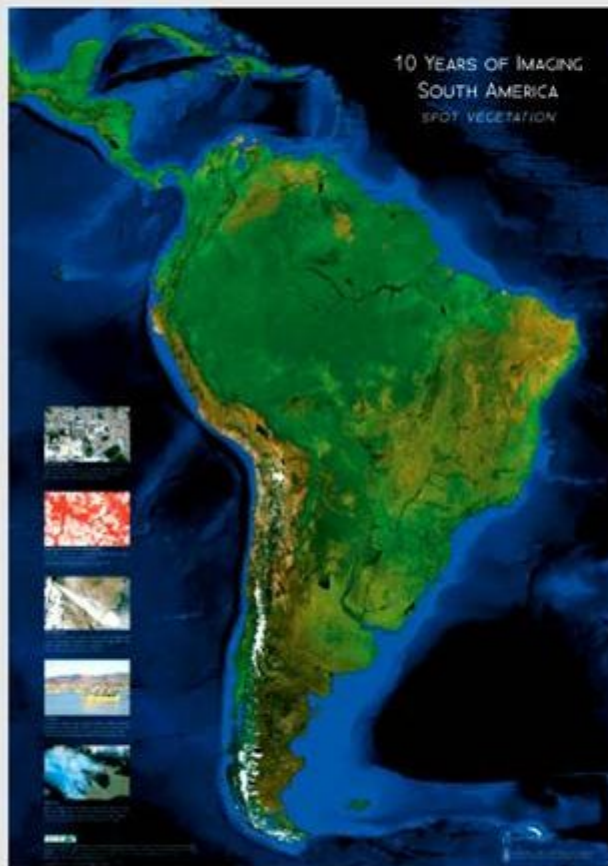
Hurricane alert

In the Atlantic, the frequency and intensity of landfalling storms has been increasing over the last 30 years, possibly because of global change.

Katrina was one of the most powerful and deadly hurricanes to strike the US - Source: [NOAA/NASA GOES Project](#)

10 YEARS OF IMAGING SOUTH AMERICA

SPOT VEGETATION



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Booming cities

Latin America experiences an explosive urban growth. In 2008, almost 80% of the population lived in urban areas.

Rio de Janeiro slums. Source: West Virginia University



Agrofuels and the Rainforest

The biofuel crop area is expanding rapidly across South America, contributing to deforestation.

*Deforestation in Mato Grosso Brazil seen by ASTER in 2006.
Source: [NASA and U.S./Japan ASTER Science Team](#)*



Volcanoes

The Chaitén volcano in Chile is one of Latin America's 269 active volcanoes. Following its eruption in July 2008, the plume drifted all the way across Argentina.

Source: [MODIS Rapid Response Project, NASA/GSFC](#)



El Niño

is a cyclic climatic event severely altering weather patterns worldwide. During a major El Niño, ocean water warms up and the sea level rises by up to 35 cm along the Pacific coast.

El Niño events can lead to a dramatic decrease in fish catch. © [Puerto urbano](#)



Glaciers

are a critically important water resource for South America. Since the 1980's they have been retreating drastically, providing one of the most visible indications of climate change.

Evolution of Grey Glacier in Chile (ISS and Landsat). Source: [NASA](#).

10 YEARS OF IMAGING OCEANIA

SPOT VEGETATION



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Mining and the Environment

Australia is one of the world's largest producers of minerals. Besides other environmental impacts mining is responsible of 10% of Australia's greenhouse gas emissions.

Kalgoorlie Super Pit is Australia's largest open cut gold mine. [Source](#)



Endangered Islands

Low-lying Pacific islands could be wiped off the map by rising seas induced by global warming. A 50 cm rise would lead to the displacement of about 200 million people worldwide.

Tidal flooding on Funafuti Tuvalu. ©2005 Gary Braasch.



Drought

Rainfall over eastern Australia, the most populated area, has been decreasing. Locally the annual precipitation has fallen from 400 mm to 200 mm over the last 40 years.

Displacement of the shore of Lake Hume. Source: www.flickr.com



World's Greatest Reef in Peril

Since 1978, the 2,300 km long Great Barrier Reef is suffering from mass bleaching, a threatening condition triggered by unusually high sea surface temperatures.

Source: commons.wikimedia.org

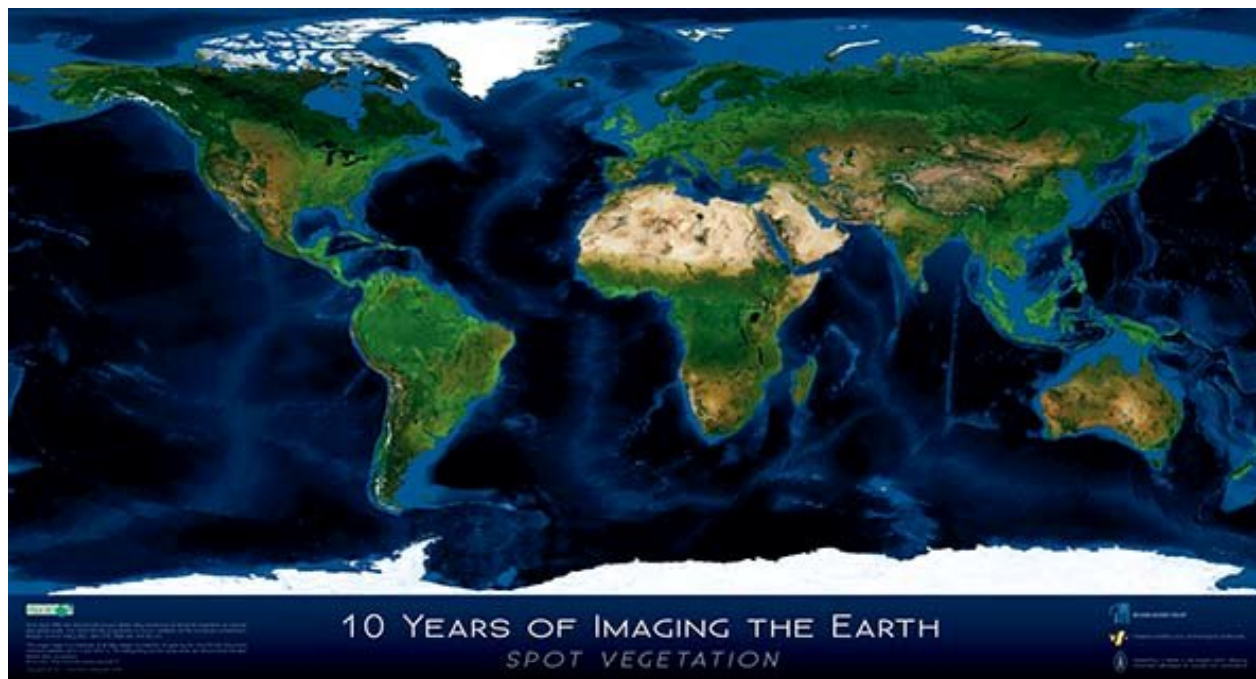


Raging Fires

Depending on the season, bushfires can occur in different parts of Australia throughout the year. Fire frequency is also closely related to drought years and especially El Niño events.

Fires detected by MODIS over a 10-day period in November 2008.

Source: [MODIS Rapid Response Project, NASA/GSFC](#)



Target audience: general public – secondary schools

Limited number of specimens – put at disposition of Belgian teachers via
Geography teachers associations and ESERO desk

We invite you to visit the website

<http://eoedu.belspo.be/vgt10>

If you are interested in having posters:

eodesk@belspo.be



Thank you for your attention

