

## **Demonstrations of Data Fusion using GRFM, other SAR, and Optical Imagery**

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Methods of data fusion of particular interest to the Global Rain Forest Mapping (GRFM) project will be demonstrated by exploring different ways of combining information, either imagery or classification products, from at least two sensors. Often, SAR and optical data are complimentary, but suitable techniques must be employed in combining the imagery in order to derive a significant new product. Derived products, such as classification maps, are sometimes more suitable when merging different data sets, especially when considering the analysis of data that requires manual interpretation. An assessment will be made of the advantages and disadvantages to each technique discussed. The techniques involved in data fusion range from accurate co-registration of the data to merging classification products from different sensors. They will vary according to research objectives, but generally fall into the following categories:

Accurate co-registration of the data. This consists of understanding the coordinates of both data sets (i.e.. projection, datum, corner coordinates), so that the user can compare targets in each. It may require that tie points be identified in both images. This is the most basic and required condition for performing data fusion.

Resampling of the imagery. This step is usually required if the imagery is to be incorporated into a GIS system.

Image substitution by imagery. Fusion of imagery can be useful in some circumstances; for instance, replacement of clouds in an optical image with radar imagery.

Image substitution by classification. The fusion of a classification product into an image product may be desirable if some regions of the image product are insensitive to a particular land cover type; for instance, insertion into a radar image of savanna regions with a more accurate Landsat land cover classification.

Classification based on imagery from both sensors. Classification uses the raw data from two different sensors to classify land cover types.

Re-classification based on imagery and classification. In this case, a classification is performed using the imagery from one instrument (i.e.. JERS-1 SAR) and a manually interpreted Landsat classification image to increase the number of categories of land cover types.

Re-classification based on two or more classification products. Two classifications, for example, from JERS-1 SAR and from Landsat TM, are compared and used to combine and compare land cover types.

This work was performed at the Jet Propulsion Laboratory under contract to the National Aeronautics and Space Administration.