Geocoding of UAVSAR Data Products

Yang Zheng, Ron Muellerschoen, Thierry Michel, Bruce Chapman, Scott Hensley, Yunling Lou

Jet Propulsion Laboratory, California Institute of Technology

In order to ease data fusion and broaden user base, NASA/JPL's Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR) routinely geocodes data products as part of its standard data release. UAVSAR is an airborne repeat-pass L-band polarimetric radar [1] developed by JPL as an imaging radar testbed for future spaceborne missions. This paper discusses the current methodology that UAVSAR uses to geocode slant range data to ground range and the format of the ground range data products.

UAVSAR uses the backward nearest-neighbor fixed-window geocoding method to project slant range data to ground range. First, the approximate image corners are calculated and a grid of latitude and longitude is created from the corners. The latitude spacing is always a constant. The longitude spacing is the same as the latitude spacing near the equator, resulting in an equiangular grid. As the data location approaches the poles, however, the longitude spacing increases incrementally. For each point on the latitude and longitude grid, a corresponding slant range radar data coordinate is calculated, and a fixed window of slant range radar pixels around that point is averaged to obtain the geocoded pixel value. This method was chosen for its fast, fixed computation time and a constant number of looks in the ground range product.

The geocoded polarimetric products are based on six cross products (HHHH, HHHV, HHVV, HVHV, VHHH, VVVV) formed from the four single-look slant range products (HH, HV, VH, VV). All the cross products have the same row and column dimensions as the single-look slant range products. Three of the cross products (HHHH, HVHV, VVVV) contain real numbers, while the other three (HHHV, HHVV, VHHH) contain complex numbers. In all the cross products, HV is the result from symmetrizing the HV & VH single-look slant range products.

In addition to the six binary geocoded cross products, UAVSAR provides the interpolated DEM used during the geocoding process. This interpolated DEM covers the same area and has the same dimension as the geocoded cross products. Low-resolution kml and high-resolution kmz files that are displayable on Google Earth and Google Maps are also created from a three-color overlay of the HHHH, HVHV, and VVVV channels. Figure 1 is an example geolocated image in kmz format overlaid on Google Map. These products make visualization more intuitive and allow users to easily compare UAVSAR data with other forms of data. Finally, a text annotation file is available that contains the dimensions, boundaries, and rough image corners of the geocoded products as well as other useful SAR processing parameters.

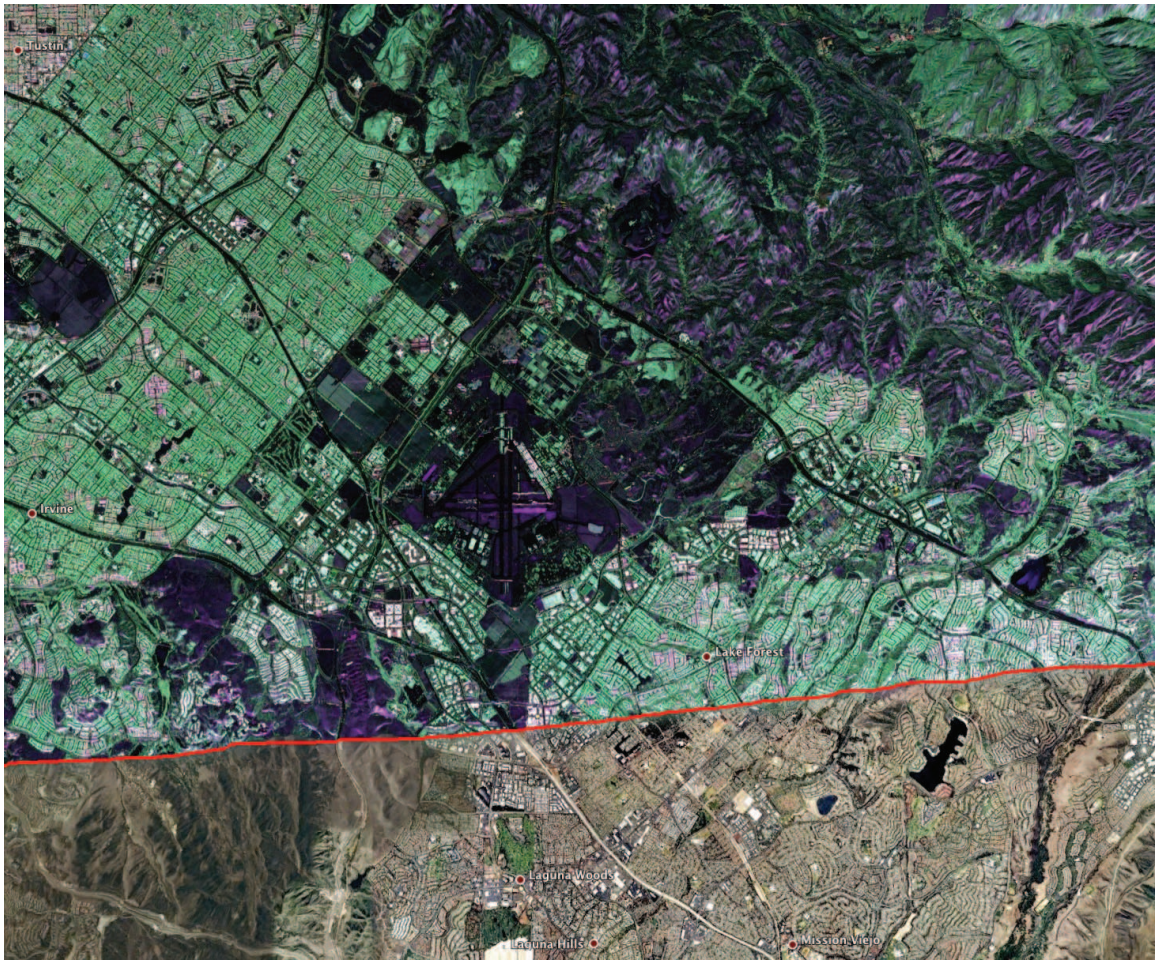

Figure 1. Geocoded UAVSAR data near Irvine, CA overlaid on Google Map.

Having geocoded products not only makes visualization more intuitive, it is also very helpful in terms of data search. UAVSAR website (uavsar.jpl.nasa.gov) provides both text-based search in terms of acquisition date, heading, site name, etc., as well as map-based search using the boundaries and corners provided by the geocoded products.

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