遥感数字影像处理导论

（第三版）

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Introductory Digital Image Processing

A Remote Sensing Perspective

Third Edition

John R.Jensen

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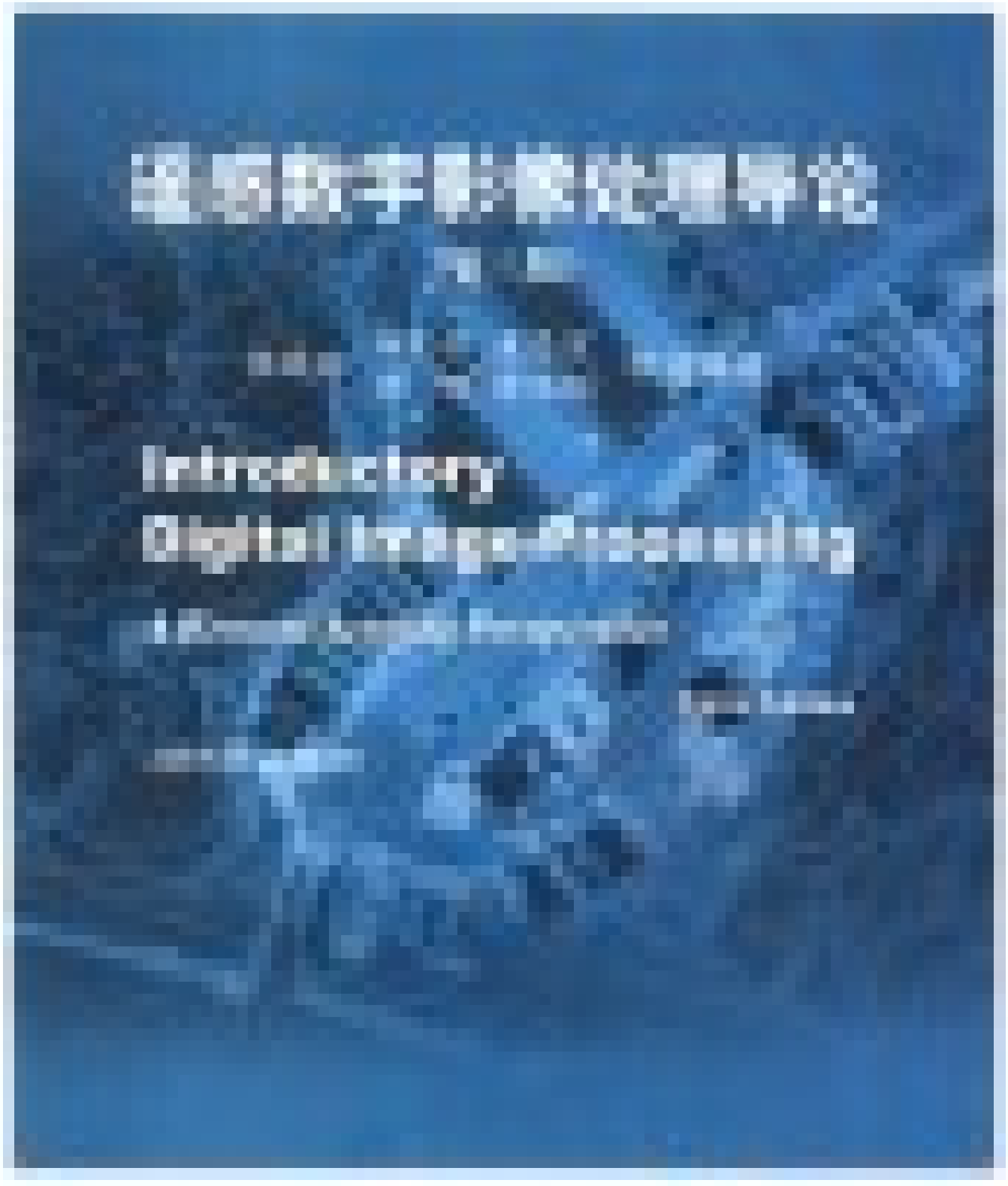

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本书在总结遥感成像特点的基础上，按照遥感影像处理的步骤循序渐进地讨论了包括：遥感数据采集、遥感数字影像处理的软硬件、遥感影像的质量评估与统计评价、遥感影像显示与科学可视化、辐射校正（大气校正）、几何纠正、影像增强、模式识别、人工智能信息提取、高光谱影像分析、变换检测和专题信息精度评价等，并附上了遥感常用词汇中英文对照索引，内容丰富、新颖，且具有很强的可操作性。此外，书中还附有大量直观精美的图片，以加深读者对重要影像处理概念的理解。

