

GLIMS

Global Land Ice Measurements from Space

Annual satellite imaging of the world's glaciers

Assessment of glacier extent and change

Development and population of a digital glacier data inventory

HIGH ICE

High Asia Institutes for Glaciology:

Hydrology, Ice, Climate, and Environment

"Science for Peace for the High Asia Region of Chaos"

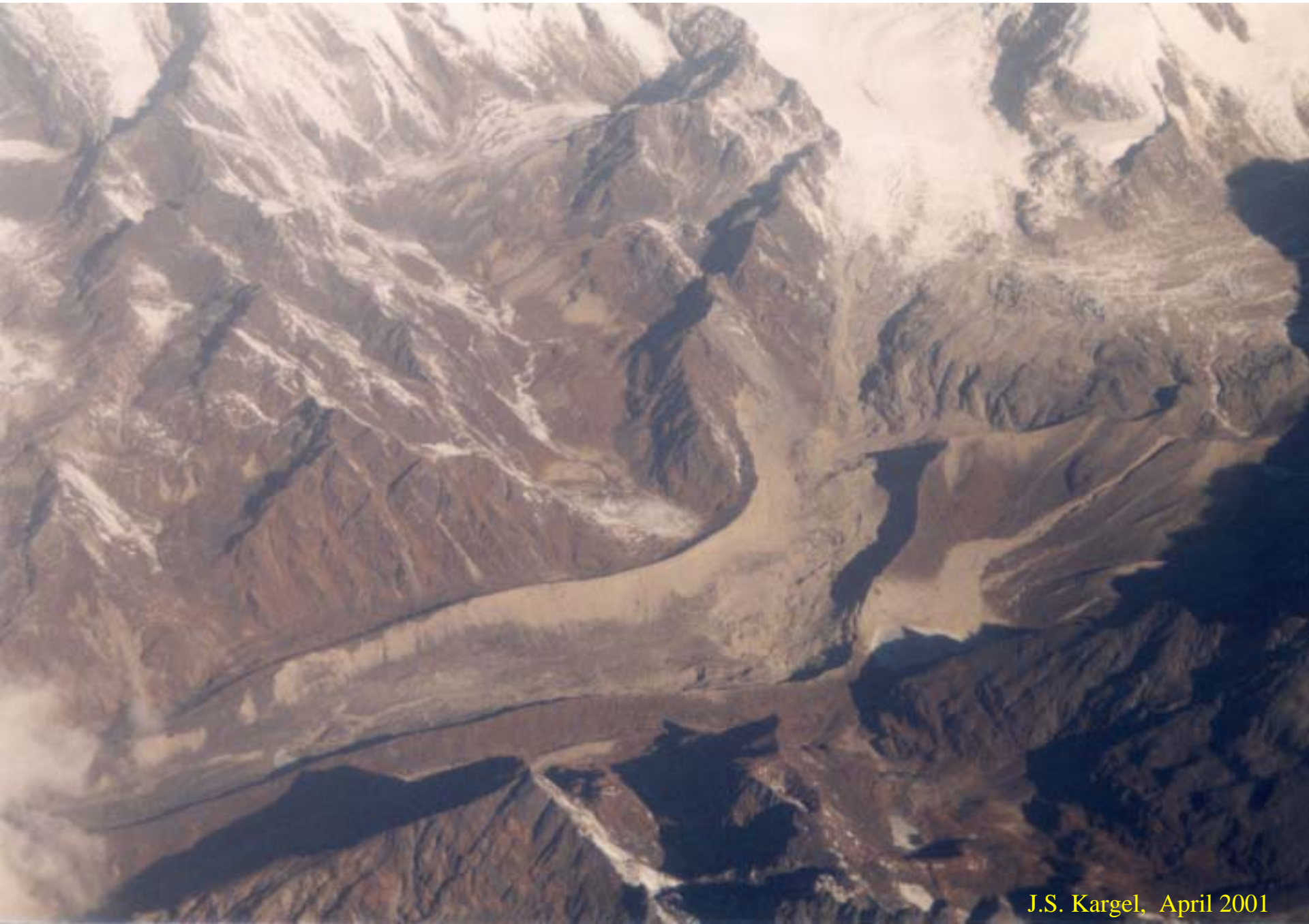
Glaciers of High Asia:

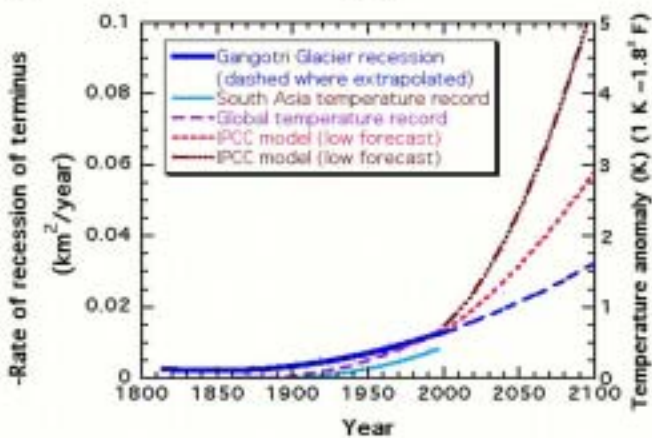
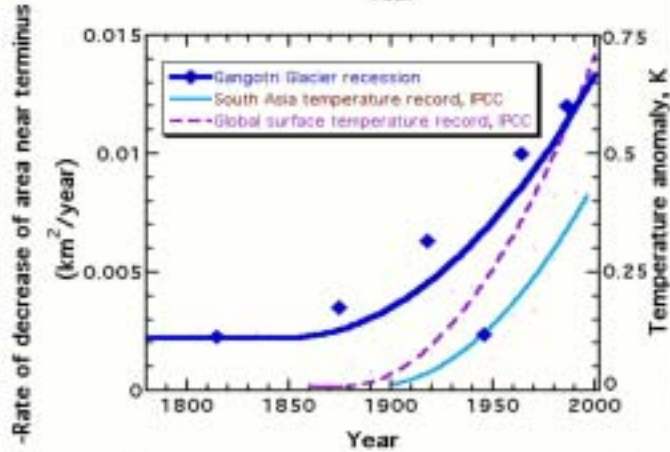
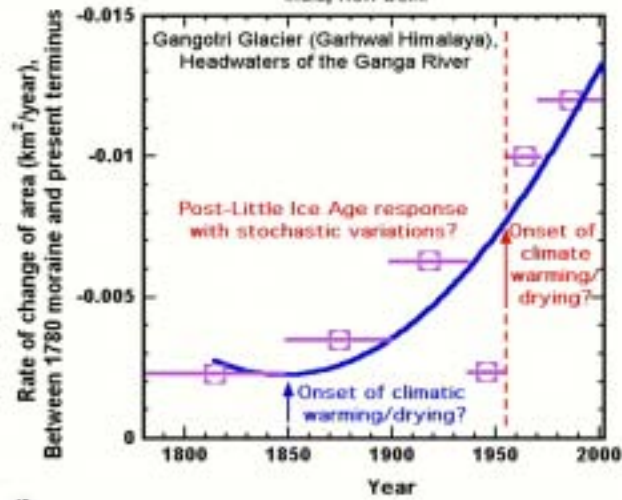
Where tectonics and climate, people and cultures meet

