

University of Wisconsin - Madison (UW)
University of Hawaii (UH)
Texas A& M (TAMU)
University of Colorado at Boulder (CU)
University of Alabama in Huntsville (UAH)
MURI



*“Physical Modeling for Processing
Geosynchronous Imaging Fourier Transform
Spectrometer (GIFTS) – Indian Ocean METOC
Imager (IOMI) Hyperspectral Data”*

Enhanced Tasks

1 *Mathematical Quantification of Useful Hyperspectral Information*

2 *Radiative Transfer Modeling*

- Clear Sky Emission/Absorption
- Atmospheric Particulate Emission/Absorption
- Surface Emission/Absorption
- **Cloud modeling**
- **Aerosol/Dust Modeling**

3 *Mathematical Retrieval Algorithm Development*

- Atmospheric Parameters
- Suspended Particulate Detection and Quantification
- Sea Surface Temperature
- Surface Material Identification

4 *Product Research*

- Ocean Surface Characterization
- Lower Tropospheric Temperature, Moisture and Winds
- Surface Material Products
- Aerosols/**Dusts**
- Derived (Second Order) Products
- **visibility and Clouds**

Co-I and Subcontract Tasks

•Prof. Paul Lucey (UH-HIGP)

HIGP Hawai'i Institute of
Geophysics & Planetology

Surface Characterization

•Prof. Ping Yang (TA&M)



Cloud Modeling

•Prof. Irina Sokolik (CU)



Aerosol/Dust Modeling

•Prof. Gary Jedlovec & Sundar Christopher (UAH)



Cloud and Aerosol products, & Wind Tracking Analysis

Surface Characterization

Co-Investigator: Prof. Paul Lucey (UH-HIGP)

Tasks and Goals:

- Surface Materials Properties
- Airborne hyperspectral data reduced to emissivity
- Laboratory data collection of materials spectral properties
- Directed airborne hyperspectral data collection
- Specialized surface materials properties of interest to GIFTS/IOMI MURI
- Data collections in support of atmospheric model validation
- Hyperspectral analysis methodologies
- Target detection and surface materials classification algorithms.



Surface Characterization

Co-Investigator: Prof. Paul Lucey (UH-HIGP)

Progress:

- Surface Emissivity Simulation
- Estimate of MODIS surface emissivity
- Cloud Detection and Removal
- Emissivity assignment
- Provide MURI team with surface emissivity model

Planned Tasks:

- Dynamic emissivity
 - Vegetation senescence
 - Surface moisture
- “Ground truth” using data from ASTER



Cloud Modeling

Subcontractor: Prof. Ping Yang (University of Texas A&M)

Tasks and Goals:

- Develop State of the Art Cloud Model for GIFTS/IOMI
 1. Water Cloud Radiative Property Modeling
 2. Ice Cloud Radiative Property Modeling
 3. Full Fast Physical Cloudy Radiative Transfer Modeling
 4. Cloud Property Retrieval

Cloud Modeling

Subcontractor: Prof. Ping Yang (University of Texas A&M)

Progress:

- Modeling of the single-scattering properties of cirrus and water clouds
- Modeling of bulk optical properties of cirrus and water clouds
- Developed a fast radiative transfer model for clouds



Cloud Modeling

Subcontractor: Prof. Ping Yang (University of Texas A&M)

Planned Tasks:

Retrieval of Cirrus Properties from High Spectral Resolution Infrared Observations:

- Sensitivity study
 - Simultaneous retrieval of the optical thickness and effective particle size of cirrus clouds



Aerosol/Dust Modeling

Subcontractor: Prof. Irina Sokolik (University of Colorado)

Tasks and Goals:

Establish a framework for the development of a new physically-based treatment of mineral dust for IR high resolution spectral remote sensing

Progress:

•*Development of new aerosol models:*

Developed and tested new high resolution optical models of Asian dust and aerosol species.

<http://irina.colorado.edu/HROMAA/>

•*Forward modeling&sensitivity studies:*

Linked kCARTA and DISORT and modified to handle the new aerosol models.

•*NAST-I data analysis:*

Collected and analyzed NAST-I & various data (meteorological, satellite, lidar network, etc.).



Aerosol/Dust Modeling

Subcontractor: Prof. Irina Sokolik (University of Colorado)

Planned Tasks:

- Examination of Asian dust outbreaks based on observational data and MM5 simulations
- Continue to provide and refine dust/aerosol parameterization model



Cloud and Aerosol Product Research

Subcontractor: Prof. Gary Jedlovec & Prof. Sundar Christopher
(University of Alabama in Huntsville)

Tasks and Goals:

- Identify cloud and surface characteristics in high spectral resolution data which best delineate clouds, aerosols, and surface properties from one another.
 - Develop a cloud detection algorithm that exploits high spectral resolution measurements such as GIFTS/IOMI



Cloud and Aerosol Product Research

- Subcontractor: Prof. Gary Jedlovec & Prof. Sundar Christopher (University of Alabama in Huntsville)

Progress:

UAH student (Kevin Laws) complete M.S. refining cloud detection algorithm with GOES – demonstrates value of spatial and temporal thresholds in difference images

- New UAH graduate student (Nicole Slodysko) began thesis work with analysis of AIRS data for cloud spectral properties

Planned Tasks:

Cloud spectral features (slope and offsets) will be used to develop a robust cloud detection algorithm for high spectral resolution data



Summary

1. Surface modeling and Characterization

- Provided a surface emissivity simulation model

2. State of the Art Cloud Modeling

- Provided a fast cloudy radiative transfer computational package

3. State of the Art Aerosol/Dust Modeling

- Provided a aerosol/dust model

4. Geo (high temporal) Cloud and Aerosol Products Research

- The use of Geo high spectral resolution data for cloud detection

