GLIMS

Global Land Ice Measurements from Space

( Newly revamped website! http://www.glims.org )

Glim: “A Glimpse of a Passing Phenomenon”

ASTER Science Team Meeting
Pasadena, California, March 2004

www.GLIMS.org
• Programmatic developments
  -- U.S. funding/projects
  -- GLIMS consortium organizational development

• NSIDC mini-presentation
  -- GLIMS Data archive
  -- Data analysis quality assessment “round-robin”

• Sample results of ASTER/glacier science results, Himalaya

• New GLIMS-related collaborations (and you are invited)
  -- HIGH ICE (High Asian Institutes of Glaciology: Hydrology, Ice, Climate, and Environment)
  -- Siachen International Peace Park (Kashmir)
NASA OES-02

ASTER Science Team Member Proposal
(funded)

Global Land Ice Measurements from Space (GLIMS) Core Functions:
International Organization, ASTER Glacier Image Data Management,
and Glacier Hazard/Emergency Response

PI, Jeffrey S. Kargel
New NSIDC GLIMS Funding

REASON CAN: Detection and Evaluation of Change in Glacier Systems Using the Global Land Ice Measurements from Space (GLIMS) Database (PI: Richard Armstrong)

NRA-03-OES-02: GLIMS Core Functions (PI: Richard Armstrong)
Other funded GLIMS proposals

- M. Bishop and J. Shroder, UNO/Omaha, OES-02, "Climate Forcing and Glaciers in the Western Himalaya: Assessing Glacier Fluctuations using ASTER Data"

- G. Hamilton, U Maine, OES-02, "High-resolution Satellite Image Mapping of Arctic Glacier and Ice-cap Fluctuations: Evidence for Regional Climate Change and their Contribution to Sealevel"

- A. Fountain, PSU/Portland, OES-02, Topic: ELA and glaciers of Alaska and the Conterminous U.S.
Global Land Ice Measurements from Space

www.GLIMS.org

GLIMS primary goal: Determine extent and changes of Earth’s glaciers

PREVIOUS RESULTS AND CONTINUING TASKS:

- Acquired ~40,000 ASTER L1A scenes (of any quality)
- Archived and distributed over 5000 L1B glacier scenes
- Timely ASTER imaging response to glacier hazard events
- Purchased 150+ Landsat ETM+ scenes for RC ftp download
- 25 Regional Centers producing digital maps of glaciers and glacier change
  - Mapping current extent of exposed land ice and debris-covered ice
  - High resolution surface displacement fields
  - Automating data extraction from ASTER
  - GLIMSView tool for glacier analysis
  - Glacier lake extent and temperature variations using multi TIR bands
- Designed GIS digital database for GLIMS glacier inventory (NSIDC)
- GLIMS book (Praxis-Springer) in the works!

FUNDING:

-- U.S. institutions funded by six NASA grants (Office of Earth Science), $1.6M/yr
-- GLIMS Coordination Center (USGS/Flagstaff) and ASTER Science Team membership funded by NASA and USGS Cryosphere Program.
GLIMS Regions and Regional Center locations

- GLIMS is an international consortium of 25 regional centers
- 82 cooperating institutions worldwide
- Coordinated by U.S. Geological Survey - Flagstaff
Science of glaciers
Science and impacts of glaciers

THE SCIENCE

- Volcanic and Geothermal Energy Input
- Interior Thermal State
- Surface and Basal Melting
- Water Storage Mechanisms
- Water Release Mechanisms: Steady or Burst
- Accumulation of Surface Debris
- Surface Mass and Energy Balance
- Glacier Dynamic Response
- Changed Geometry (Area, Length, Thickness)
- Lasting Evidence of Change

GLIMS

“NEW LANDS”

NEW MINERAL RESOURCES
NEW HABITAT, MIGRATION CORRIDORS
NEW TRANSPORTATION CORRIDORS
CONTINUING, CHANGING HAZARDS

THE IMPACTS

PRESENT IMPACTS

- ECOSYSTEMS
- NATURAL ENVIRONMENT
- HUMAN LEISURE & TOURISM

RESOURCE VALUE

- HUMAN CONSUMPTION
- AGRICULTURE
- HYDROPOWER

HAZARDS

- TO CONSTRUCTION: TRANSPORTATION, HOMES, INDUSTRY
- TO AGRICULTURAL LAND
- TO HUMAN LIFE

FUTURE IMPACTS

Jeffrey S. Kargel
U.S. Geological Survey
12-13 Feb. 2003
Science Questions from the Research Strategy

Variability
- Precipitation, evaporation & cycling of water changing?
- Global ocean circulation varying?
- Global ecosystems changing?
- Stratospheric ozone changing?
- Ice cover mass changing?
- Motions of Earth & interior processes?

Forcing
- Atmospheric constituents & solar radiation on climate?
- Changes in land cover & land use?
- Surface transformation?

Response
- Clouds & surface hydrological processes on climate?
- Ecosystem responses & affects on global carbon cycle?
- Changes in global ocean circulation?

Consequence
- Weather variation related to climate variation?
- Consequences in land cover & land use?
- Coastal region change?

Prediction
- Weather forecasting improvement?
- Transient climate variations?
- Trends in long-term climate?
- Future atmospheric chemical impacts?
- Future concentrations of carbon dioxide and methane?

* indicates a high priority or focus area.
Glaciers in the context of 12 major national research applications

- Energy Forecasting
- Carbon Management
- Agricultural Competitiveness
- Aviation Safety
- Community Growth
- Homeland Security
- Public Health
- Community Disaster Prep.
- Coastal Management
- Invasive Species
- Water Management
- Air Quality Management
Kolka Glacier disaster - ASTER rapid response

Kolka Glacier disaster

- 80 million cubic meter rock/ice avalanche and subsequent debris/mud flows on September 20, 2002
- Overran Karmadon village 18 km down valley
- Over 120 killed
- Mudflow continued 15 km further down valley
- Rapid ASTER imaging response over several days following emergency.
- ASTER data used by emergency response teams