In 2019, Villanova purchased a Pleiades 4-band pan-sharpened satellite image of Mexico Beach, Florida (Hurricane Michael) and a SPOT-7 1.5m 4-band pan-sharpened satellite image of Paradise, California (Camp Fire) with the Pennsylvania View (PA View) grant funding.

The goal is to use the imagery to demonstrate for students how remote sensing technology can be used to undertake scientific geospatial analysis, in this case, evaluating imagery for natural disaster assessment and environmental effects of two areas: 1) the area of the Camp Fire in Butte County, California in November 2018 and 2) the Florida Panhandle area of Mexico Beach affected by Hurricane Michael in October 2018. This project will use image processing techniques to analyze the impacts and extent of the destruction caused by the wildfire in California and the hurricane when it passed over the Florida Panhandle. It is anticipated that both the high-resolution Pleiades (50cm) imagery and medium resolution SPOT (1.5m) satellite imagery should be sufficient to detect changes in land use/land cover and various environmental effects from these natural disasters such as burn scars, vegetation impacts, flooding and habitat destruction. The project will introduce the Remote Sensing students to geographic technologies and techniques. The use of the imagery has proven popular beyond the Remote Sensing Course. This project and the imagery will also be utilized for the Disasters Course as well as the Geotechniques Course and Environmental Studies courses.

Camp Fire[1]:
The Camp Fire was the deadliest and most destructive wildfire in California history. It is also the deadliest wildfire in the United States since the Cloquet fire in 1918 and is high on the list of the world's deadliest wildfires; it is the sixth-deadliest U.S. wildfire overall. It was one of the world's costliest natural disasters in 2018. Named after Camp Creek Road, its place of origin, the fire started on November 8, 2018, in Butte County, in Northern California. After exhibiting extreme fire spread, fireline intensity, and spotting behaviors through the wilderness community of Concow, an urban firestorm formed in the densely populated foothill town of Paradise. The fire caused at least 85 civilian fatalities, with two people still missing, and injured 12 civilians, two prison inmate firefighters, and three other firefighters. It covered an area of 153,336 acres (62,053 ha) (almost 240 sq. miles), and destroyed 18,804 structures, with most of the damage occurring within the first four hours. Total damage was $16.5 billion; one-quarter of the damage, $4 billion, was not insured. With the arrival of the first winter rainstorm of the season, the fire reached 100 percent containment after seventeen days on November 25, 2018.

Hurricane Michael[2]:
Hurricane Michael made landfall near Mexico Beach on October 10, 2018, just before 1 p.m. local time with maximum sustained winds of 160 miles per hour (260 km/h), the first Category 5 hurricane to make landfall in the United States since Hurricane Andrew in 1992. Michael made history as the third strongest (by pressure) and fourth strongest (by wind speed) landfalling storm in the continental United States. The storm caused extensive damage to the community, and to the nearby Tyndall Air Force Base. Nearly all homes were totally destroyed. Brock Long, the FEMA administrator, told CNN that Mexico Beach was "wiped out" and referred to the community as "ground zero". The elementary school and city hall were among the buildings devastated; the pier washed away, and the water tower was knocked down.

