

HyspIRI Combined CQ6 Science Questions

Gregory Glass

Department of Molecular Microbiology and Immunology

Johns Hopkins University

Baltimore, MD

410-955-3708

gglass@jhsp.edu

Dale A. Quattrochi

NASA

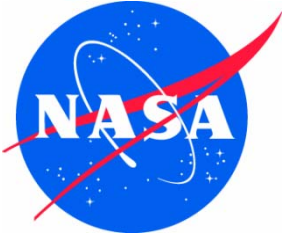
Earth Science Office

Marshall Space Flight Center

Huntsville, AL

256-961-7887

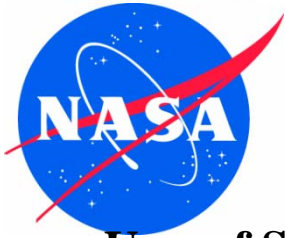
dale.quattrochi@nasa.gov



CQ6 HysplRI Science Questions



CQ6 Overarching Question: *How do patterns of human environmental and infectious diseases respond to leading environmental changes, particularly to urban growth and change and the associated impacts of urbanization?*



CQ6 HypsIRI Science Questions

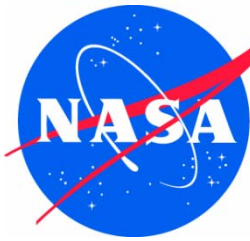
Human Health and Urbanization Sub-questions



Uses of Space-based Observations to Address Human Health Concerns

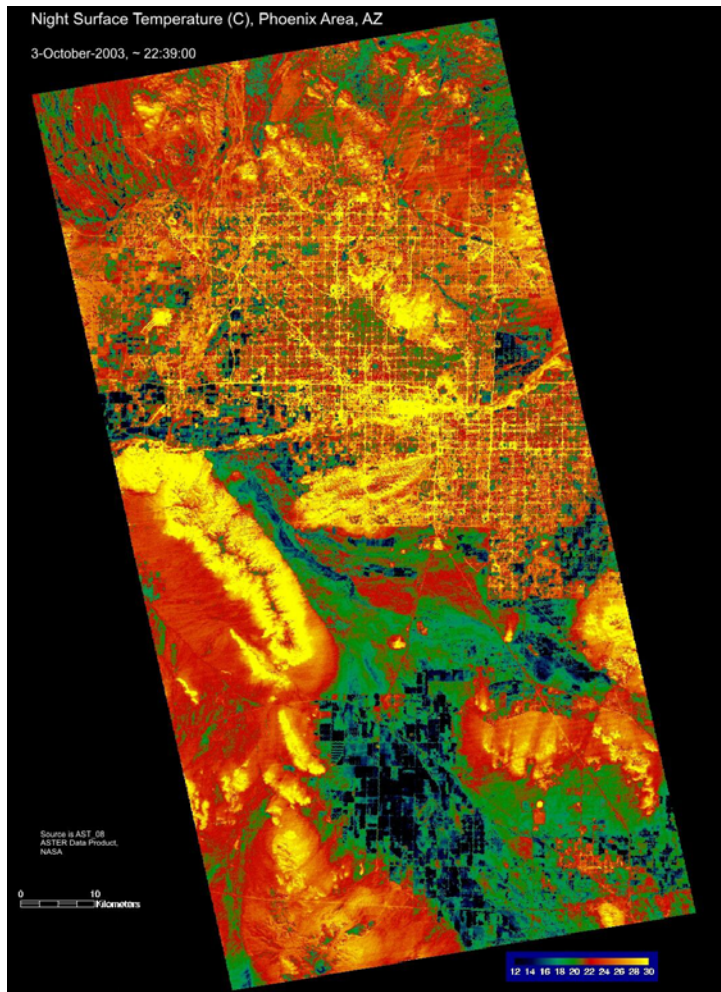
In addressing human health and security concerns, space-based observations are most useful when merged with many other sources of data. Public-health, risk assessment, management and decision making has benefited from space-based technologies, and can benefit further with improvements in these technologies, through applications that address issues of:

- How land surface characteristics such as vegetation state, soil moisture, temperature, and land cover composition affect heat stress and drought, and vector-borne and zoonotic disease [DS: 156,158,160,183-184,198]
- How air pollution (e.g., particulate matter) interacts with land cover status and energy balance characteristics, to impact respiratory and cardiovascular diseases? [DS: 158,177]
- What changes can be observed and measured in emissivities of urban surfaces and how do emissivities change for different cities around the world as they impact the urban heat island and associated land-atmosphere energy balance characteristics? [DS: 167-168]
- How the distribution of urban and peri-urban impervious surfaces affect regional energy balance fluxes, hydrologic processes, and biogeochemical fluxes, and what is the response of ecosystems to these changes? [DS: 167-168,198,203]
- How environmental management strategies mitigate changes to hydrologic processes, including heat and biogeochemical fluxes and coastal waters in reducing related risks to human health and economic well-being? [DS: 146,167, 196, 204, 208]
- How can we characterize the dispersion, transport, and chemical evolution of hazardous plumes generated by industrial effluents and accidents? [DS: 160-161, 170-178]



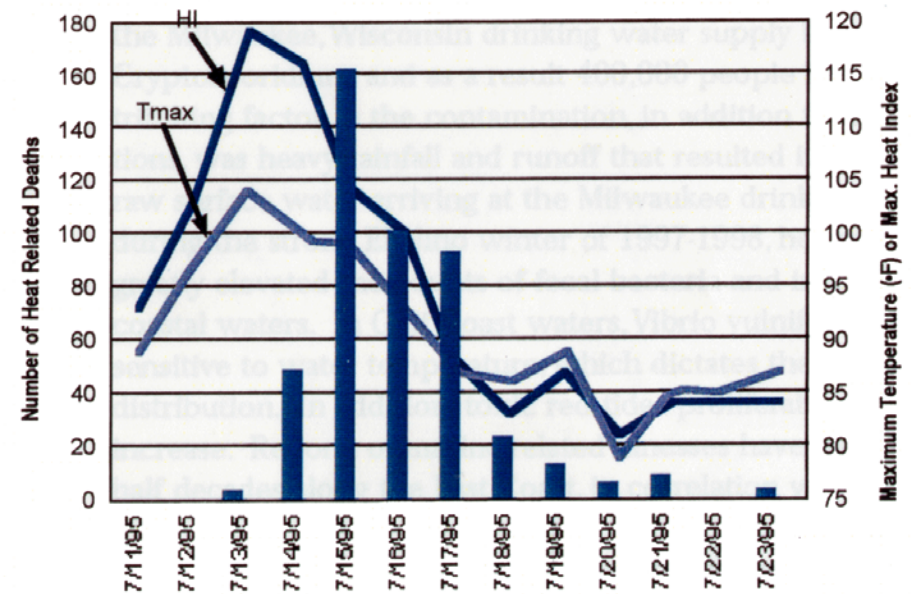
CQ6. HypsIRI Science Questions

Human Health and Heat Island

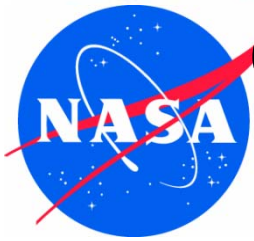


Heat Related Deaths - Chicago

Maximum Temperature and Heat Index



This graph tracks maximum temperature, heat index, and heat-related deaths in Chicago each day from July 11 to 23, 1995. The gray line shows maximum daily temperature, the blue line shows the heat index, and the bars indicate number of deaths for the day.