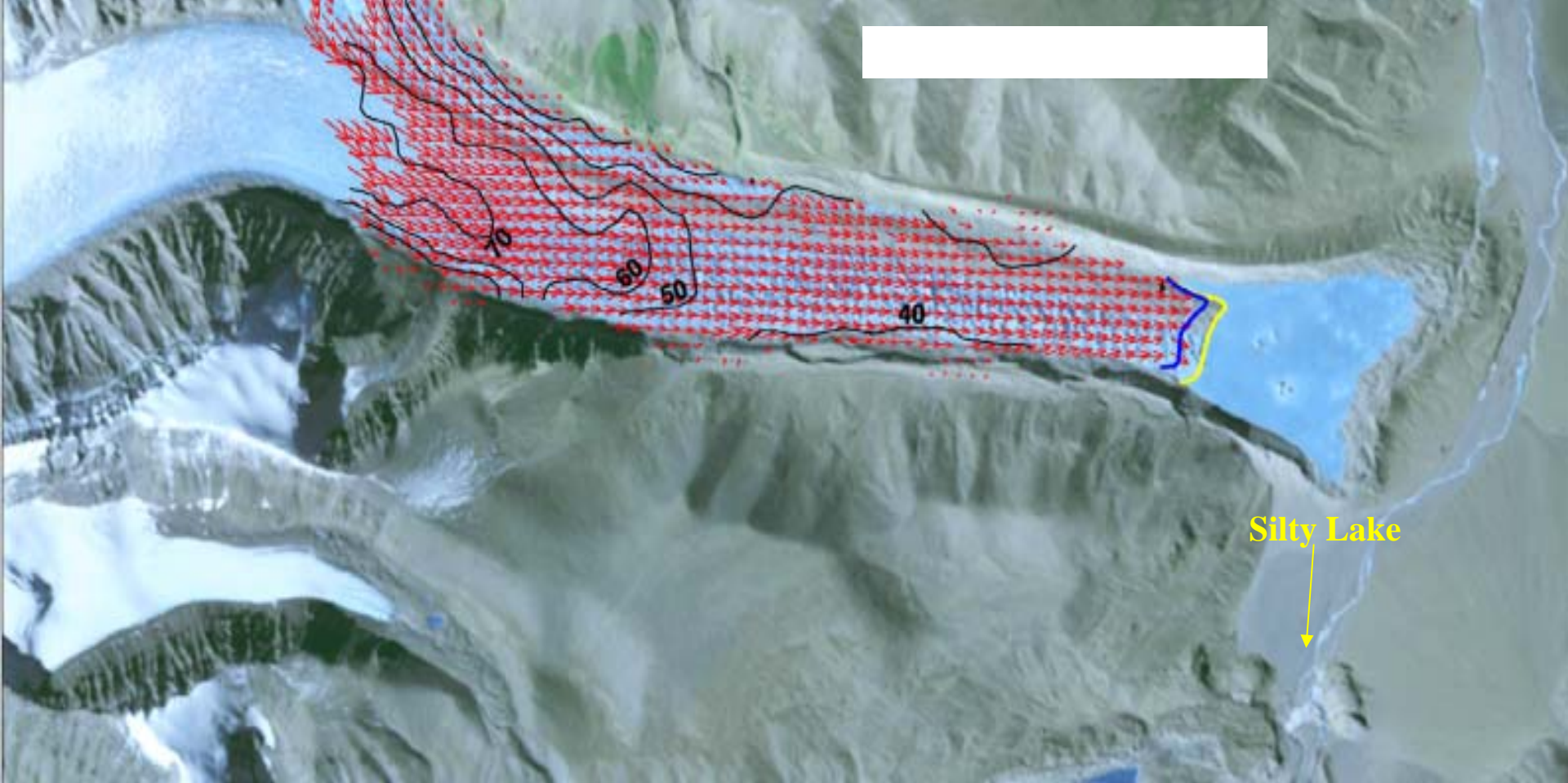
(all of them changing)