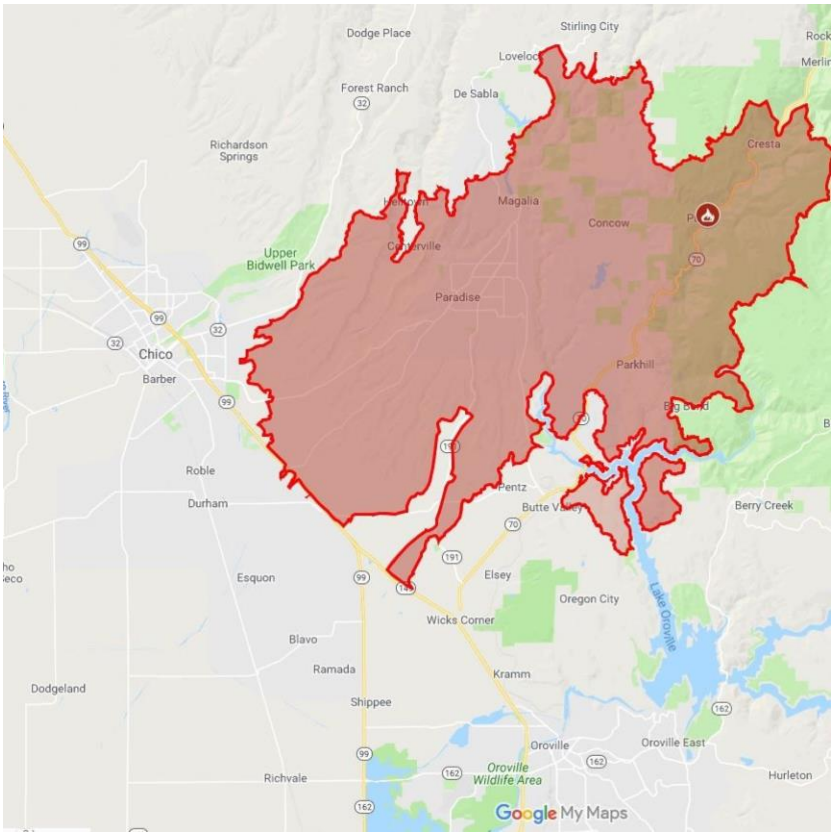

Figure 1. Map of the Camp Fire burn area around Paradise, CA.

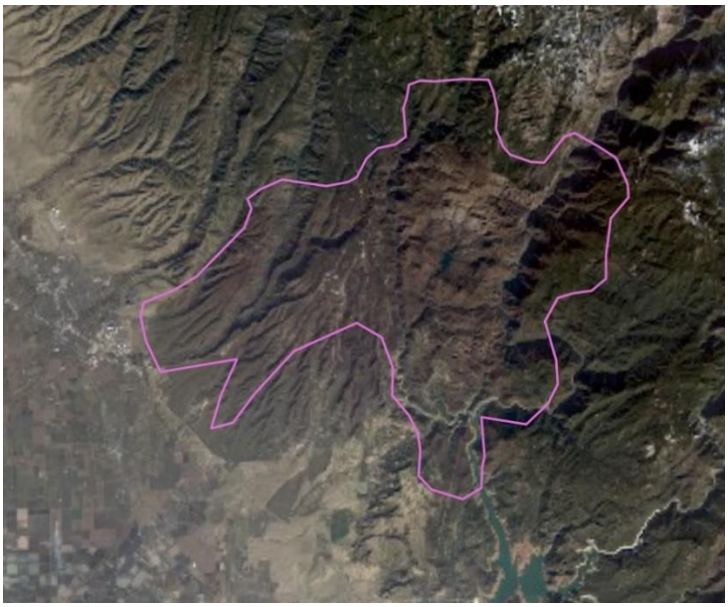

Figure 2. SPOT natural-color image of the Camp Fire burn area.