本书适合作为高等学校遥感及相关应用专业本科生和研究生双语版教材，对于相关专业的工作人员也是很好的参考手册，也可作为专业英语的参考资料。

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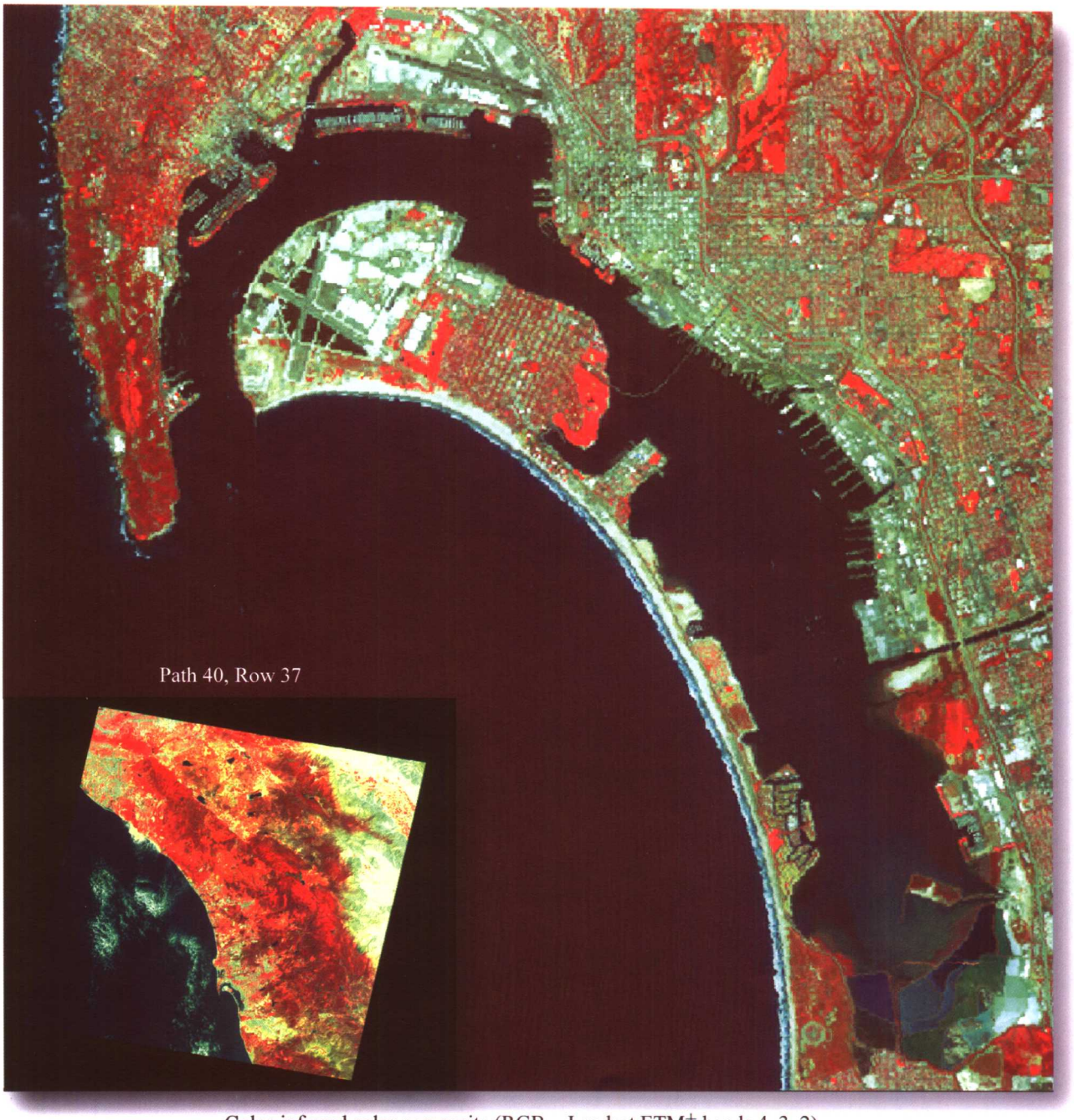
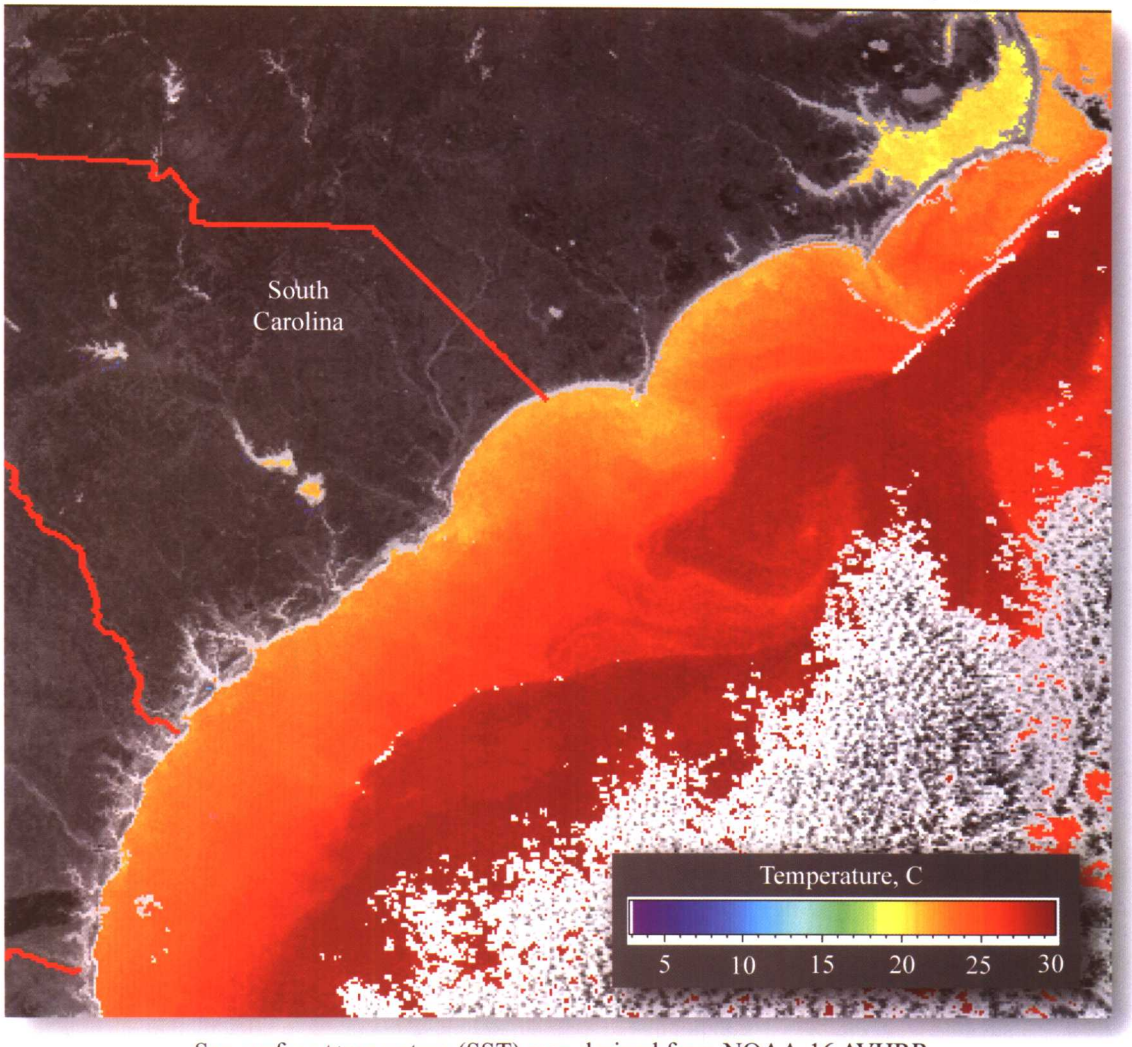
Landsat 7 Enhanced Thematic Mapper Plus Imagery of San Diego, CA



Color-infrared color composite (RGB = Landsat ETM$^+$ bands 4, 3, 2).

Color Plate 2-1 Color composite of Landsat 7 Enhanced Thematic Mapper Plus (ETM$^+$) imagery of San Diego, CA, obtained on April 24, 2000 (courtesy of NASA).

NOAA-16 Advanced Very High Resolution Radiometer Imagery



Sea-surface temperature (SST) map derived from NOAA-16 AVHRR band 4 (10.3 - 11.3 μm) imagery obtained on October 16, 2003.

