Alabama Disaster
Exploring Predictive Terrestrial Environmental Parameters of Tornadogenesis in Alabama
Through the use of NASA EOS

Project Summary
The April 27, 2011 Tornado outbreak is the second deadliest U.S. history, but is the
deadliest since the Doppler Radar system has been used to warn communities. Alabama
has been involved in six of the ten deadliest tornadoes outbreaks in U.S. History. Records
of tornadoes path are showing that the presence of tornadoes within tornado alley are not
entirely random and that environmental factors may contribute to where tornadoes may
form and what direction they may travel. Studies are showing that topography may enhance
or even facilitate tornadoes. Storms crossing a river valley perpendicular to their path will
have an increase in shear within the parent supercell thunderstorm (Bosart et al. 2004).
Abrupt changes in vegetation, as in natural and cultivated plats, have been found to
produce convective clouds (Esau and Lyon 2002). Thermally induced diurnal circulations
have been found to occur in areas of differential land use (Weaver and Avissar 2001).
Terrestrial environmental parameters such as land use/land cover, vegetation, soil profiles,
topography and other surface features need to be explore to help predict areas with high
risk of tornadoes. This information is crucial for disaster management. NASA EOS can
provide historical data to create a predictive model and, if successful, can continue to
update the model and human development continues to change the landscape.
Alabama- Oceans, Climate, and Ecological Forecasting
Utilizing NASA EOS to create a habitat suitability model for oyster reefs in the Mobile Bay area.

Project Summary
The decline of oyster reefs in Mobile Bay is of concern both environmentally and economically. Oysters are important ecosystem engineers and their harvest is a large part of the Gulf coast economy. This project seeks to create a habitat suitability model that will help guide oyster reef restoration efforts in Mobile Bay, Alabama. The model will be based on water quality parameters such as salinity, total suspended solids, and temperature which are easily measured. The model will be distributed to organizations such as the Mobile Bay National Estuary Program, Dauphin Island Sea Lab, and Alabama Department of Natural Resources that are working to revive the oyster reefs in Mobile Bay.

The habitat suitability model will be created based on water quality analysis using EFDC and LSPC models. The LSPC model uses land use inputs from Landsat data and temperature and precipitation based on NWS records and IPCC climate change projections to determine runoff rates and stream discharges into Mobile Bay. The EFDC model then distributes this flow throughout the bay and accounts for factors such as sea level rise from the IPCC projections. The resulting water quality data can then be analyzed relative to the habitat parameters for oyster reefs and the regions most suitable for oyster reef restoration can be determined. A secondary goal of this project is to validate the models being used through mathematical analysis and through comparison with measured values, such as sea surface temperature.
Iraq and Afghanistan- Public Health
Using NASA Earth Observations to assess the long term surface disturbance trends in desert ecosystems from military vehicle operations resulting in increasing harmful dust generation.

Project Summary
Exposure of high concentrations of airborne particular matter, dust, on the human respiratory system can have adverse health effects (Cook et al, 2005). Countless studies have been published showing the link between dust inhalation and a variety of respiratory disease. However, the pathogenic role of the microbial and viral component of the dust has not been extensively studied. Leski et al. (2011) conducted testing of dust particles across 19 locations in Iraq and Kuwait and found the presences of potential human pathogens including: *Mycobacterium, Brucella, Coxiella burnetii, Clostridium perfringens*, and *Bacillus*. King et al (2011) examined 49 previously healthy soldiers with unexplained exertial dyspnea and diminished exercise tolerance after deployment in Iraq and Afghanistan and found that 38 of them suffered from diffused constrictive bronchiolitis which may have resulted from inhalation exposure. Long term exposure to desert dust carrying pathogens may create conditions conductive for novel outbreaks of disease (Griffin and Kellog, 2004). NASA Earth Observations can help determine the regions that have been suffered the most disturbances in the Middle East, particularly Iraq and Afghanistan, by performing land use and land cover change analysis.