Plate Descriptions

PLATE 1. Eye of Hurricane Andrew Approaching the Louisiana Coast

This image of Hurricane Andrew was taken Aug. 26, 1992, just as the eye of the storm was moving ashore. The NOAA GOES-7 image shows bands of intense rain and the spiral "arms" of the storm.

SOURCE: NOAA NESDIS. Used with permission.

PLATE 2. Late Start of the 1993 Growing Season in the United States

The vegetation index, an indicator derived using data from the Advanced Very High Resolution Radiometer (AVHRR) flown on the NOAA polar-orbiting operational environmental satellites, was used to detect the beginning and progress of the 1993 growing season in the United States. The accompanying image compares values of the Normalized Difference Vegetation Index (NDVI) for mid-May in 6 consecutive years, 1988-1993.

This image shows that the development of vegetation in mid-May 1993 is below the other 5 years. In the southeastern United States and California the area with well-developed vegetation in 1993 (NDVI between 0.1 and 0.3, yellow and light green colors) is much smaller than for any other of the 5 years. Also, very few areas show well-developed vegetation (NDVI above 0.3, dark green color) in May 1993. In the rest of the United States the area with low NDVI values (between 0.005 and 0.1, red and brown colors) in 1993 is much larger than in the other 5 years. Interestingly, a much larger area with underdeveloped vegetation (NDVI below 0.05, gray color) is observed this year compared with 1988-1992.

Similar images from April show that late development of vegetation in 1993 has been observed since the beginning of the usual growing season. The current vegetation state is approximately 3 to 5 weeks behind the 1988-92 average for the entire United States. The exceptions are southern Florida, California, and Texas, where end-of-April vegetation development was normal or ahead of normal. By mid-May nearly 35 percent of the U.S. area was more than 4 weeks behind.

SOURCE: NOAA/NESDIS, Satellite Research Laboratory. Used with permission.

PLATE 3. Vegetation Index

NOAA satellites monitor the greenness in vegetation. This Vegetation Index image shows abundant (dark green) vegetation across the Amazon of South America, while lack of vegetation (black areas) is seen across the Sahara Desert in northern Africa.

SOURCE: NOAA/NESDIS. Used with permission.

PLATE 4. Landsat Image of the Olympic Peninsula, Washington

The Earth Observation Satellite Co. (EOSAT) generated this image from data acquired on July 21, 1988, from the LandSat 5 satellite (Thematic Mapper bands 4,5,1 (RGB)). The permanent snowcap appears lavender; dark red distinguishes old forest growth from new (light red and cyan). Seattle's metropolitan area appears east of Puget Sound.

SOURCE: Photograph courtesy of EOSAT. Used with permission.

PLATE 5. Sea-Surface Temperature

NOAA satellites provides a detailed view of sea surface temperatures for use by the shipping and fishing industry. The dark red indicates the Gulf Stream while the green and blue shades indicate the cooler coastal waters.

SOURCE: NOAA/NESDIS. Used with permission.

PLATE 6. Tidal Effects in Morecambe Bay

This multitemporal image from the ERS-1 satellite's synthetic aperture radar shows Morecambe Bay (just north of Blackpool, UK). Highlighted in magenta are the vast expanses of sandbanks and mud flats within the Bay that are covered by the sea at high tide (Aug. 7, 1992) and exposed at low tide (Aug. 1 and 13). The patterns within these areas reflect the various rises, dips and drainage channels that cross the sand and mud at low tide. The tidal effect can be observed to extend several kilometers inland up the numerous river courses.

SOURCE: European Space Agency. Used with permission.

PLATE 7. Deforestation in Brazil

This false-color, ERS-1 synthetic aperture radar image shows the Teles Pires river in Brazil (Mato Grosso State) and tropical rain forests that have been partially cut down. A regular pattern of deforestation is clearly visible, with some rectangular patches of destroyed forest extending over areas as large as 20 square kilometers. Since tropical forests are often obscured by clouds, the radar on ERS- 1 is well-suited to imaging areas near the equator.

SOURCE: European Space Agency. Used with permission.

PLATE 8. Changes in the Central Pacific Ocean

This series of three panels shows monthly sea level changes in the central Pacific Ocean as observed by the TOPEX/Poseidon satellite from November 1992 to January 1993. The area shown in red is the region where sea level is more than 15 centimeters (6 inches) greater than normal. In the series of panels, the eastward movement of an area of high sea level is clearly visible. Such movement represents the release of vast amounts of heat energy stored in a so-called ‘‘Warm Pool’ region of the western equatorial Pacific. When it impinges on the coast of South America, such a current may become known as an El Nino event; past El Nino events have resulted in devastation of Peruvian fisheries, increased rainfall amounts across the southern United States and world-wide disturbances in weather patterns that have caused severe economic losses. These images were produced from TOPEX/Poseidon *altimetry* **data** by the Ocean Monitoring and Prediction Systems Section of the U.S. Naval Research Laboratory. TOPEX/Poseidon is a joint project of NASA and the French space agency, Centre National d’Etudes Spatiales (CNES).

SOURCE: Public Information Office, Jet Propulsion Laboratory, California Institute of Technology, National Aeronautics and Space Administration, Pasadena, California. Used with permission.

PLATE 9. Ozone Depletion

Data from NOAA’s Polar-Orbiting TOVS (Tiros Operational Vertical Sounder) is used to display the rapid decline in protective stratospheric ozone over Antarctica during the past dozen years. The growing black spot represents the lowest total ozone values,

SOURCE: NOAA, NESDIS. Used with permission.

PLATE 10. Kharg Island

By tinting the 1986 image of Kharg Island, Iran one color, and the 1987 image another, and then combining the images, analysts were able to highlight changes on the island. Objects present in the first image but not in the second appear in blue, while objects present in the second image but not in the first, such as the circular antiaircraft battery on the small island to the North appear yellow.

SOURCE: 1993 CNES, Provided by SPOT Image Corp., Reston, VA. Reprinted with permission.

PLATES 11 and 12, Civilian Satellites and Verification

In the first image, the Vetrino missile operating base in 1988 is shown. Overlay of the site diagram from the INF treaty shows a reasonably good fit with observed and treaty data. Nevertheless, some *differences* can be identified; for example, atA the road turns in a different direction, at *B* some new construction has taken place by 1988, and at C, the structure is not indicated in the treaty.

The second image shows an enlarged section from an image of the Polotsk missile operating base. Overlay of the site diagram from the INF treaty is not a good fit in this case. For example, the orientation of a building at *A is* different in the image from that indicated in the treaty; the road at *B* cannot be seen in the image and the perimeter fence (C)is very different. Also, considerable difference exists between the structure at *D* and the road leading in or out of the facitity.

SOURCE: Bhupendra Jasani, CNES/SPOT; images processed at RAE, Farnborough, UK. Reprinted with permission.