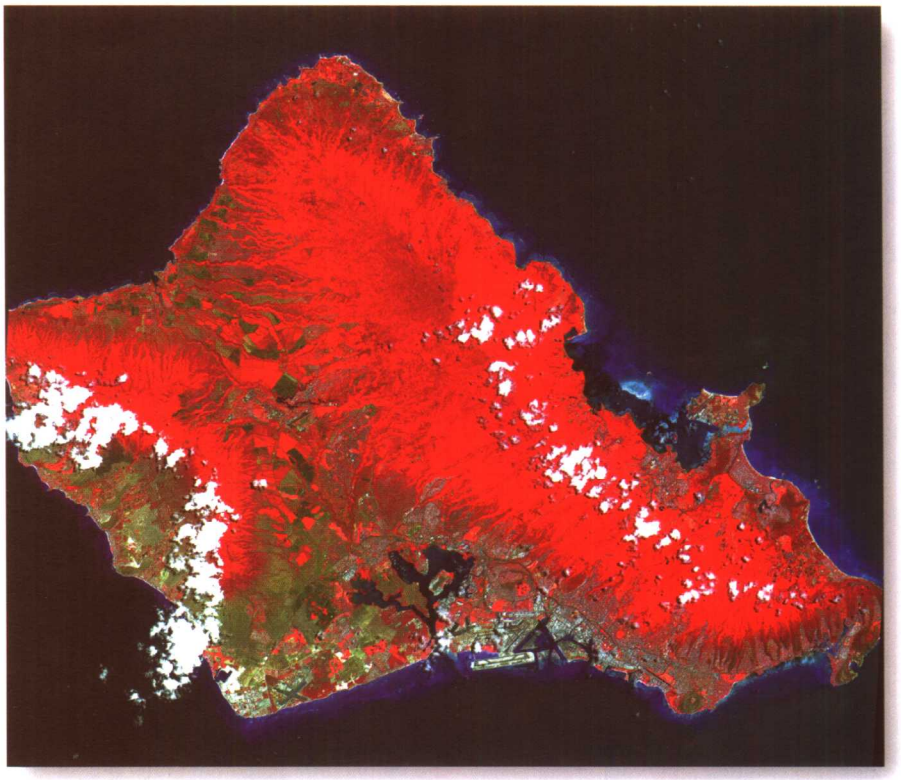
Color Plate 2-2 Sea-surface temperature (SST) map derived from NOAA-16 AVHRR thermal infrared imagery (courtesy of NOAA and the Ocean Remote Sensing Program at Johns Hopkins University; Gasparovic, 2003).

SPOT 5 Imagery of Los Angeles, CA

SPOT 5 image of Los Angeles, CA, created by merging 2.5 x 2.5 m panchromatic data with 10 x 10 m multispectral data. The imagery is draped over a 30 x 30 m USGS digital elevation model.

Color Plate 2-3 SPOT 5 imagery of Los Angeles, CA (© CNES 2004, Spot Image Corporation).

Terra ASTER Optical Imagery of Oahu, HI

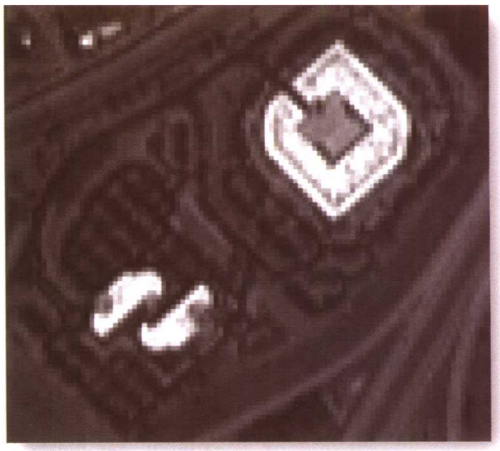


a. ASTER 15 x 15 m color composite of Oahu, HI, obtained on June 3, 2000 (RGB = bands 3, 2, 1).

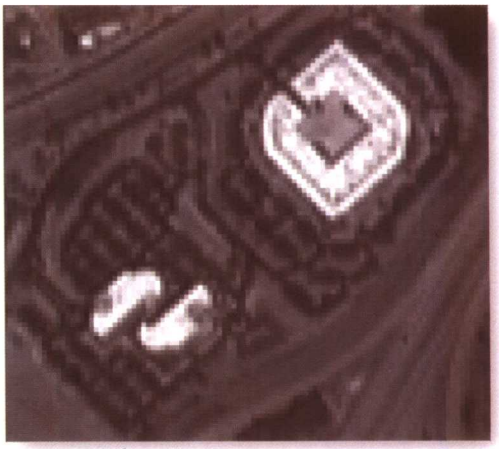
b. Enlargement centered on Pearl Harbor.

Color Plate 2-4 *Terra* ASTER imagery of Oahu, HI (courtesy of NASA/GSFC/MITI/ERSADC/JAROS, U.S./Japan ASTER Science Team, and the California Institute of Technology).

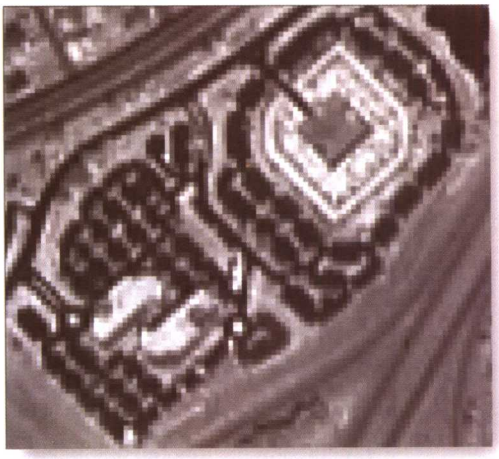
IKONOS Multispectral and Panchromatic Imagery of Columbia, SC



a. Band 2 (0.52 - 0.60 μm) 4 x 4 m.



b. Band 3 (0.63 - 0.69 μm) 4 x 4 m.



c. Band 4 (0.76 - 0.90 μm) 4 x 4 m.