CQ6. HypIRI Science Questions

Heat Stress & Drought



Chile 31 March 2001 Color Composite bands 3,5,4 (2.5% Saturation)

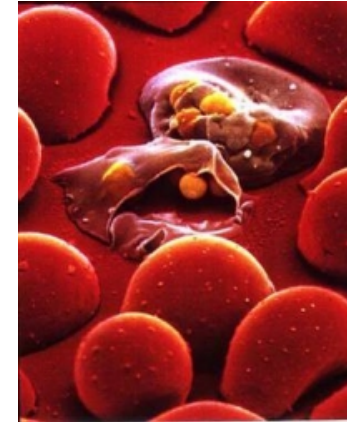
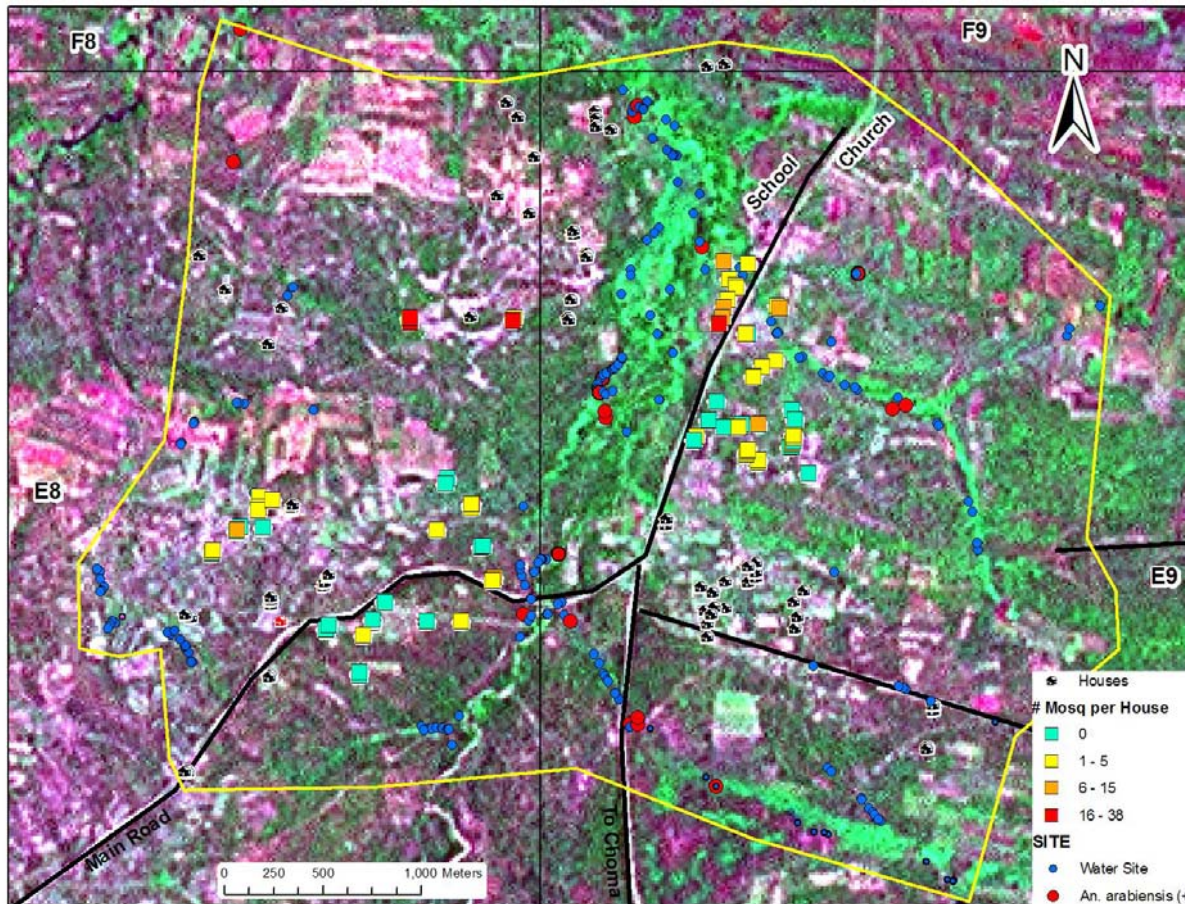


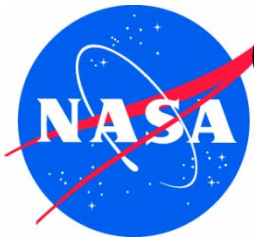


CQ6. HyspIRI Science Questions

Vector-borne Diseases (Malaria)

Heterogeneous Transmission with Landscape



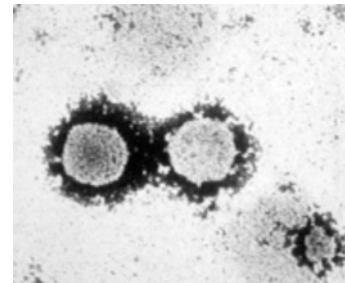
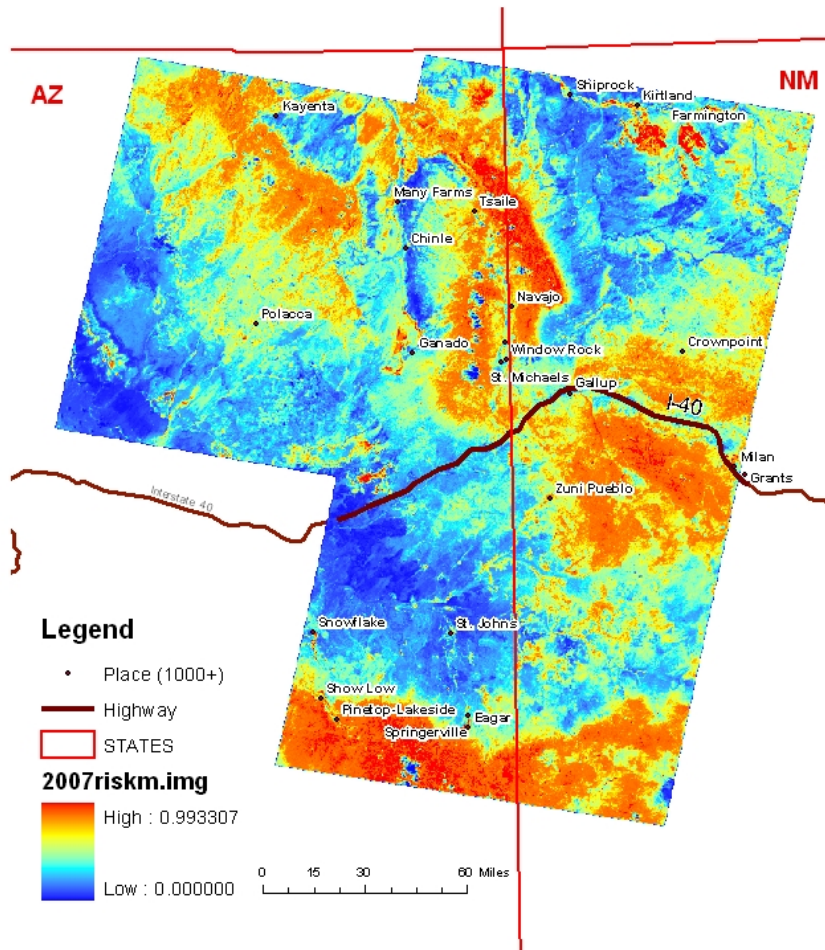