Skeletal remains of what was a debris-covered glacier near Mt. Everest





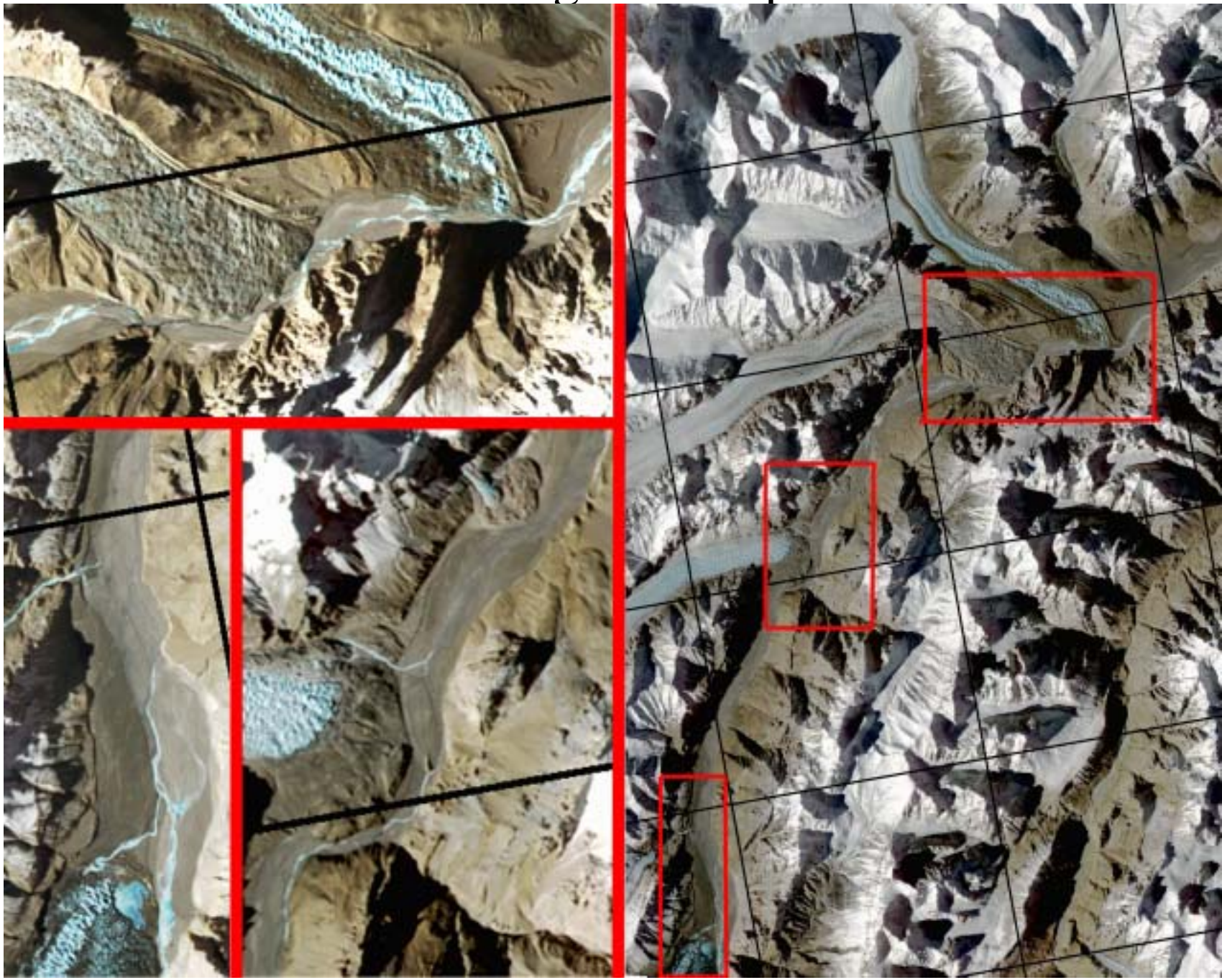


Himalaya-Tibet: Auto correlated velocity measurements from two high res. ASTER images.

ASTER L1B 321 RGB

A. Käab / University of Zurich