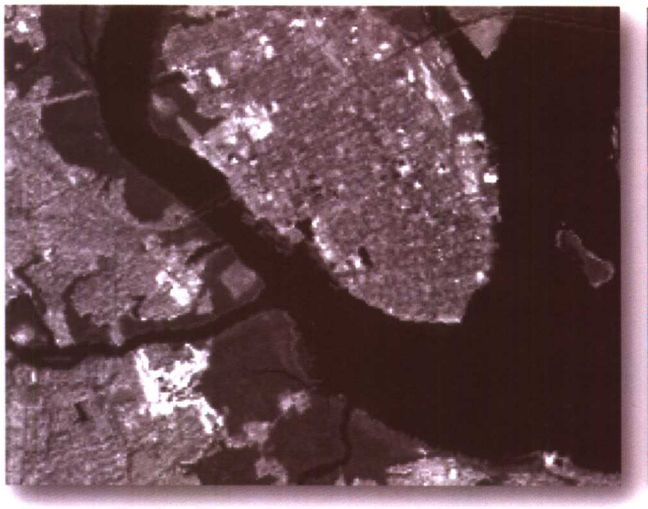
d. Panchromatic band (0.45 - 0.90 μm) 1 x 1 m.

e. Color composite (RGB = bands 4, 3, 2).

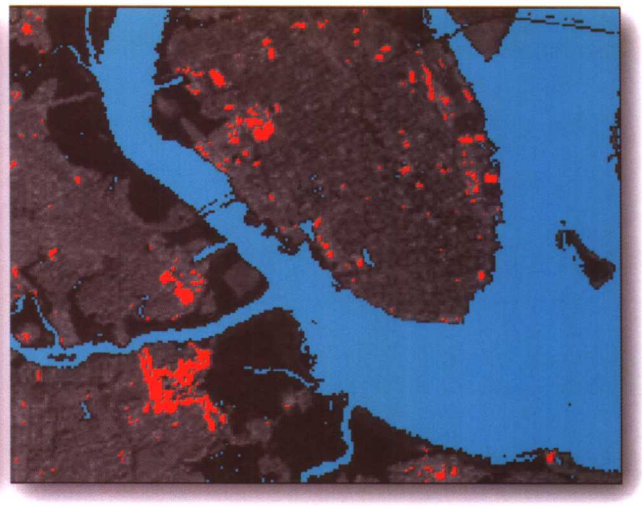
f. Brovey merge of bands 4, 3, 2 and panchromatic.

Color Plate 2-5 IKONOS imagery of a business park in Columbia, SC. a–d) Individual 4 × 4 m multispectral bands and the 1 × 1 m panchromatic band are displayed. e) Standard color composite of IKONOS bands 4, 3, and 2. f) Color composite of a merged dataset created using a Brovey transform discussed in Chapter 5 (images courtesy of Space Imaging, Inc.).

Density Slicing Using an 8-bit Color Look-up Table

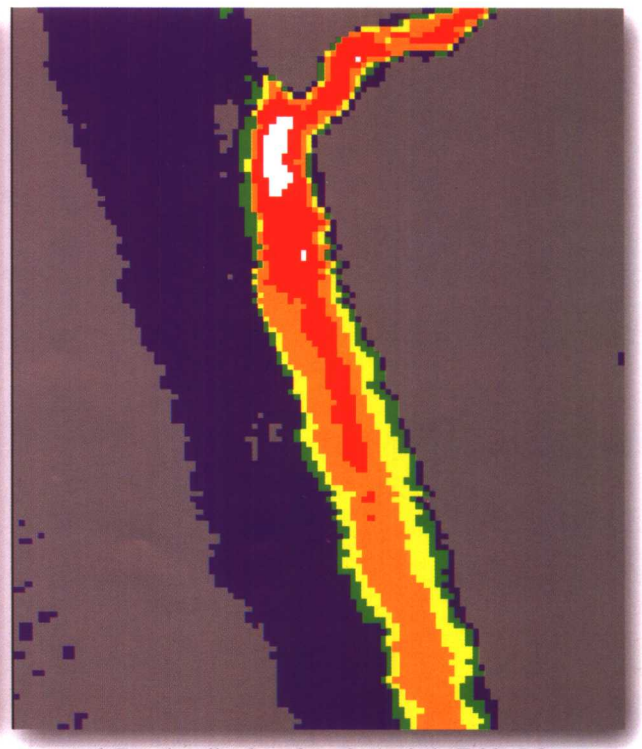


a. Landsat Thematic Mapper band 4 image of Charleston, SC, obtained on November 9, 1982.



b. Density slice based on the logic in Table 5-1.

c. Predawn thermal infrared image of the Savannah River obtained on March 28, 1981.

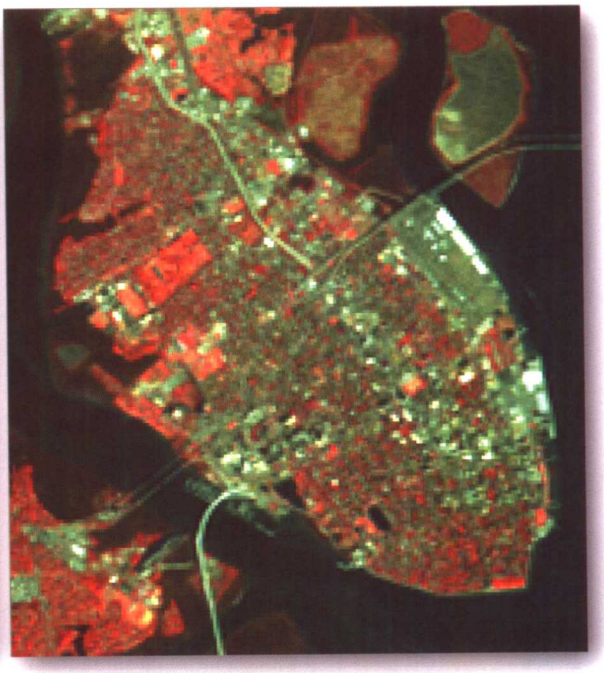


d. Density slice based on the logic in Table 5-2.

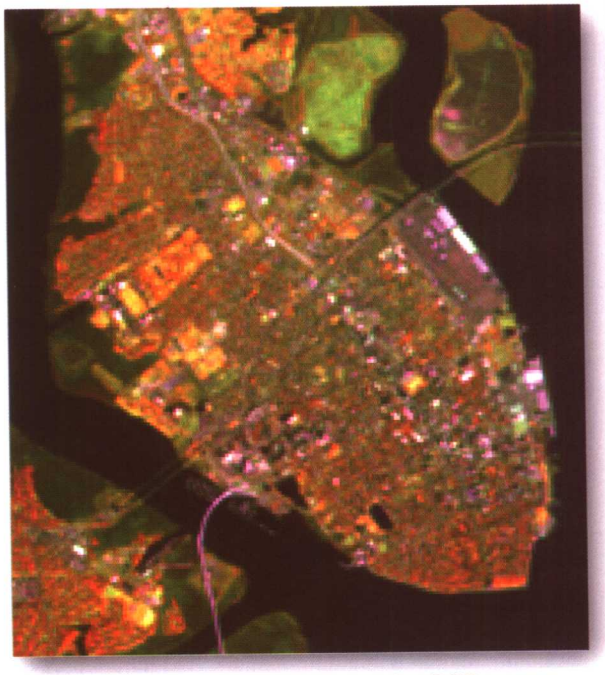
Color Plate 5-1 a) Black-and-white display of Landsat Thematic Mapper band 4 (0.76 – 0.90 μm) 30 × 30 m data of Charleston, SC. b) Color density slice using the logic summarized in Table 5-1. c) Black-and-white display of predawn thermal infrared (8.5 – 13.5 μm) imagery of the Savannah River. Each pixel is approximately 2.8 × 2.8 m on the ground. d) Color density slice using the logic summarized in Table 5-2.

