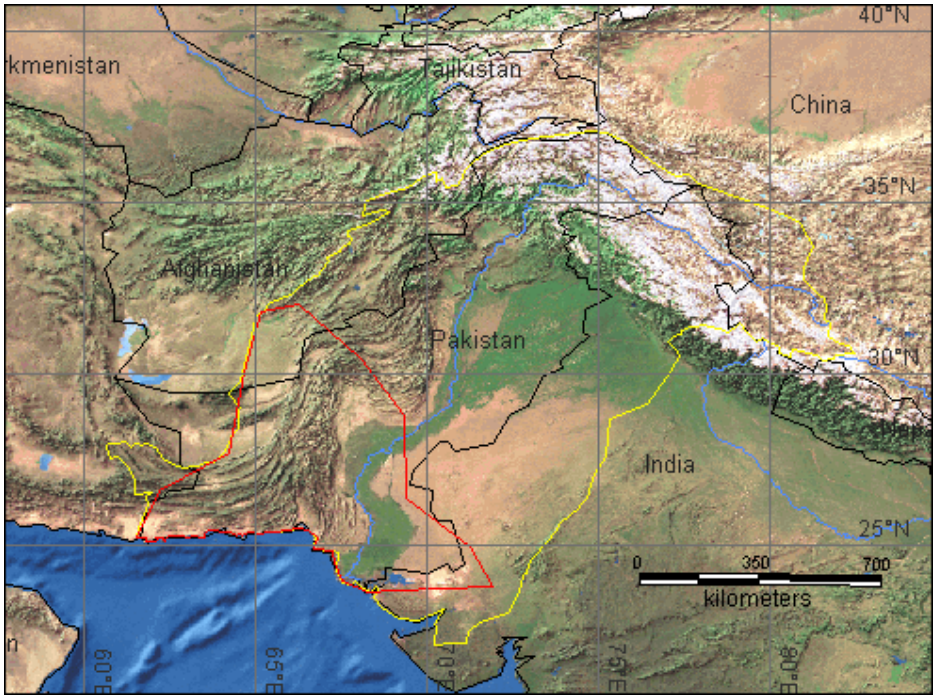
Dartmouth Flood Observatory
Flood Analysis Report 2003-046

Event:	DFO-2003-046, S. Pakistan and E. Afghanistan	Previous Events:	DFO-1999-034; 1998-082; 1994-033; 1991-011; 1988-073
Duration:	February 16 - 22, 2003, 7 days	News Notes:	Widespread flash floods – see notes next page.
Cause	Heavy rains February 16-18.	Locations:	Sind and Baluchistan provinces in Pakistan. Kandahar area in southern Afghanistan.
Region Affected:	433,500 sq. km	Watershed:	1,641,000 sq. km; Indus River
Severity:	1, large	GIS vectors	20030220PakAfgh046M25; 20030219PakAfgh046Maq250; 20030219Indus046Maq250
Magnitude:	12.9		

Figure 1. Location of contributing watershed (yellow line) and area affected by flooding (red line)