CQ6. HysplRI Science Questions

Zoonotic Diseases



Hantavirus Pulmonary Syndrome Riskmap
Southwestern, USA 2007





CQ6. HysplRI Science Questions

Air Pollution & Cardiovascular Disease

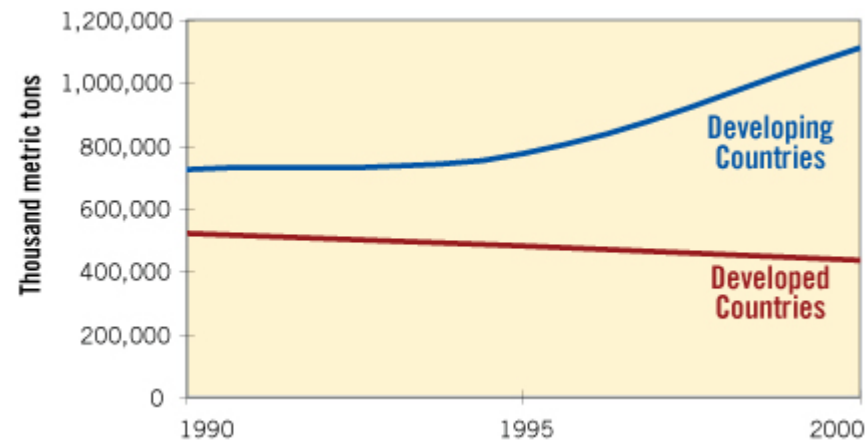
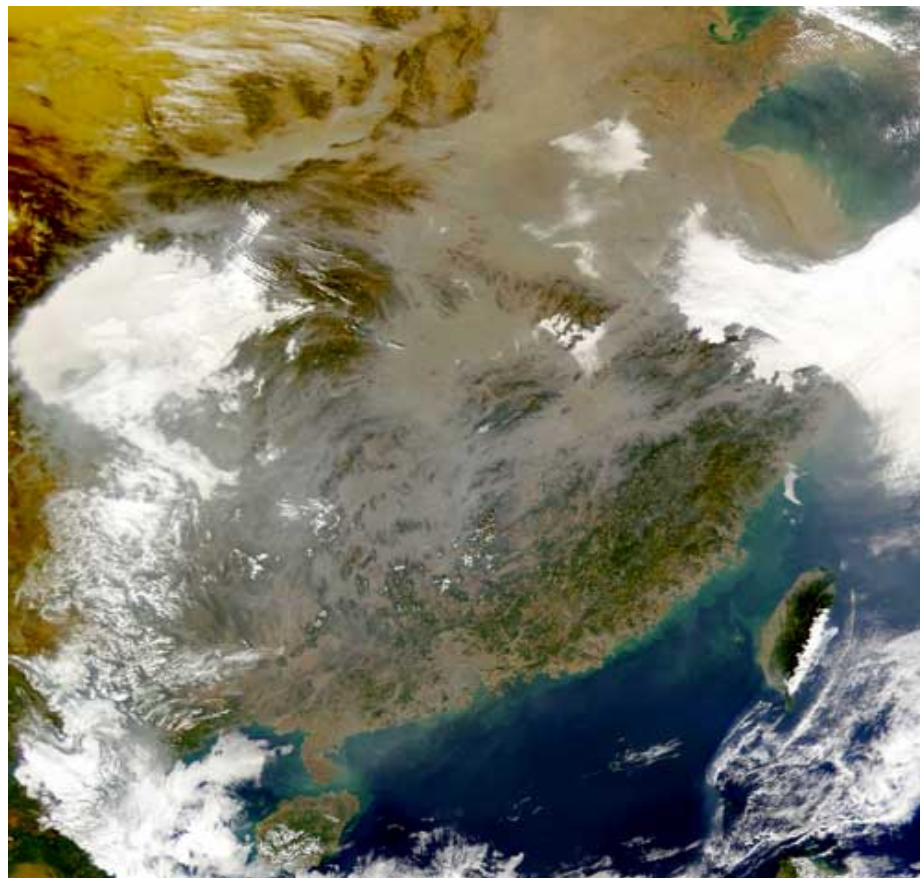


TABLE 1. Excess Deaths from Selected Environmental Factors

Environmental risks	Global estimate	Asian estimate (S, SE Asia + W Pacific)	Asia as a percent of global
Unsafe water	1,730,000	730,000	42%
Urban outdoor air	799,000	487,000	65%
Indoor air	1,619,000	1,025,000	63%
Lead	234,000	88,000	37%

DALY (YLL) attributable to PM2.5

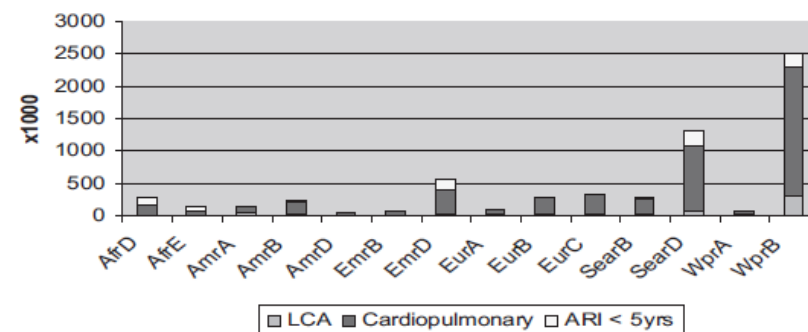
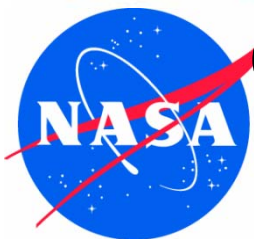