Color Composites of Landsat Thematic Mapper Data of Charleston, SC, Obtained on February 3, 1994

a. Landsat TM bands 3, 2, 1 = RGB.



b. Landsat TM bands 4, 3, 2 = RGB.

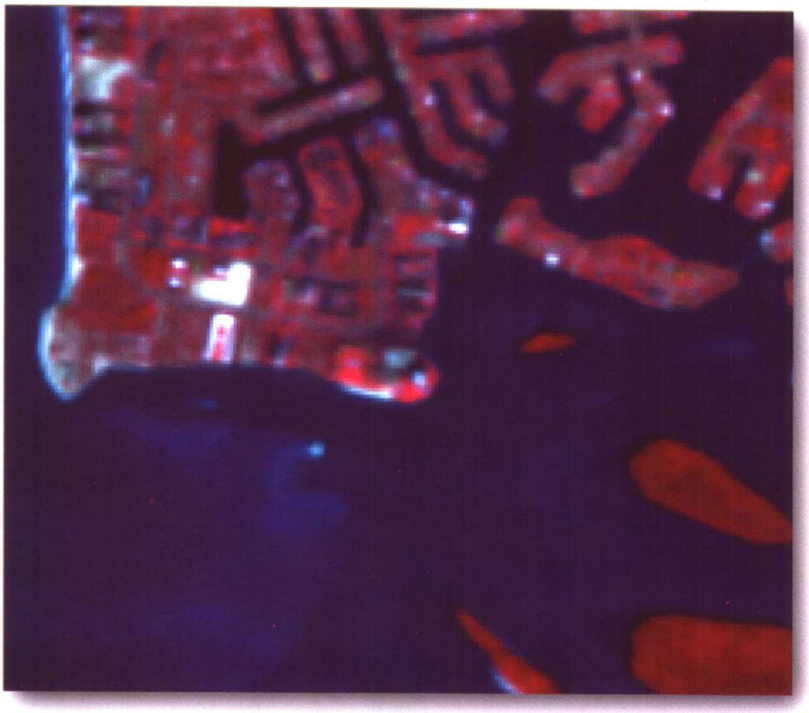


c. Landsat TM bands 4, 5, 3 = RGB.

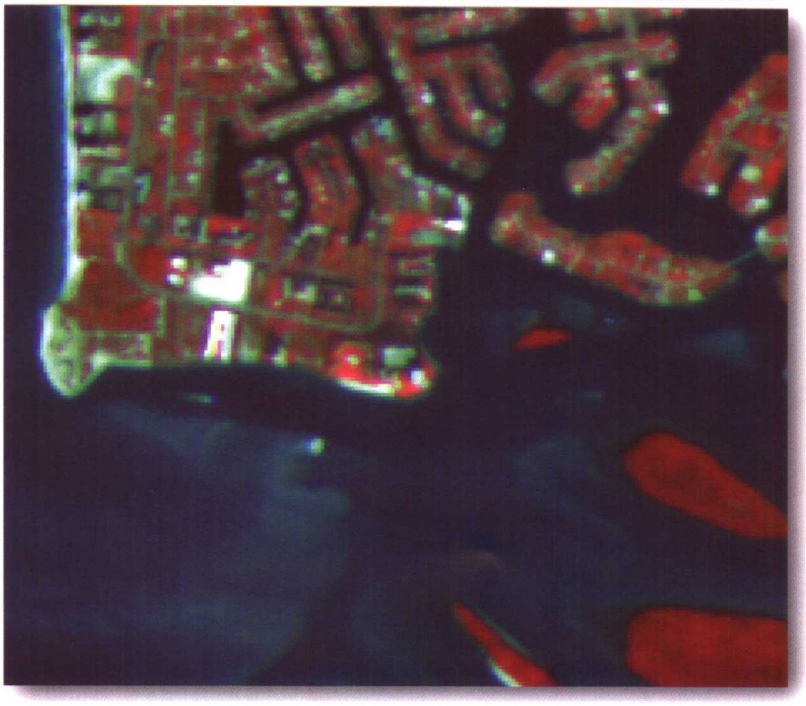
d. Landsat TM bands 7, 4, 2 = RGB.

Color Plate 5-2 Color composites of Landsat Thematic Mapper data of Charleston, SC, obtained on February 3, 1994. a) Composite of Landsat TM bands 3, 2, and 1 placed in the red, green, and blue (RGB) image processor memory planes, respectively. b) TM bands 4, 3, and 2 = RGB. c) TM bands 4, 5, 3 = RGB. d) TM bands 7, 4, 2 = RGB.

Merging (Fusion) of SPOT 20 x 20 m Multispectral and 10 x 10 m Panchromatic Data of Marco Island, FL



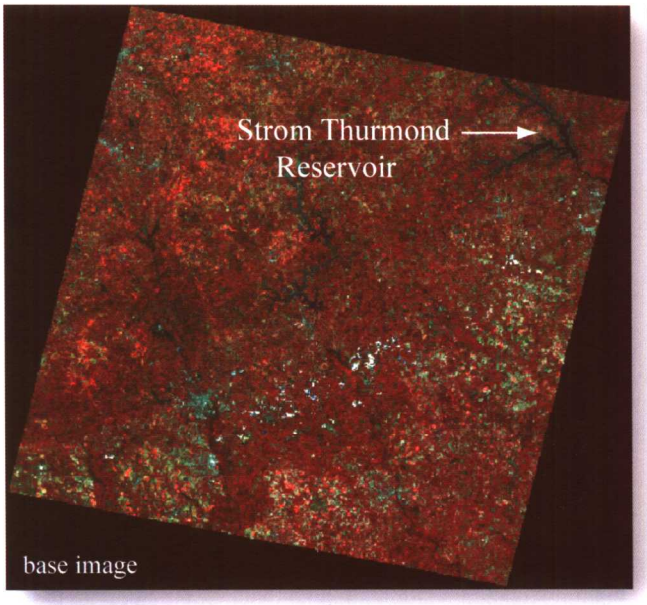
a. Color-infrared color composite of SPOT band 3 (near-infrared), 2 (red), and 1 (green) = RGB. Each band is 20 x 20 m.