Glacier Hazard Monitoring and Response: Ice Dam Threat



ASTER LIB 321RGB 2001 Dec. 28



Supraglacial Lakes

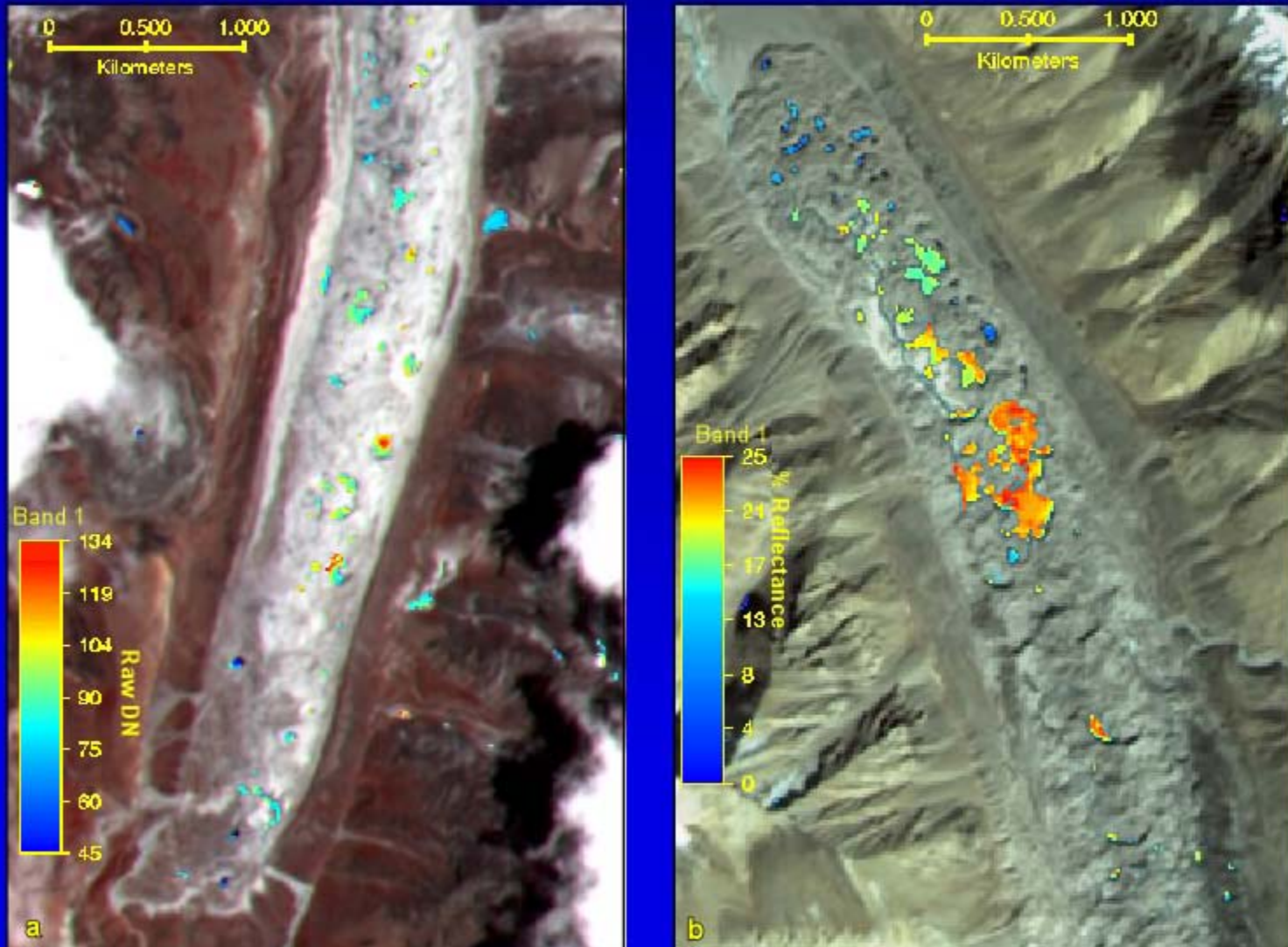
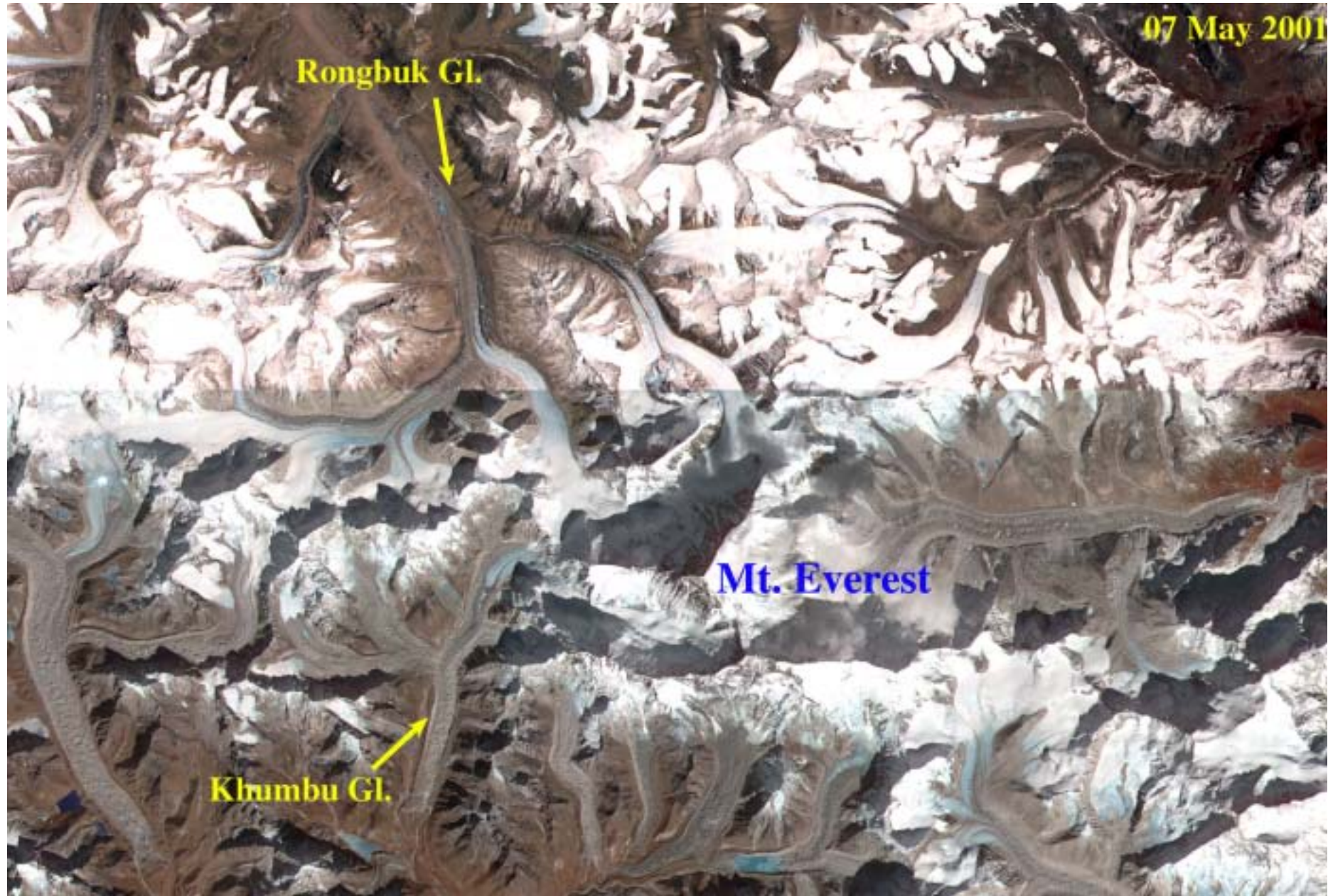
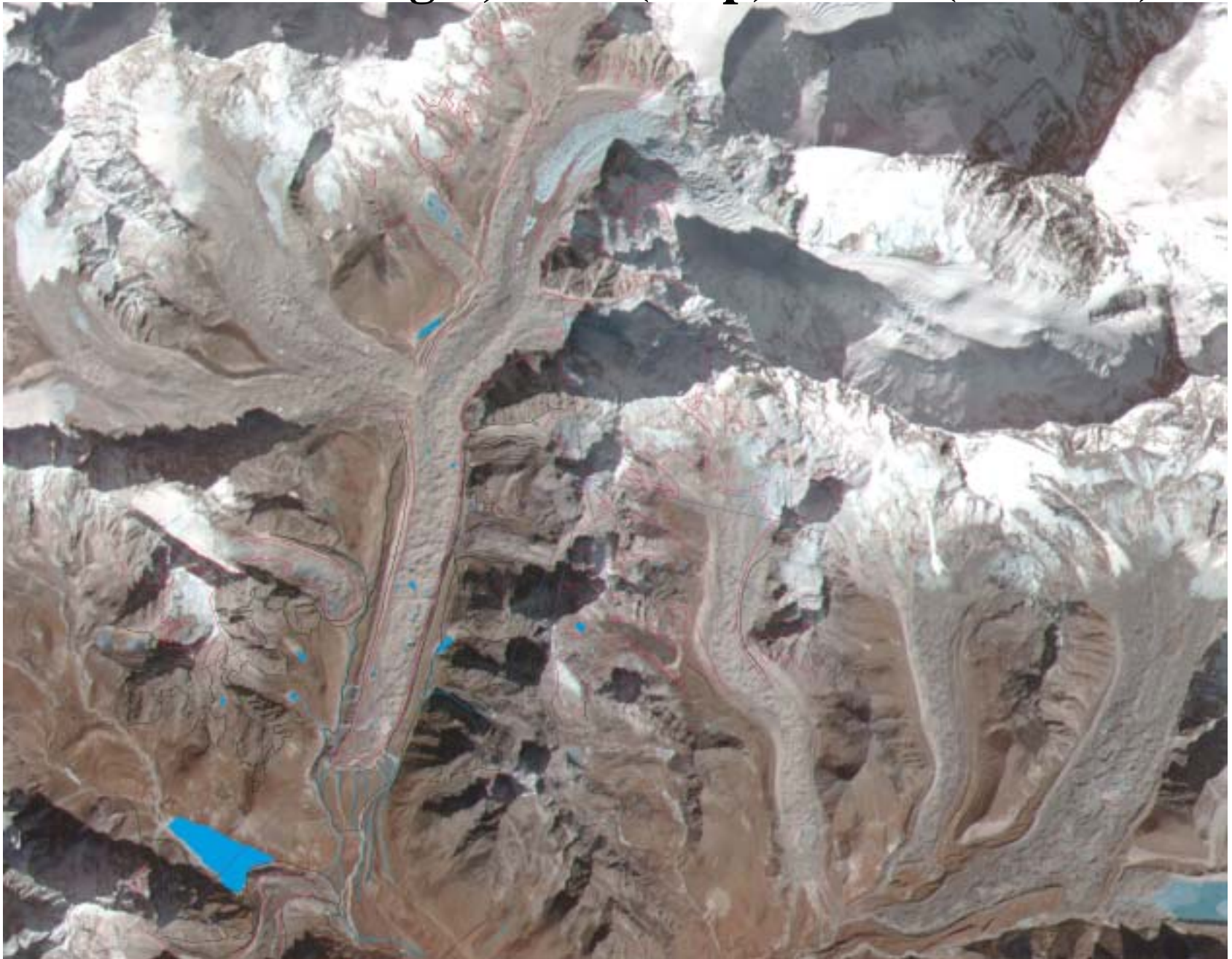