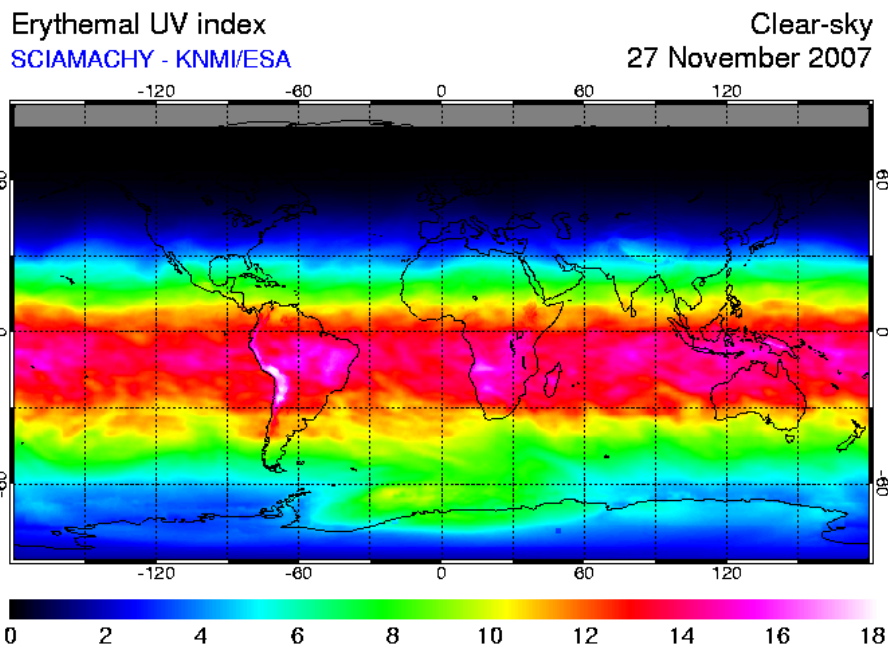
FIGURE 3. Years of life lost attributable to urban air pollution by region.