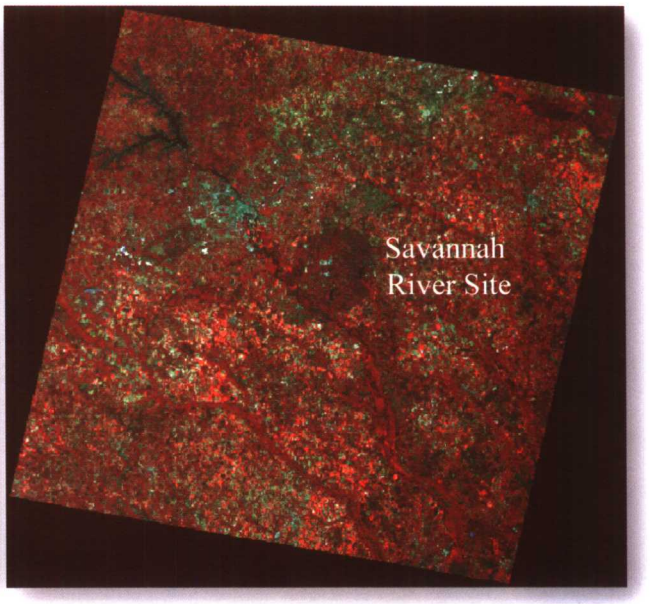
b. Fused color-infrared color composite of SPOT band 3 (near-infrared), 4 (panchromatic), and 1 (green) = RGB. The panchromatic band is 10 x 10 m. The composite was created by substituting the panchromatic band for band 2 (red).

Color Plate 5-3 Merging (fusion) of SPOT multispectral data (20 × 20 m) with SPOT panchromatic data (10 × 10 m) using the band substitution method. The 20 × 20 m multispectral data were resampled to 10 × 10 m (© CNES 2004, Spot Image Corporation).

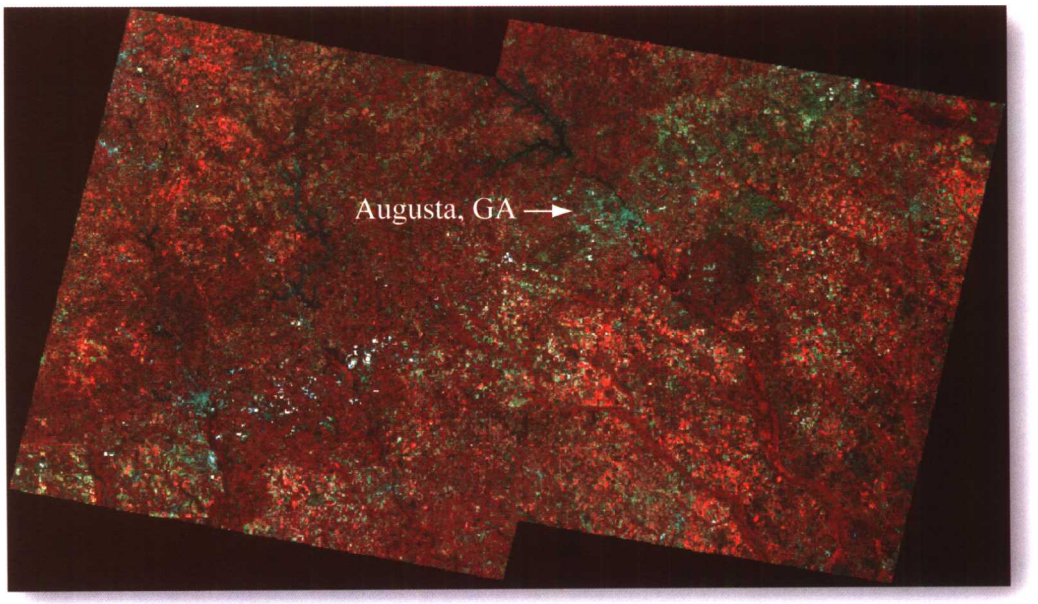
Image Mosaicking



a. Rectified Landsat ETM+ image of eastern Georgia obtained on October 3, 2001 (bands 4, 3, 2; Worldwide Reference System—Path 18, Row 37).