Figure 3. Kumbu Glacier, Nepal (a) and Rongpu Glacier, Tibet (b). The base images for both figures are false color composites of ASTER bands 321 in RGB. Band 1 values for supra-glacial ponds are represented by the pseudocolor scales shown in the left of each image.

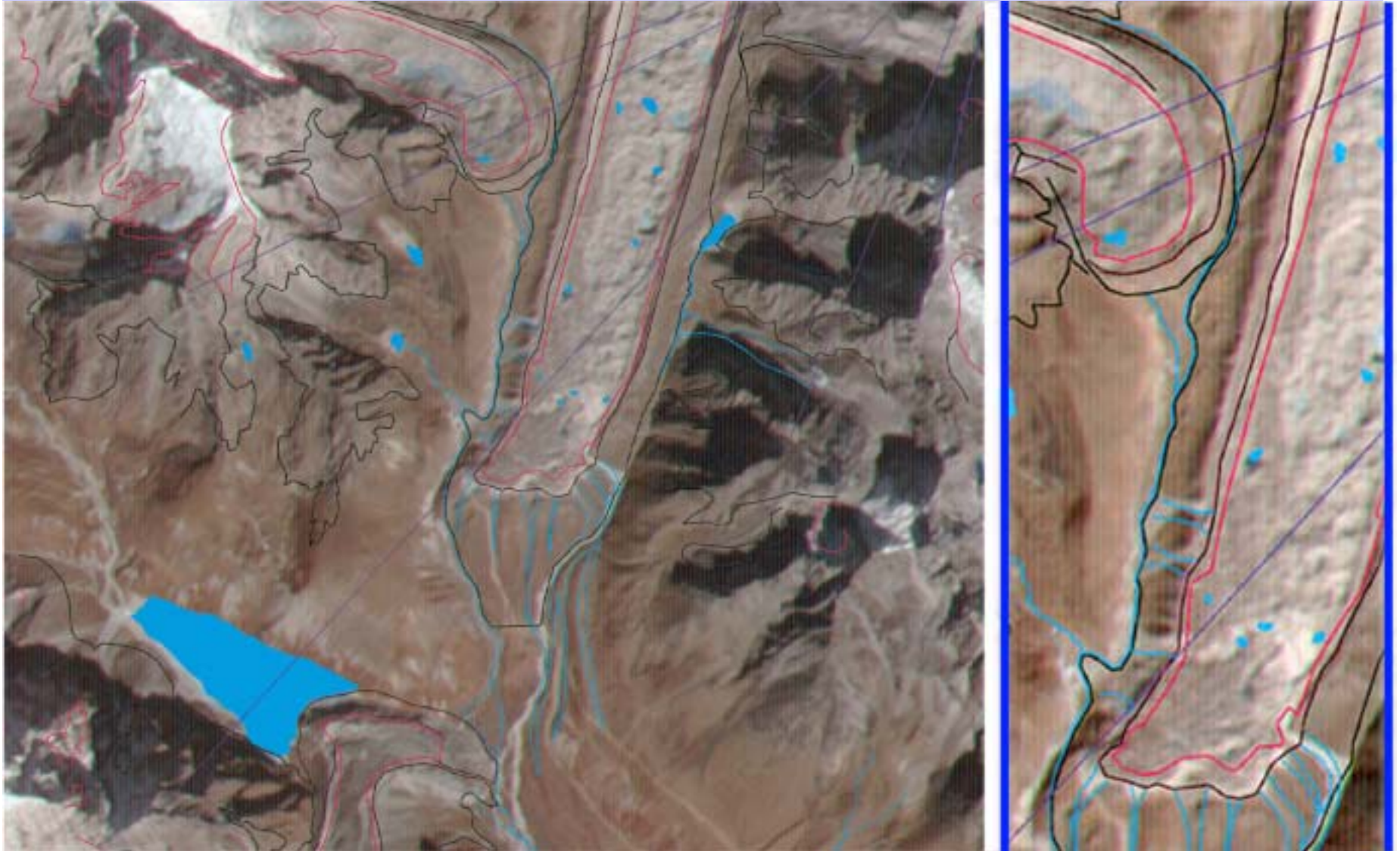
Mt. Everest ASTER mosaic



Khumbu changes, 1958 (map) - 2001 (ASTER)



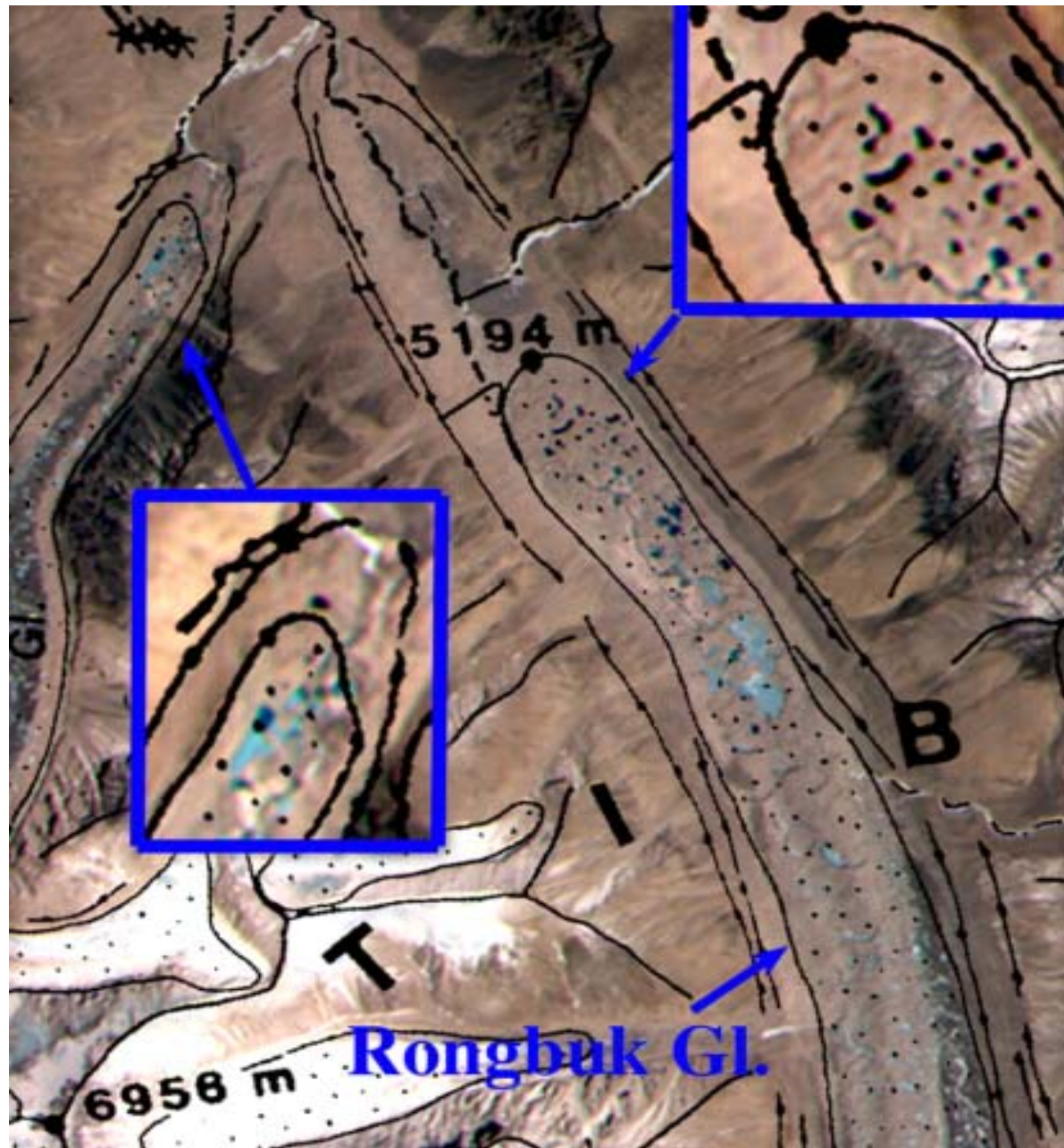
Khumbu Glacier changes, terminus area, 1958 (lines drawn from shaded relief/topo map) to 2001 (ASTER)