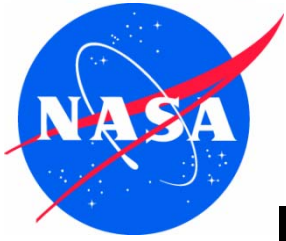
Cohen AJ, et al 2005



CQ6. HypsIRI Science Questions

UV and Cancer

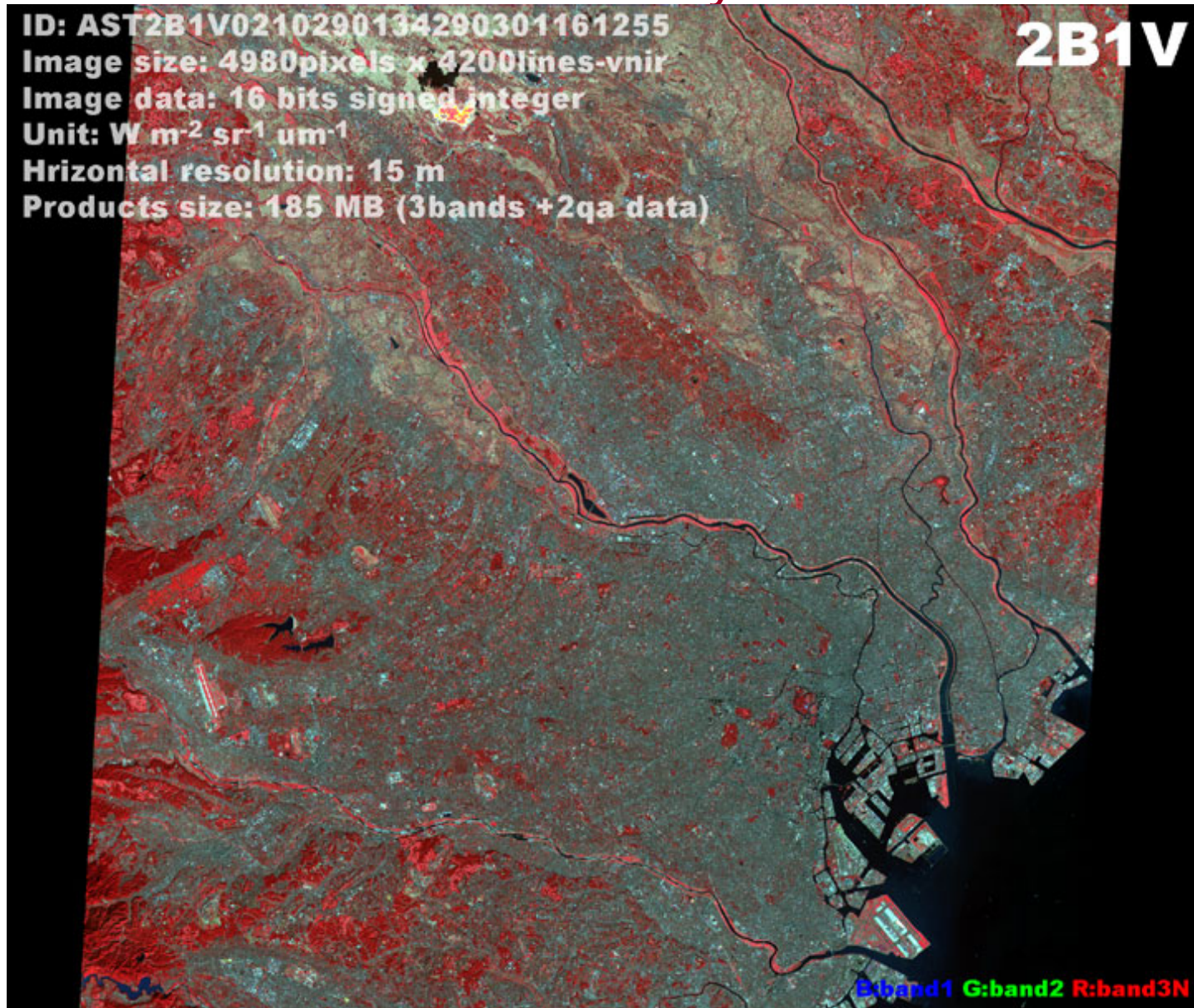




CQ6. HypsIRI Science Questions



Emissivity

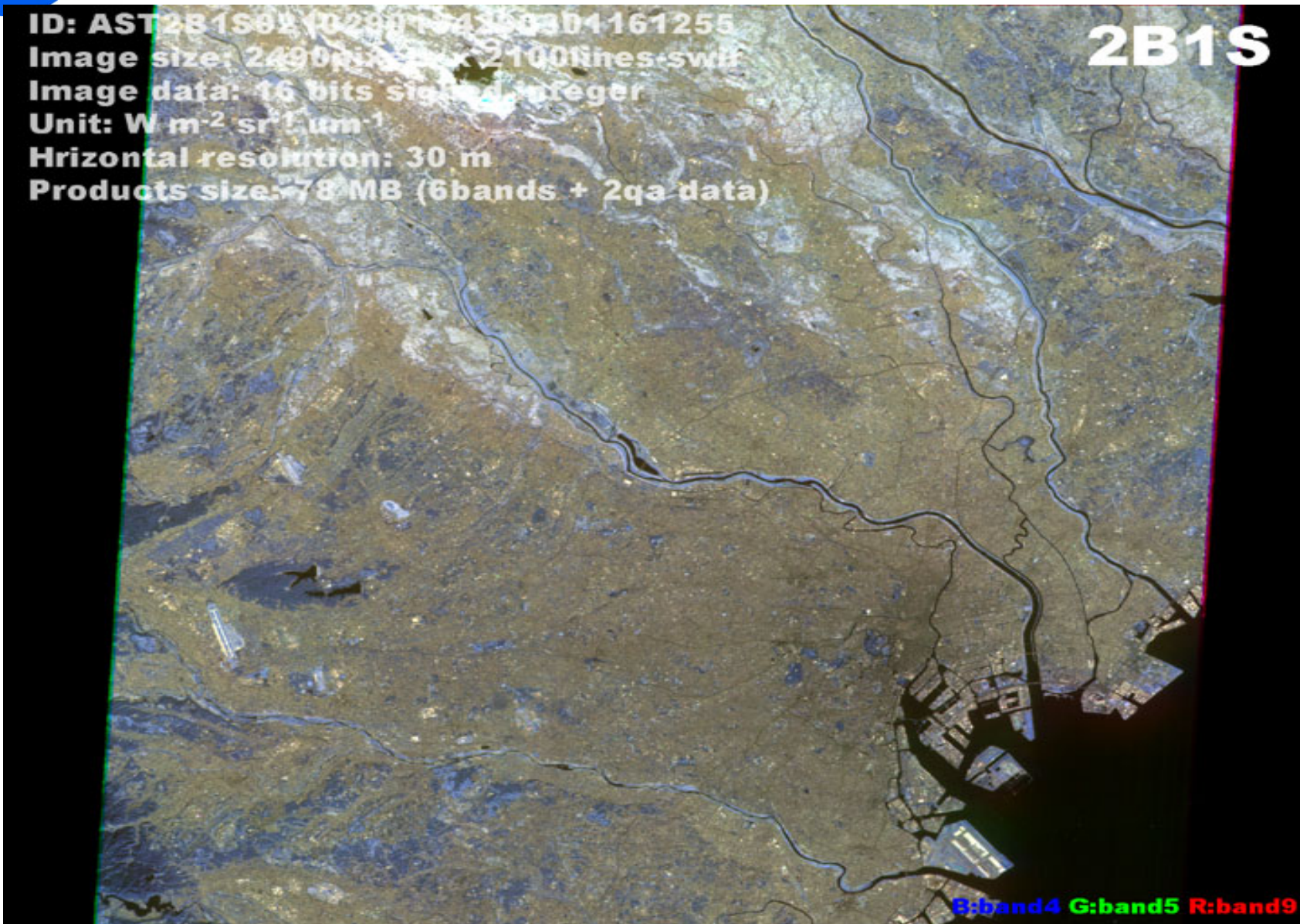