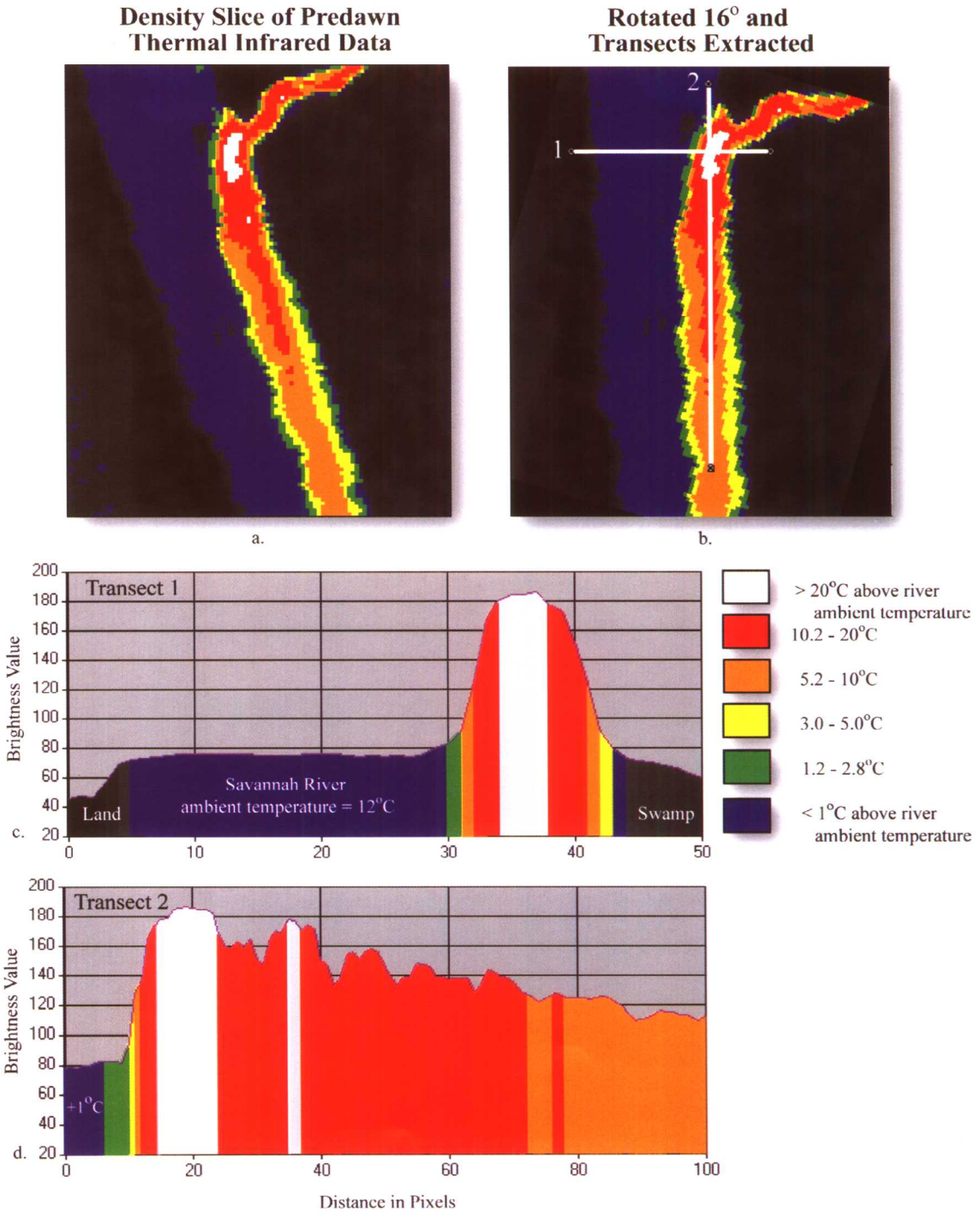


b. Rectified Landsat ETM+ image of western South Carolina obtained on October 26, 2001 (bands 4, 3, 2; Worldwide Reference System—Path 17, Row 37).

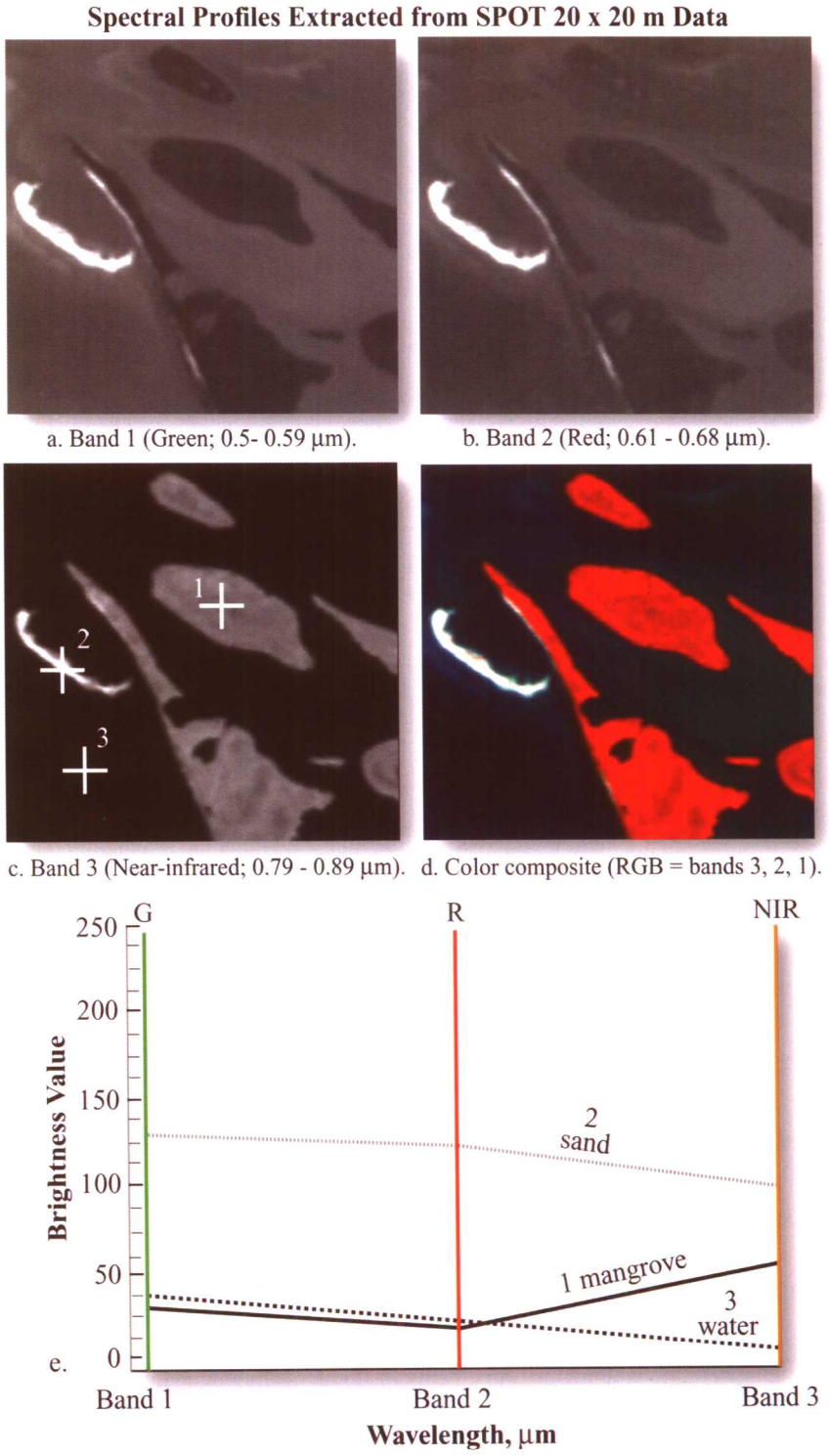


c. Feathered mosaic of rectified Landsat ETM+ imagery of eastern Georgia and western South Carolina.