J. Kargel, GLIMS/USGS: July 2003 INQUA/Reno; March 2004-ASTER Sci. Team/Pasadena

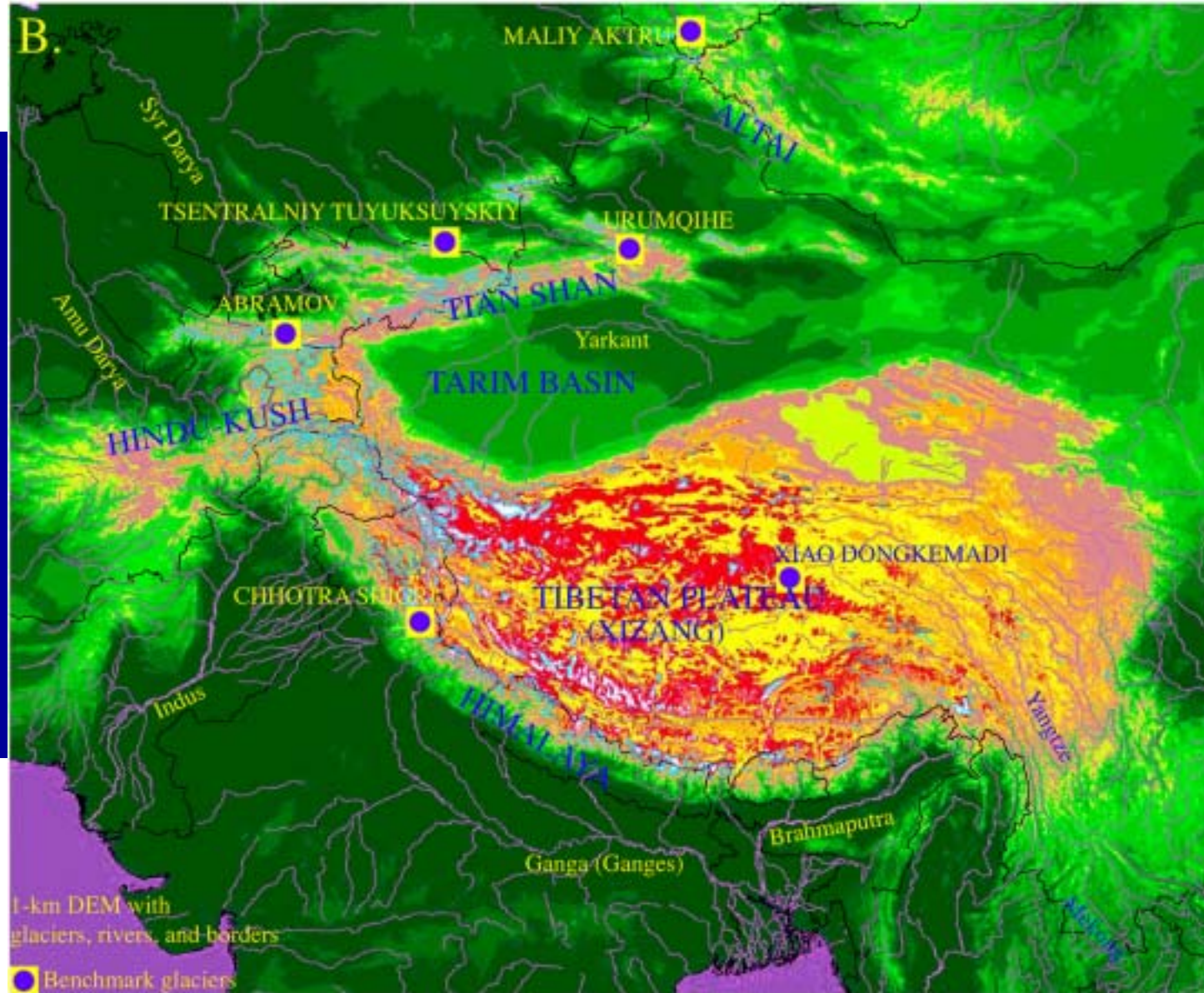
Rongbuk Glacier changes: map by Burbank (1986 data) registered to 2001 ASTER scene.

- No discernable change of terminus position.
- If this glacier is experiencing mass loss, it is due to stagnation and downwasting.
- Expected vertical change is at limit of resolution of ASTER DEMs.
- ASTER provides baseline terminus and surface relief for future.



Benchmark glaciers: Required for field validation

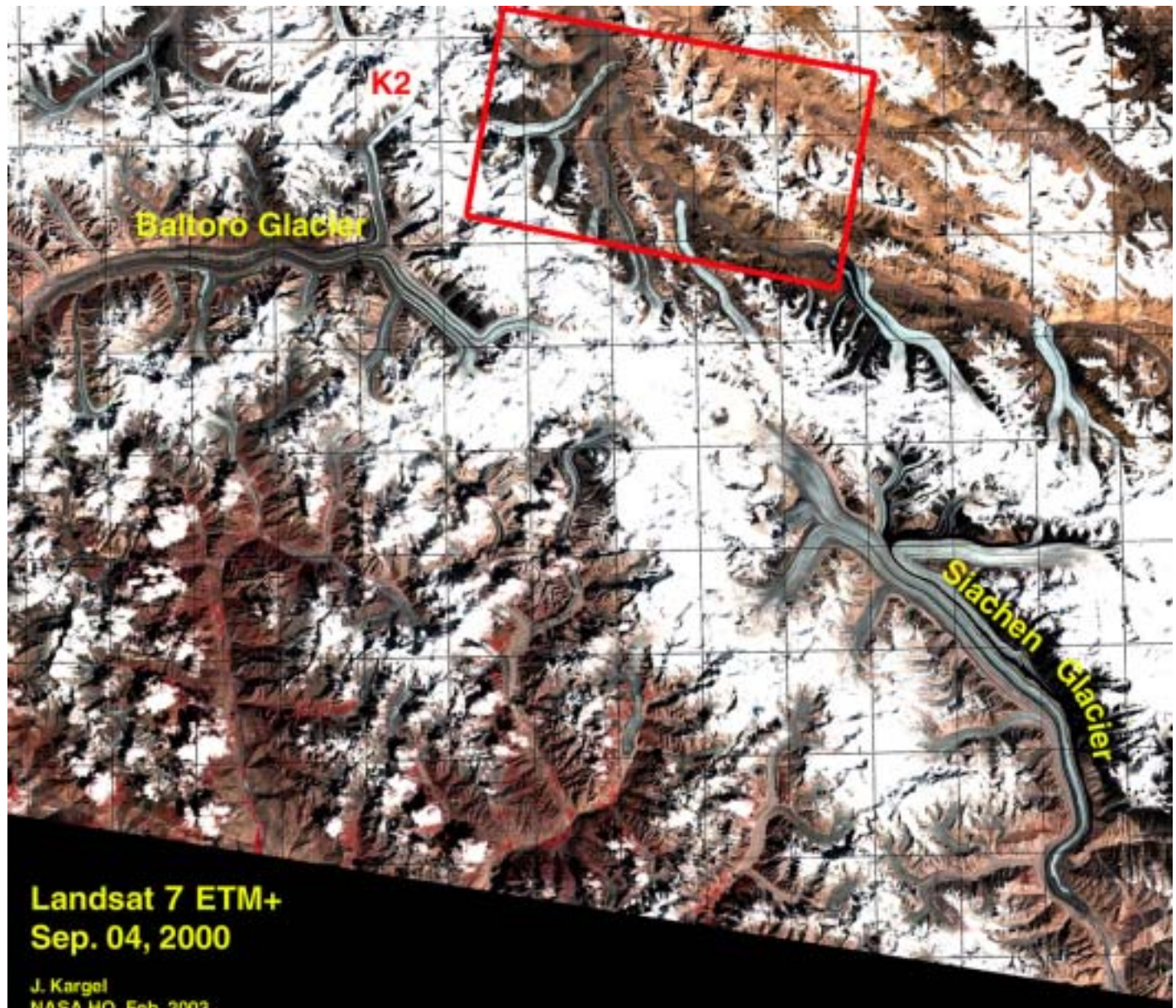
Chhotra Shigri, a new “benchmark glacier” in Indian Himalaya established by the South Asia Regional Center for GLIMS and HIGH ICE glacier change validation and calibration with climate.