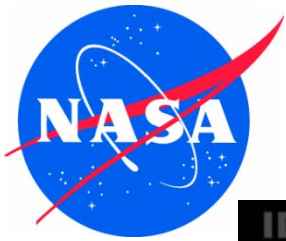


CQ6. HypsIRI Science Questions



Emissivity

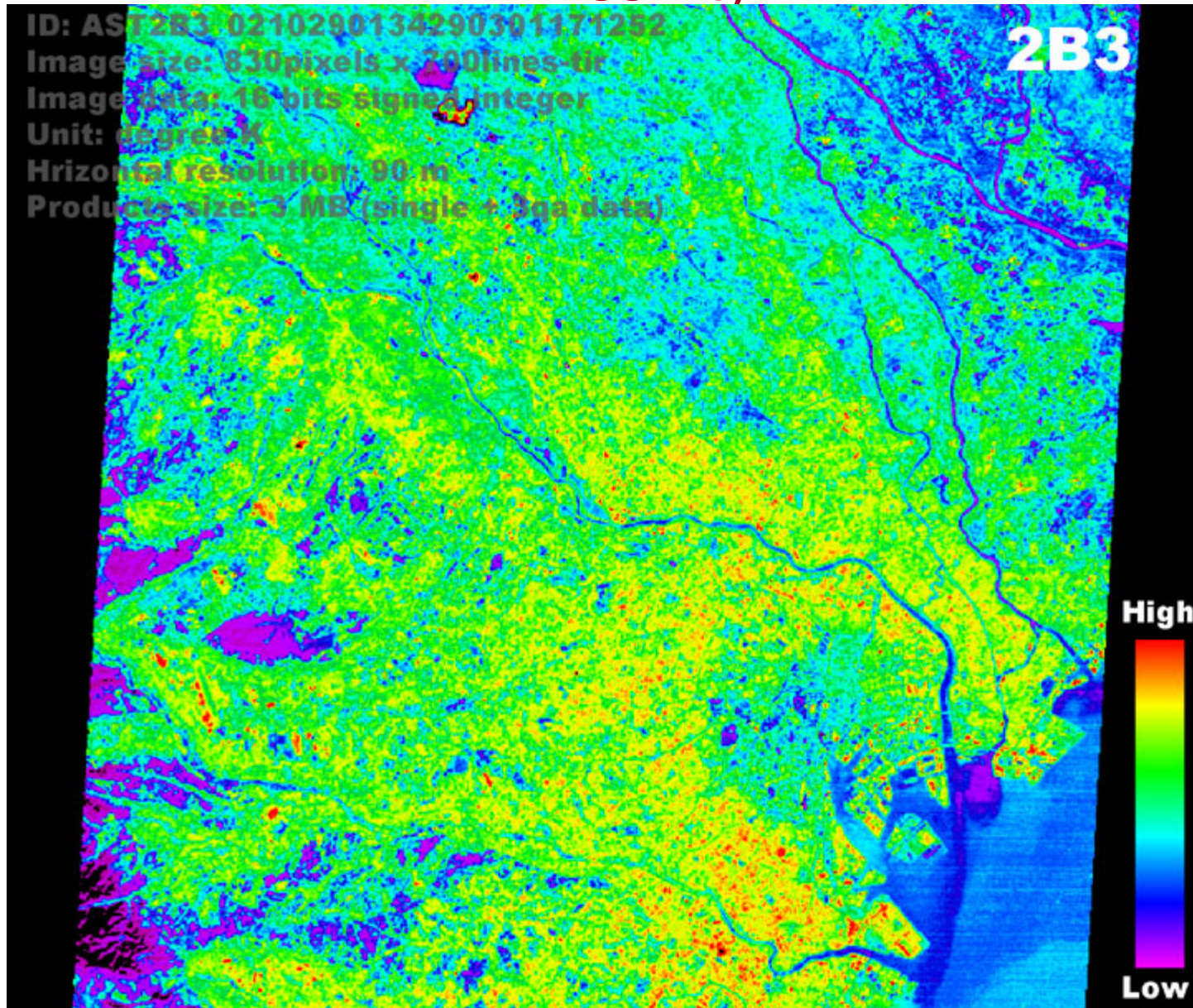


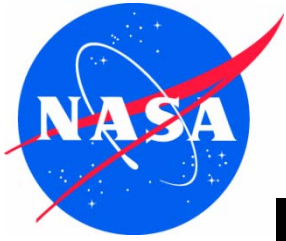


CQ6. HypsIRI Science Questions



Emissivity





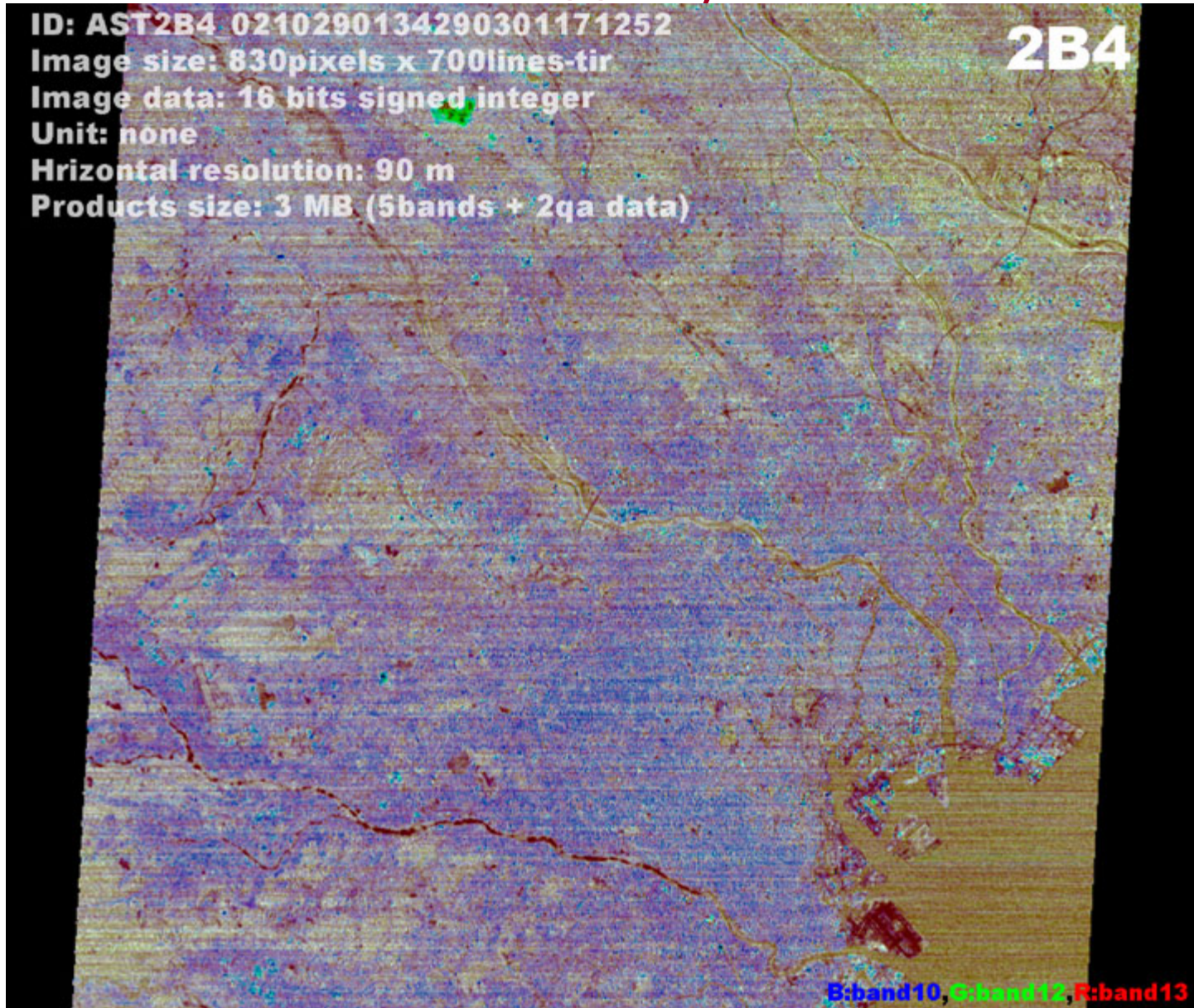
