International Space Station Photography of LTER Sites

Astronaut photography is a uniquely useful dataset due to its inherent variability in spatial scale and temporal frequency. Used together with traditional remotely sensed data, astronaut photography has the potential to increase the temporal resolution of land cover/land use change, vegetation dynamics, and surface soil process information for LTER sites. William Stefanov is the primary contact at NASA/Johnson Space Flight Center for this collaboration.

John Vande Castle at the LTER Network Office and Will Stefanov (formerly with CAP) at the NASA Johnson Space Center worked on the use of Space Station photography for LTER Sites. JSC staff gave a positive response to adding LTER sites as specific targets in future missions and this was included in the science plan beginning with the ISS 011 crew.

The ISS Photography is freely available at the "**The Gateway to Astronaut Photography of Earth":** http://eol.jsc.nasa.gov/sseop/clickmap/

A more comprehensive technical serach for ISS Photography is freely available at: http://eol.jsc.nasa.gov/sseop/technical.htm

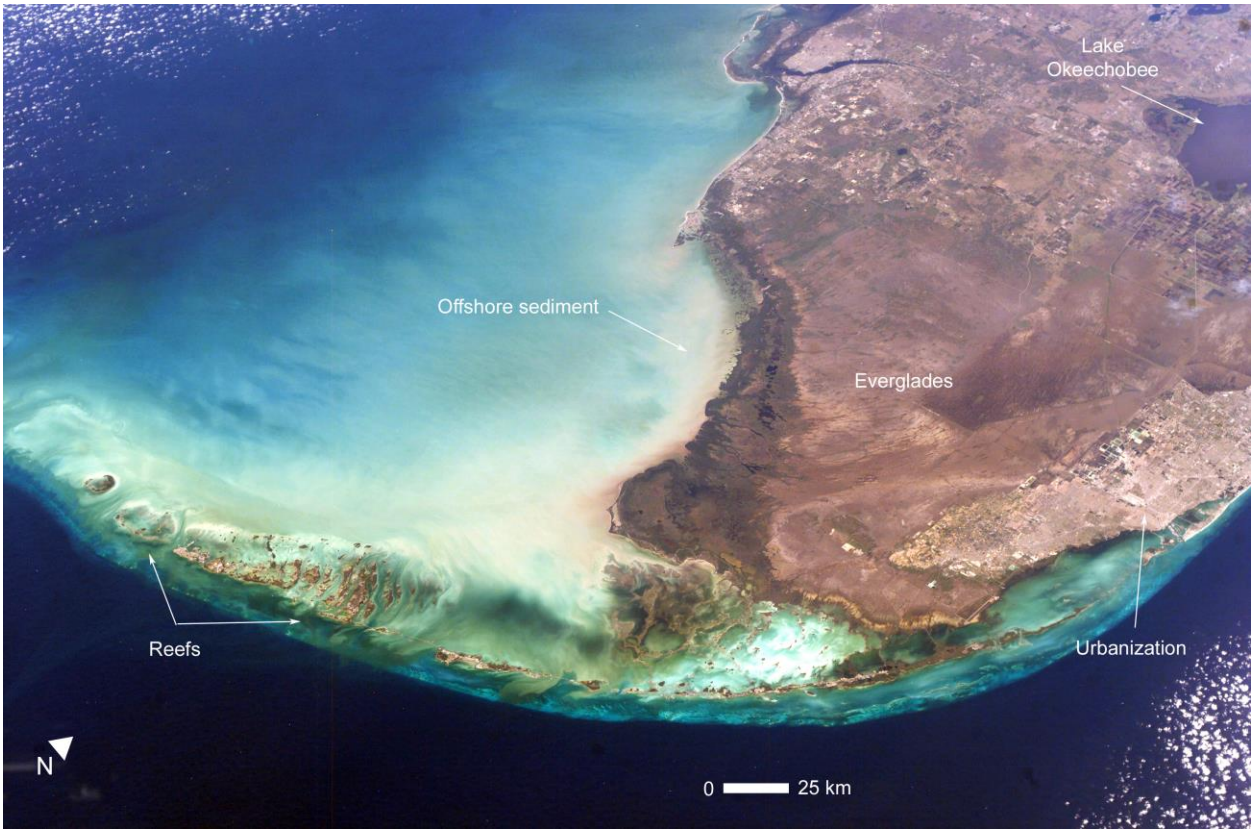
An example image from the ISS 10 Mission of the Florida Evergaldes (FCE LTER Site)

Mission: **ISS010** Roll: **E** Frame: **17590** Mission ID on the Film or image: **ISS010**
Country or Geographic Name: **USA-FLORIDA**
Features: **SOUTH FLORIDA, FLORIDA KEYS**
Center Point Latitude: **25.5** Center Point Longitude: **-81.5** Stereo: *(Yes indicates there is an adjacent picture of the same area)*
ONC Map ID: JNC Map ID: **Camera**