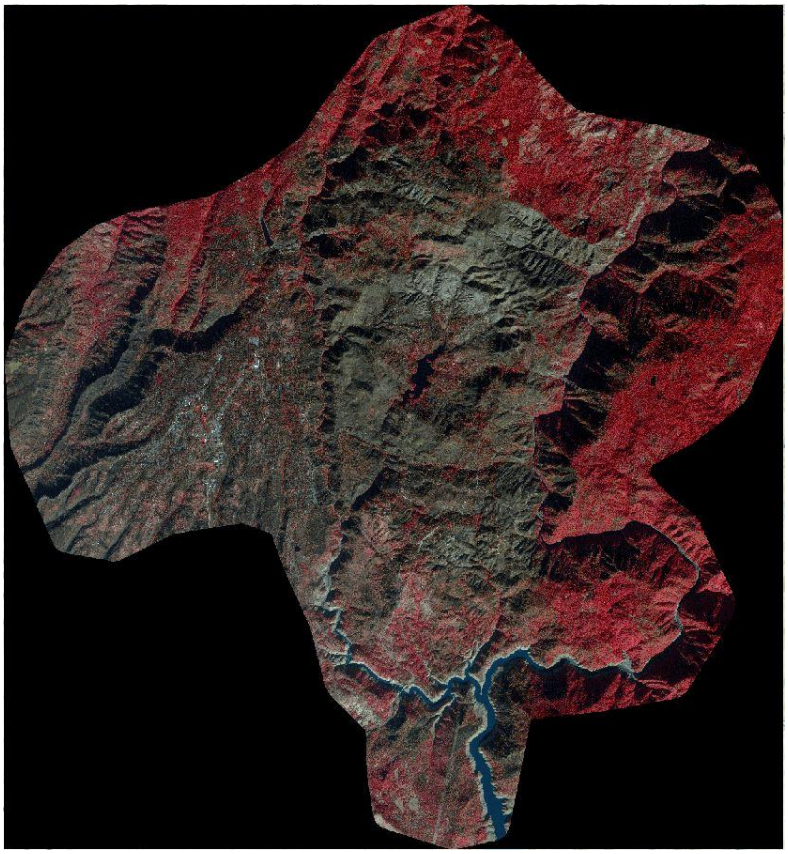

Figure 3. SPOT false-color image of the Camp Fire burn area.

Figure 4. Outline of Mexico Beach, FL impacted by Hurricane Michael.

Figure 5. Pleiades natural-color image of Mexico Beach, FL

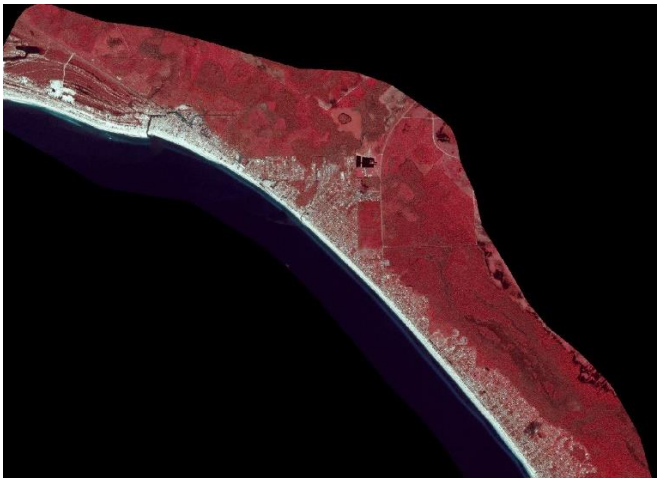

Figure 6. Pleiades false-color image of Mexico Beach, FL

Figure 7. Pleiades natural-color image of Mexico Beach, FL. Zoomed-in to show structural damage to buildings in Mexico Beach, FL from Hurricane Michael.

Summary
Students in our Remote Sensing class will able to view the SPOT and Pleiades satellite imagery in ArcGIS and other image processing tools to manipulate the imagery (zoom, pan, scroll), display various data layers provided by ArcGIS, and annotate features in the imagery. Overall the project will provide practical experience to display and analyze satellite imagery, and to understand real environmental issues from natural disasters facing communities and the potential mitigation options that can be implemented. This project can be used as a lab exercise in future remote sensing, GIS or environmental studies classes.

Purchased SPOT-7 Archive Satellite Imagery:

- AOI: Paradise, CA (Camp Fire)
- Product: 1.5m 4-Band Pan-Sharpened (Orthorectified) Product
- Date of Imagery: 12/13/2018
- Scene ID: DS_SPOT7_201812131833181_FR1_FR1_FR1_FR1_W122N40_01871
- Bit Depth: 8-Bit
- Projection / Datum: UTM / WGS84
- Format: GeoTiff (.tif)

Purchased Pleiades Archive Satellite Imagery:

- AOI: Mexico Beach, FL (Hurricane Michael)
- Product: 50cm 4-Band Pan-Sharpened (Orthorectified) Product
- Date of Imagery: 10/17/2018
- Scene ID: DS_PHR1B_201810171623281_FR1_PX_W086N29_0921_03298
- Bit Depth: 8-Bit
- Projection / Datum: UTM / WGS84
- Format: GeoTiff (.tif)

Citations:

[1] Wikipedia, https://en.wikipedia.org/wiki/Camp_Fire_(2018)

[2] Wikipedia, https://en.wikipedia.org/wiki/Mexico_Beach,_Florida

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