CQ6. HypsIRI Science Questions



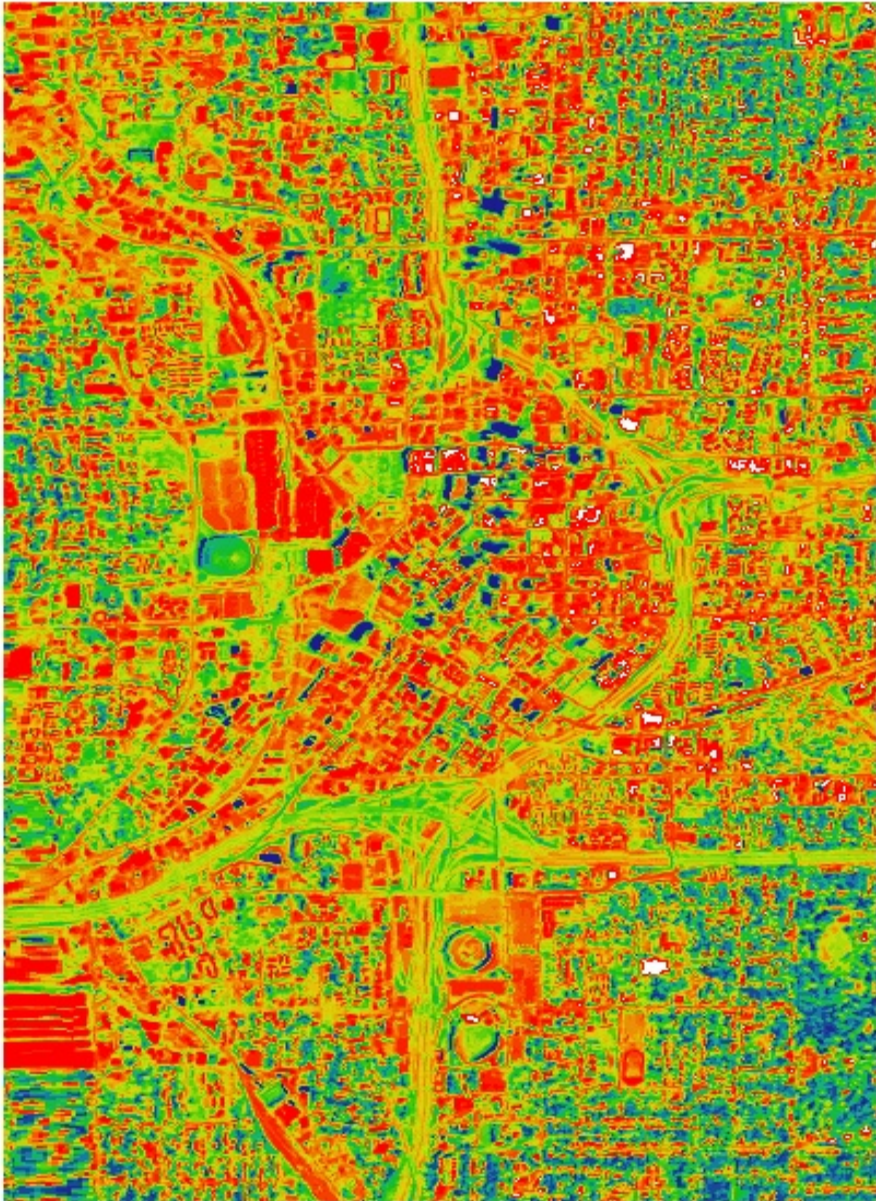
Emissivity

ID: AST2B4_0210290134290301171252
Image size: 830pixels x 700lines-tir
Image data: 16 bits signed integer
Unit: none
Horizontal resolution: 90 m
Products size: 3 MB (5bands + 2qa data)