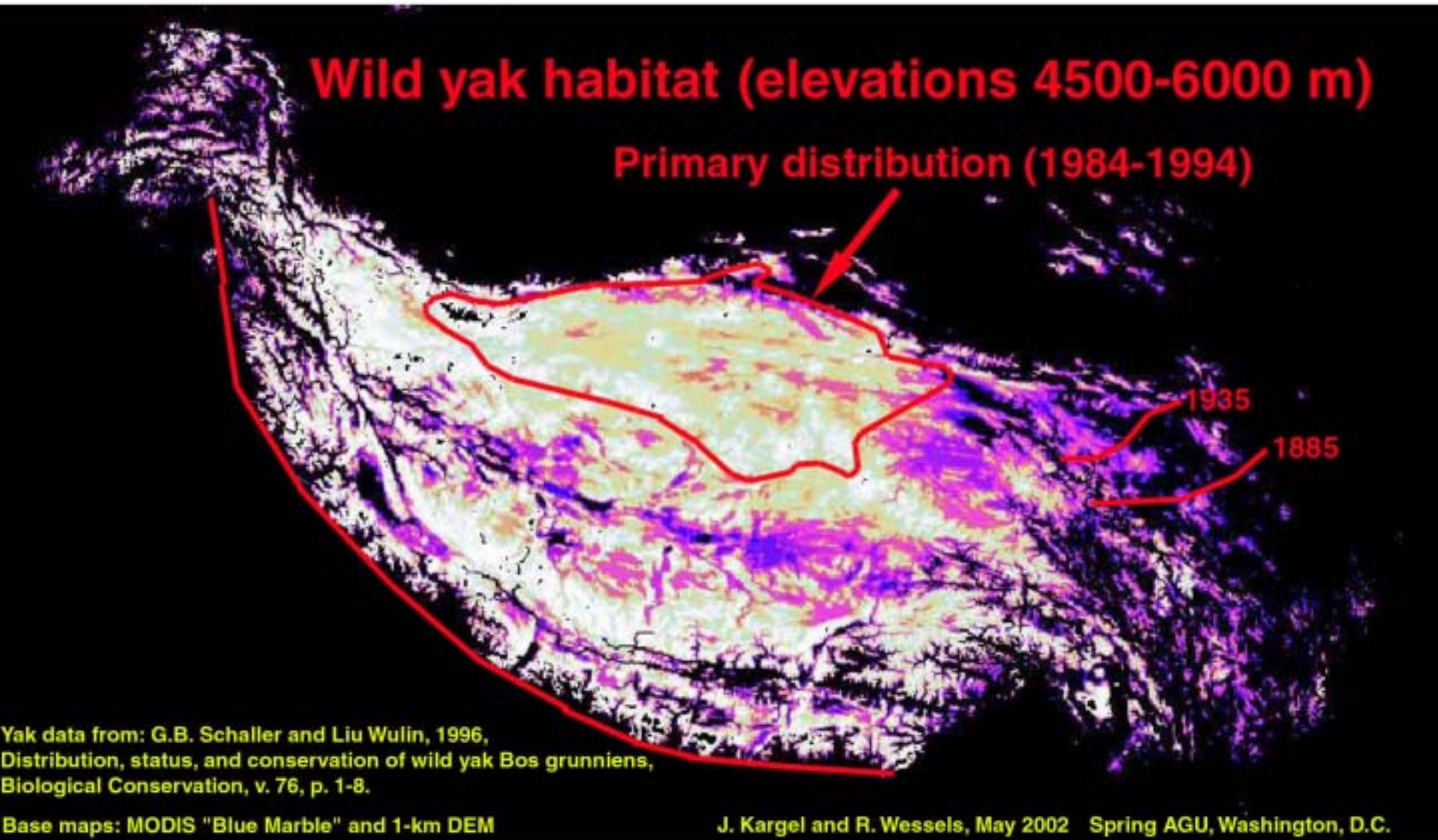
Siachen Peace Park proposal for Indian/Pakistani Kashmir: Satellite eyes focused on peace for a volatile region