Camera Tilt: **51**
Camera Focal Length: **50mm**
Camera: **E4: Kodak DCS760C Electronic Still Camera**
Film: **3060E : 3060 x 2036 pixel CCD, RGBG array. Quality**

Film Exposure:
Percentage of Cloud Cover: **10** *(0-10)* **Nadir**

Date: **20050211** *(YYYYMMDD)*GMT Time: **183608** *(HHMMSS)*
Nadir Point Latitude: **23.1**, Longitude: **-78.4**
Nadir to Photo Center Direction: **Northwest**
Sun Azimuth: **206** *(Clockwise angle in degrees from north to the sun measured at the nadir point)*
Spacecraft Altitude: **190** nautical miles *(352 km)* from the ISS



A Science Plan was written for the ISS Missions including the locations for LTER Site Targets:

ISS Earth Observations Science Plan - Long Term Ecological Research

The National Science Foundation established the Long Term Ecological Research (LTER) network over twenty years ago. This network is comprised of study sites located throughout the continental United States, Alaska, Puerto Rico, Antarctica, and the Pacific Ocean. The sites cover a wide range of ecosystems including reefs and coastal zones; hot and cold deserts; temperate, montane, and grassland regions; and urban areas. The core mission of the network is to understand ecological phenomena over long temporal and spatial scales, conduct well-designed and documented experiments at and between sites, and provide information for identification and solution of ecological problems. Astronaut photography is a uniquely useful dataset for the network due to its inherent variability in spatial scale and temporal frequency. Used together with traditional remotely sensed data, astronaut photography has the potential to increase the temporal resolution of land cover/land use change, vegetation dynamics, and surface soil process information for the LTER sites.

Science collaborators: John Vande Castle, LTER Network Office, University of New Mexico

Responsible NASA staff scientist: William L. Stefanov

Site Name: LTER Sites

Center Point: See list

Box Coordinate Range: See list

Site objective: Characterization/monitoring of land cover/land use, vegetation, and surface soil change

Camera: Digital Camera

Window: Any

Lens: 180-250 for general site mapping, 400 for detail (particularly for tree/shrub/grassland transitional areas)

Viewing Angle: Nadir (preferred) or low oblique

Season(s): All

Maximum clouds: 10%

Frequency: Four times/year to capture spring, summer, fall, winter seasonal change in vegetation

Site List - Long Term Ecological Research (LTER)

Site Name	Box Coordinate Range	Center Point
Andrews Forest	43-46N, 121-123W	44.2N, 122.26W
Baltimore Ecosystem Study	37-40N, 75-79W	39.1N, 76.3W
California Current Ecosystem	31-33N, 119-121W	32.8N, 120.3W
Cedar Creek Natural History Area	44-46N, 92-94W	45.4N, 93.2W
Central-Arizona Phoenix	31-35N, 109-114W	33.4N, 111.9W
Coweeta	34-36N, 82-84W	35.0N, 83.4W
Florida Coastal Everglades	24-26N, 79-81W	25.5N, 80.1W
Georgia Coastal Ecosystems	30-32N, 80-83W	31.4N, 81.4W
Harvard Forest	41-43N, 71-73W	42.5N, 72.2W
Hubbard Brook	42-44N, 70-73W	43.9N, 71.7W
Jornada Basin	31-33N, 105-107W	32.5N, 106.8W
Kellogg Biological Station	41-43N, 84-86W	42.4N, 85.4W
Konza Prairie	38-40N, 93-97W	39.1N, 94.6W
Luquillo	17-19N, 64-66W	18.3N, 65.8W
Moorea Coral Reef Ecosystem	16-18S, 148-150W	17.5S, 149.8W
Niwot Ridge	39-41N, 104-106W	40.0N, 105.4W
North Temperate Lakes	42-47N, 88-90W	46.0N, 89.7W
Plum Island Ecosystem	41-43N, 69-72W	42.8N, 70.9W

Santa Barbara Coastal	33-35N, 118-120W	34.4N, 119.9W
Sevilleta	33-35N, 105-107W	34.3N, 106.9W
Shortgrass Steppe	39-42N, 102-105W	40.8N, 104.8W
Virginia Coast Reserve	36-38N, 74-77W	37.4N, 75.7W

This document is intended to give the ISS crew the general science objectives and locations for a site (or set of sites). High latitude sites are not included because of the orbital characteristics of the International Space Station. The coordinates listed here can be used to search for imagery on the technical search page:

http://eol.jsc.nasa.gov/sseop/technical.htm