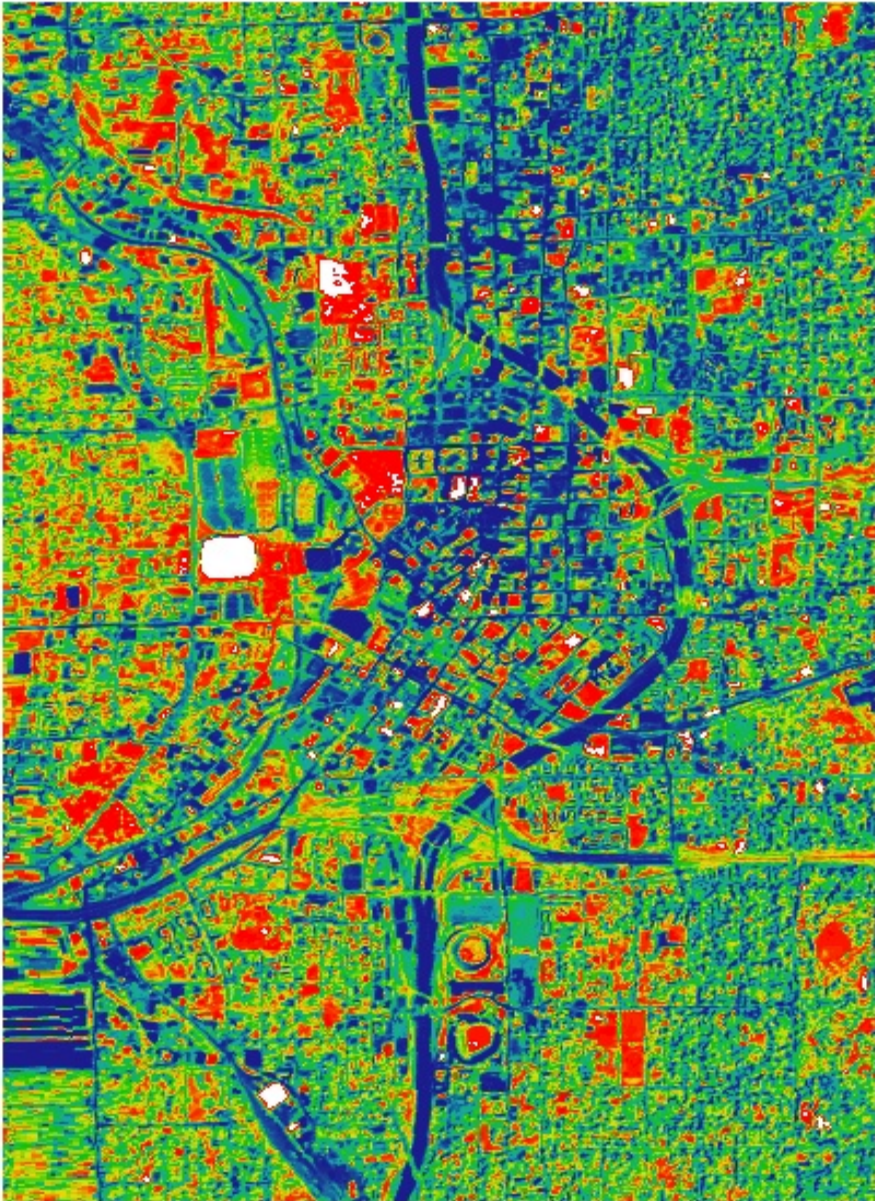
2B4



B:band10, G:band12, R:band13

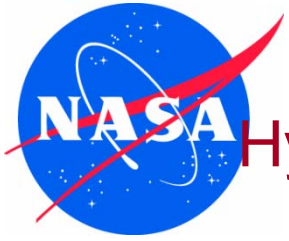


Temperature



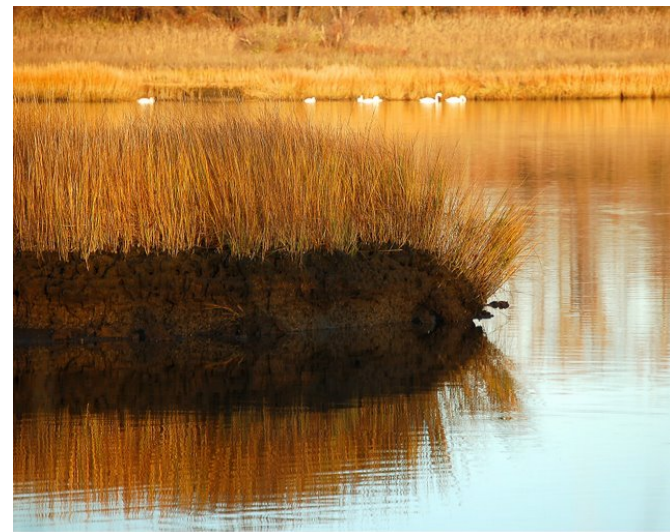
Albedo

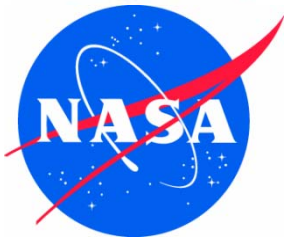
Atlanta, GA - May 1997



CQ6. HypsIRI Science Questions

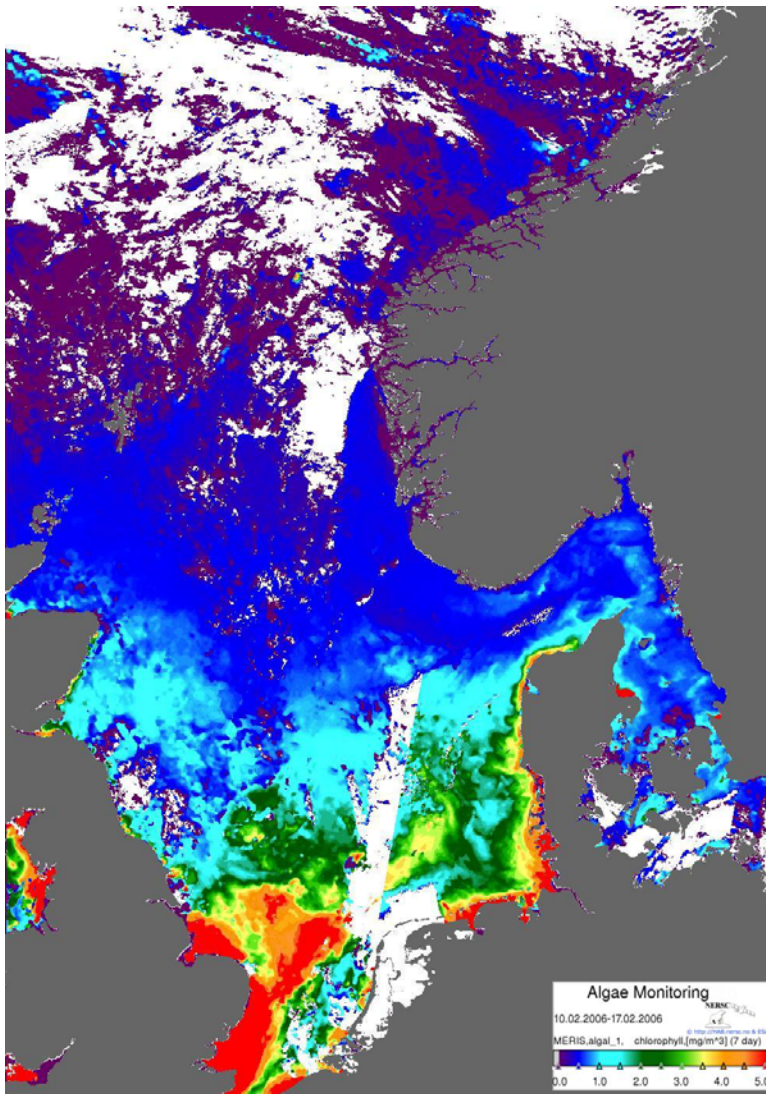
Hydrologic Processes & Biogeochemical Fluxes





CQ6. HypsIRI Science Questions

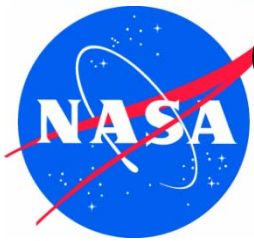
Monitoring Hydrologic Processes and Algal Blooms in Near Shore regions



Natural Color



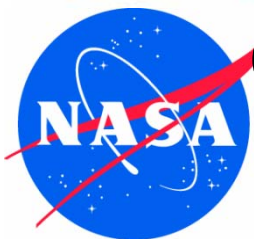
False Color (Shortwave, Near-Infrared, and Red)



CQ6. HyspIRI Science Questions

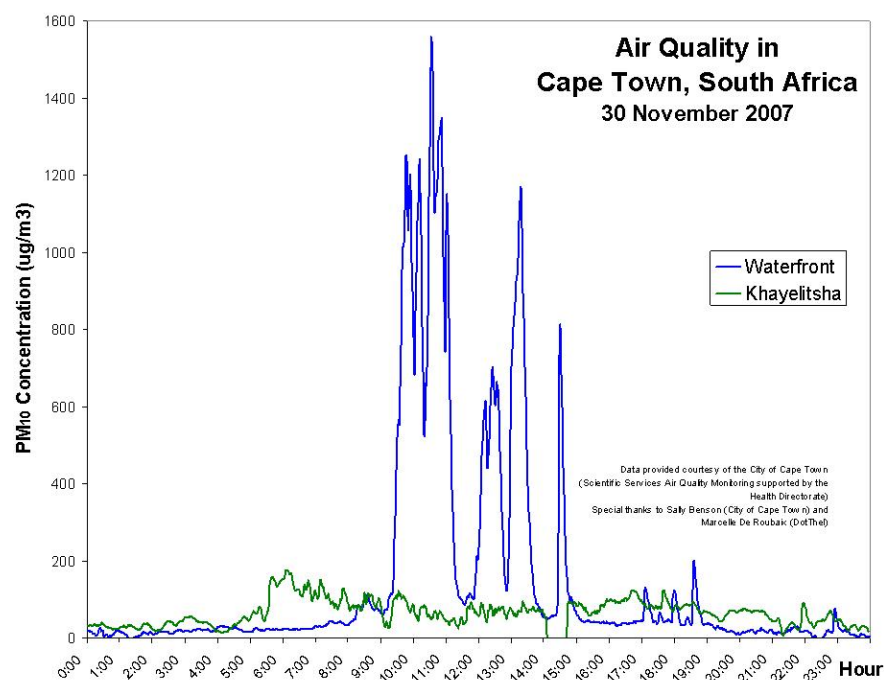
Air Pollution & Hazardous Plumes

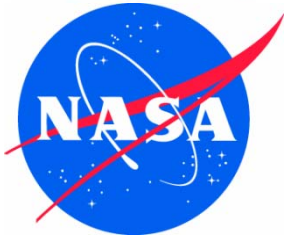




CQ6. HyspIRI Science Questions

Air Pollution & Hazardous Plumes





CQ6 HypsIRI Science Questions

Human Health and Urbanization Sub-questions



PRIORITY OBSERVATIONS, MEASUREMENTS, AND TECHNOLOGY DEVELOPMENT

This section identifies various needs for space-based observational data that will help to address human health problems in six areas of application:

(Areas That HypsIRI TIR Data Can Address)

- Heat stress and drought,
- Vector-borne and zoonotic disease,
- Ultraviolet radiation and cancer,
- Hydrologic processes, algal blooms and water-borne infectious diseases,
- Air pollution and respiratory/cardiovascular disease, and
- Acute toxic pollution releases.