**Project Leaders:
Dr. Saleem Ali
(U. Vermont)
and Former U.S.
Ambassador to
India, Harry
Barnes**

<http://www.k2peacepark.org>



Conservation potential in High Asia

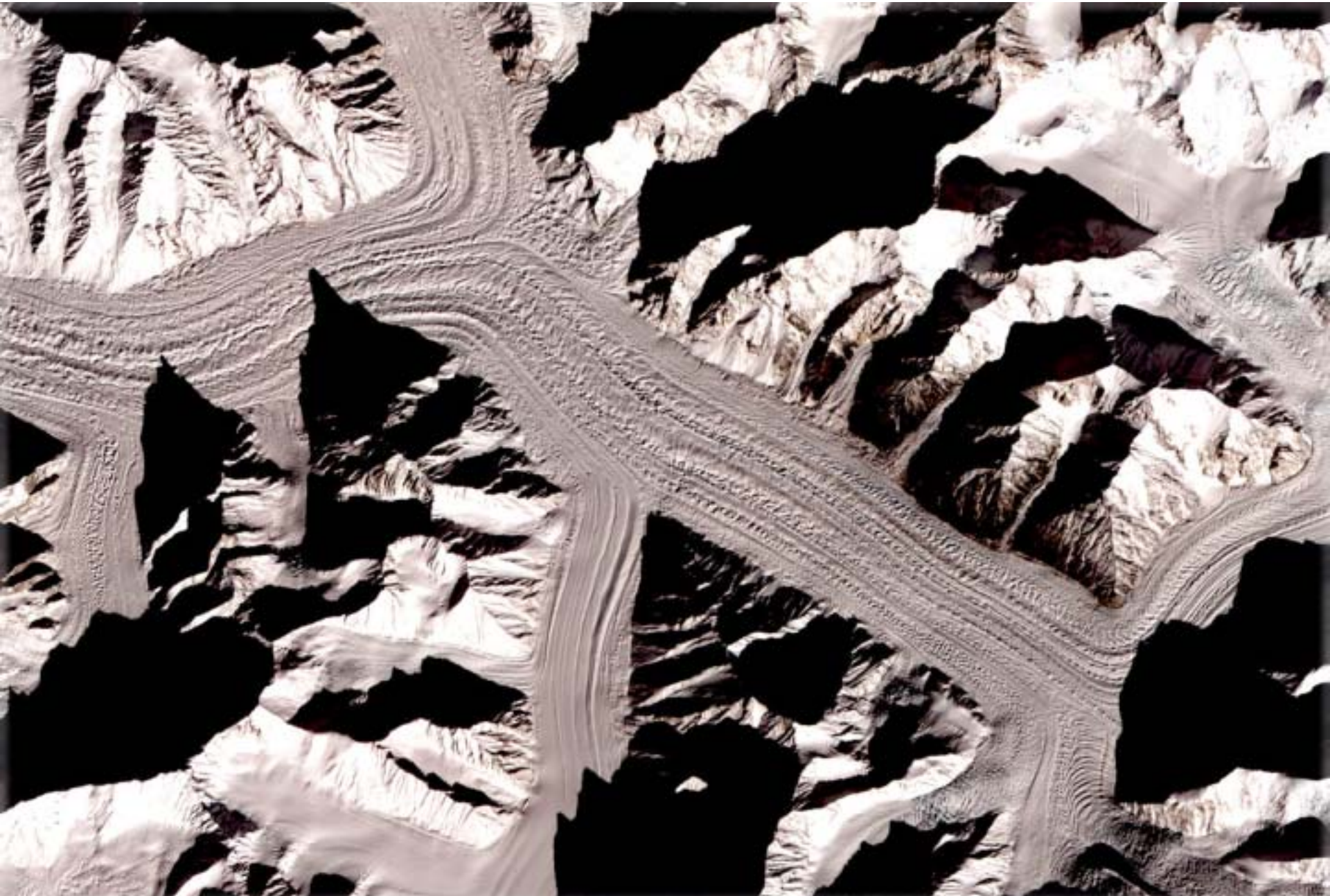


Conservation potential

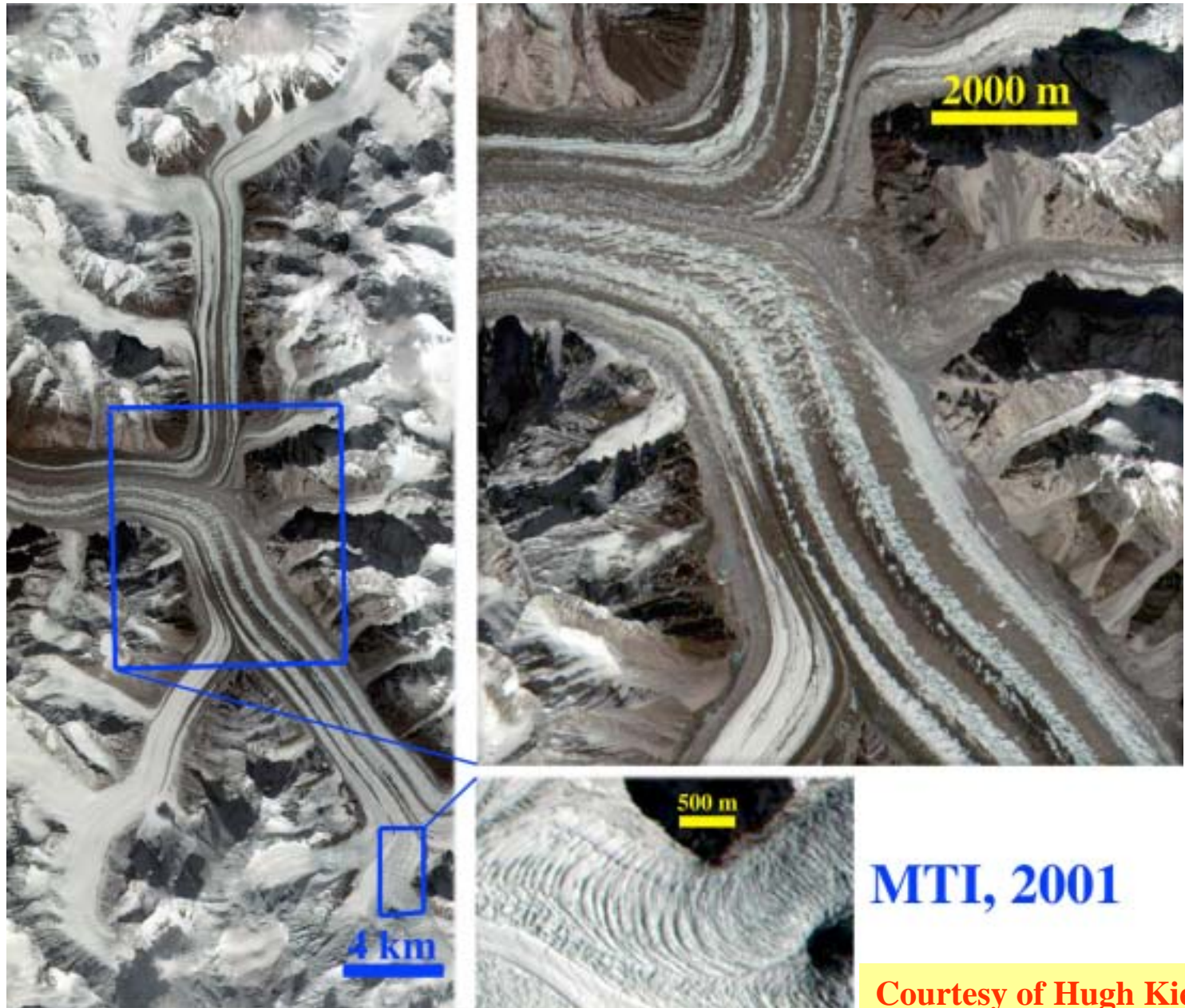
MODIS base map
GLIMS glacier database
Yak database (map of Schaller and Wulin 1996)



Baltoro Glacier, Pakistan, ASTER winter scene



MTI, Baltoro Glacier, 2001



ASTER imaging contributions to the Siachen Peace Park

Glacier Science (GLIMS/HIGH ICE):

- **Current extent of exposed ice and perennial snow**
- **Glacier extent (including debris-mantled ice)**
- **Mapping of supraglacial and proglacial lakes**
- **Glacier dynamics (change of area/length/surface profile/debris cover)**
- **Relation of current state and trends to mapped glacier extent**
- **Relation of current state and trends to moraines and other indicators of past extent.**
- **Glacier hazards (especially glacier lake outburst floods)**

Other ASTER science applications (including relation to glaciers):

- **Snowline altitudes and regional hydrology**
- **Vegetation indices of natural and semi-natural systems**
- **Ecozones and human development in relation to endangered species habitat**
- **Agriculture**
- **Urbanization**
- **Mineral and petrologic mapping**
- **Permafrost studies**
- **General geomorphologic investigations**
- **Natural hazards (landslides, forest fire, floods)**