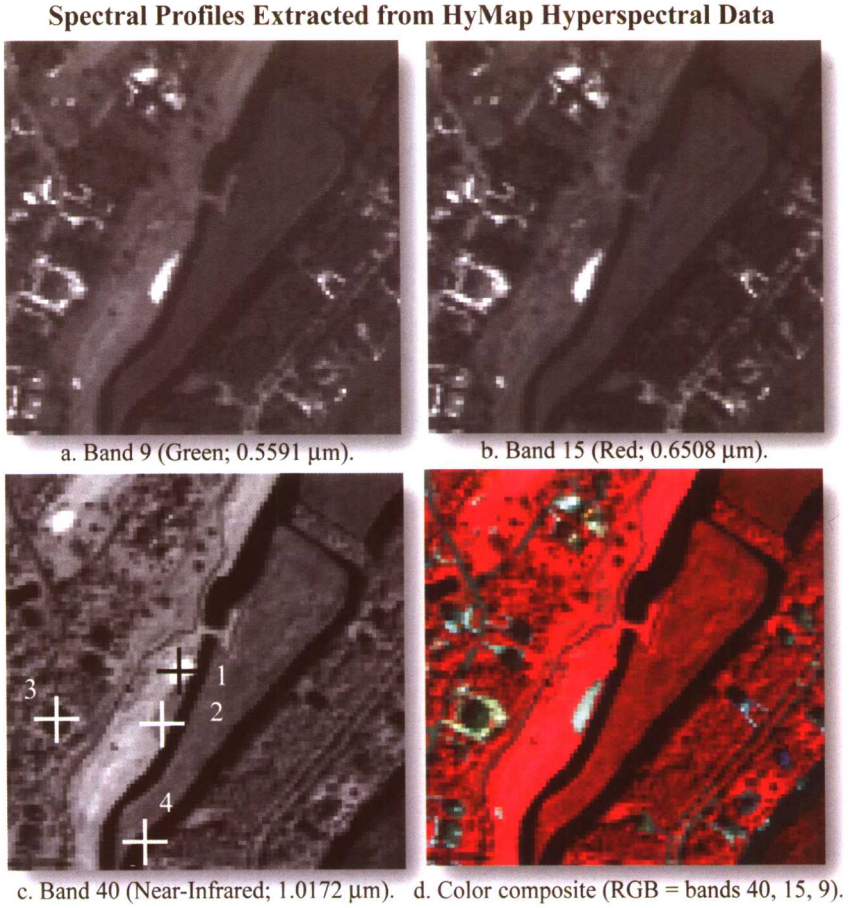
Color Plate 7-1 Two Landsat Enhanced Thematic Mapper Plus (ETM+) images are mosaicked using feathering logic.



Color Plate 8-1 Transects (spatial profiles) passed through a predawn thermal infrared image of a thermal plume located in the Savannah River. a) Original image density-sliced according to the logic discussed in Table 8-1. b) Density-sliced image rotated 16° with Transects 1 and 2 displayed. c) Spatial profile of Transect 1. d) Spatial profile of Transect 2.

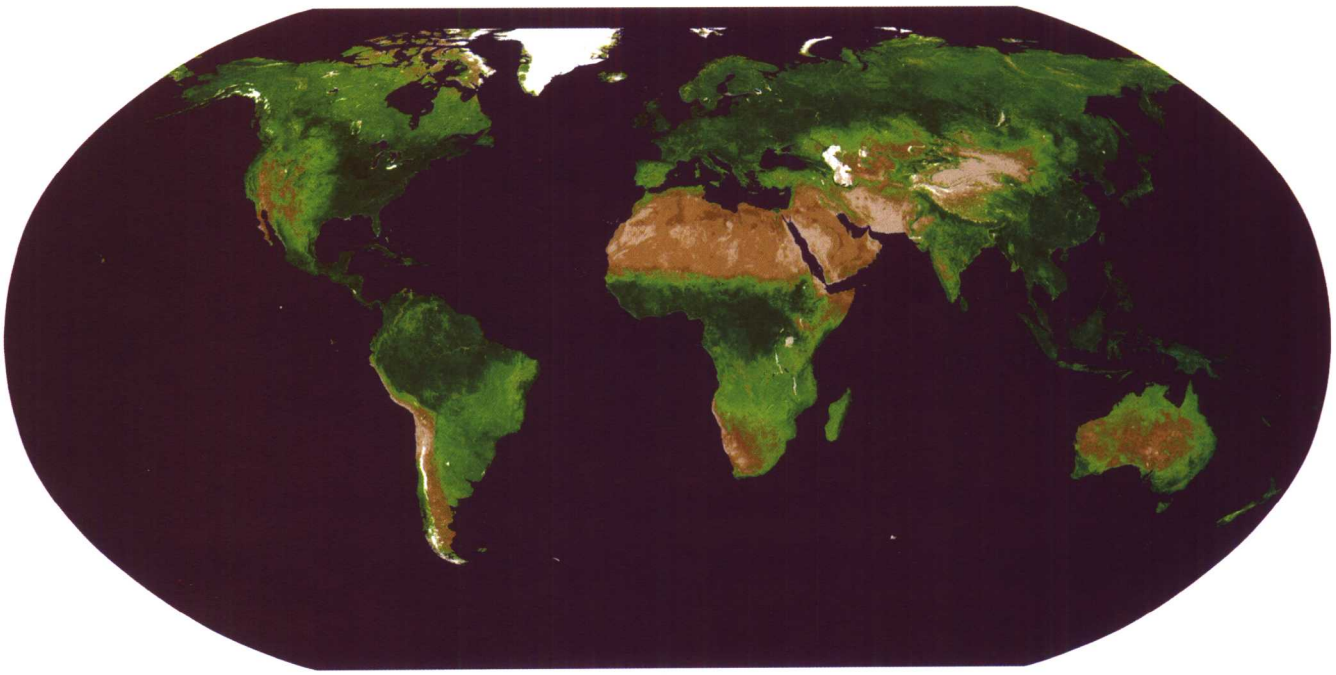


Color Plate 8-2 a–c) Three bands of SPOT 20 × 20 m multispectral data of Marco Island, FL. d) A color composite of SPOT bands 3, 2, and 1. e) Spectral profiles of mangrove, sand, and water extracted from the multispectral data (images courtesy of © SPOT Image Corporation).



Color Plate 8-3 a–c) Three bands of HyMap hyperspectral data of the Debordiu colony near North Inlet, SC. The data were obtained at a spatial resolution of 3 × 3 m. d) Color composite of HyMap bands 40, 15, and 9. e) Spectral profiles of golf "green" turf, sand, roof, and water extracted from the 116 bands of hyperspectral data.

MODIS Enhanced Vegetation Index Map of the World



Color Plate 8-4 MODIS Enhanced Vegetation Index (EVI) map of the world obtained over a 16-day period beginning on day 193 of 2003. The greener the area, the greater the amount of biomass (courtesy Terrestrial Biophysics and Remote Sensing MODIS Team, University of Arizona and NASA).