Data Fusion Applied to Geologic Mapping and Natural 1 lazards

Diane L,. Evans

California Institute of Technology

Jet Propulsion Laboratory

Pasadena, CA, 91109

Several classes of geologic and natural hazards investigations require the ability to characterize the physical nature as well as the composition and temperature of the Earth's surface. Key physical parameters include surface roughness, topography and topographic change, which are amenable to study using synthetic aperture radar (SAR) data.

SAR data have been used in conjunction with optical and infrared sensor systems in supervised and unsupervised classifications, process response models, and environmental monitoring. Multisensory classifications which include radar brightness, or backscatter images as additional "bandpasses" of optical or infrared sensor systems show improved classification accuracies over individual sensors alone. This method, however, does not exploit the full polarimetric diversity of current SAR sensors nor their interferometric capabilities.

Another approach being investigated is to derive geophysical parameters from sensor systems independently, and to do a combined interpretation on the derived geophysical products. For example, for bare surfaces (biomass < 2 kg/m2), surface roughness (1 cm-1m) can be extracted directly from L-band (wavelength=25 cm) SAR images acquired with horizontally transmitted and received (LHH) and vertically transmitted and received (LVV) polarizations. Surface roughness information can then be combined with spectral reflectance data to interpret the processes of weathering, aeolian deposition, and desert varnish and pavement formation.

SAR data combined with data from other sensors also play a central role in natural hazards observing strategies. Not only are SAR data important for all-weather and nighttime observations, changes in topography, surface roughness and soil moisture often proceed and accompany natural disasters. in addition, several examples of centimeter surface deformation have been published indicating SAR interferometry can provide a high spatial resolution complement to deformation information routinely provided by the Global Positioning Satellites. Future data fusion activities will focus on automating data acquisition requests to improve response to natural hazards.