Causation categories are: 1, thunderstorm; 2, precipitation band; 3, squall line; 4, stationary front; 5, mesoscale convective complex; 6, convective cloud cluster; 7, tropical cyclone; 8, extra-tropical cyclone; 9, stationary synoptic front; 10, ITCZ wave disturbance; 11, snowmelt; 12, rain and snowmelt; 13, ice jam or ice break-up; 14, dam break; 15, avalanche.
Severity classes: 1, large, 20%-5% exceedance probability – and/or significant damage to structures or agriculture; 2, very large, 5%-1%; 3, extreme, <1%.
Flood Magnitude: {Natural Log duration (days)} x {severity class} x {sq rt region affected (sq. km)} x .01.
Duration, region affected, and intensity are estimates from news and government reports.
Work supported by: the NASA Office of Earth Science and by the Dartmouth College Geography Department, Hanover NH 03755 USA
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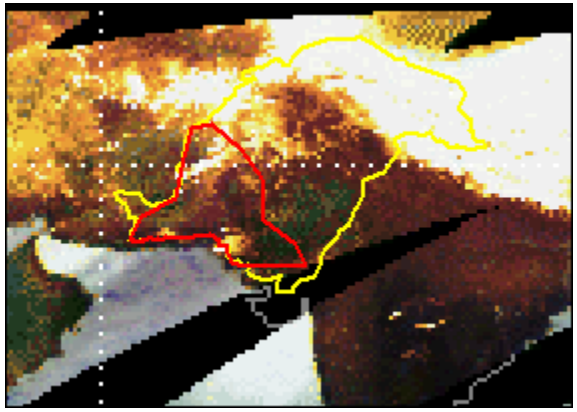
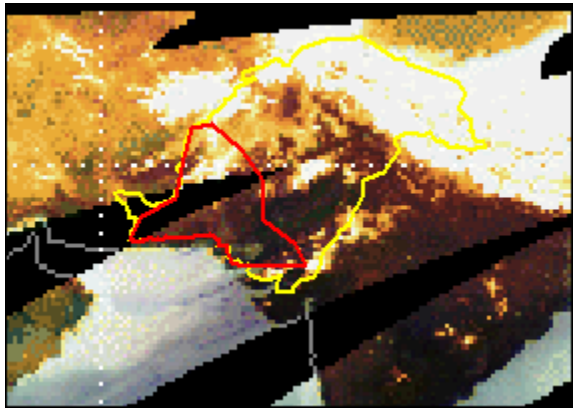
Figure 2. NASA/NASDA Tropical Rainfall Measurement Mission (TRMM) daily rainfall ("Quicklook)" data for the flood-generating storm. Images are from the TRMM home page at: http://trmm.gsfc.nasa.gov/data/quicklook/last_2_cal.html.

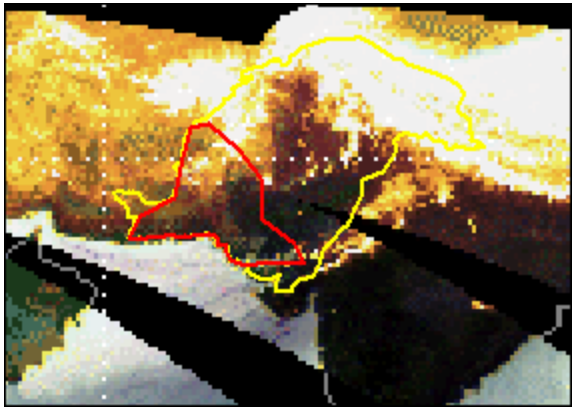
February 16, 2003



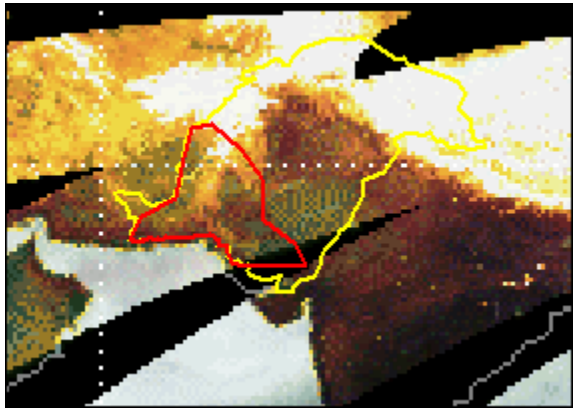
February 17, 2003



February 18, 2003



February 18, 2003



On February 17 Pakistan and Afghanistan experienced heavy rains and strong winds. TRMM data show areas of rain in the Hyderabad area beginning on February 16, and moving to the east on the 17th and 18th. The effects of the storms were widespread. The city of Hyderabad in Sind province received 105 millimeters of rain in 12 hours, breaking a 30 year old record. 80% of the neighborhoods in Hyderabad were inundated. A small dam was swept away near Quetta city in Pakistan's Baluchistan province, Quetta itself was knee deep in water. Mud houses collapsed near Karachi. A bus was swept off a hill in a flash flood in the coastal town of Gwadar in western Baluchistan. In southwestern Afghanistan flash flooding killed three people near Kandahar. Farther north in Kashmir there were mudslides and snow.

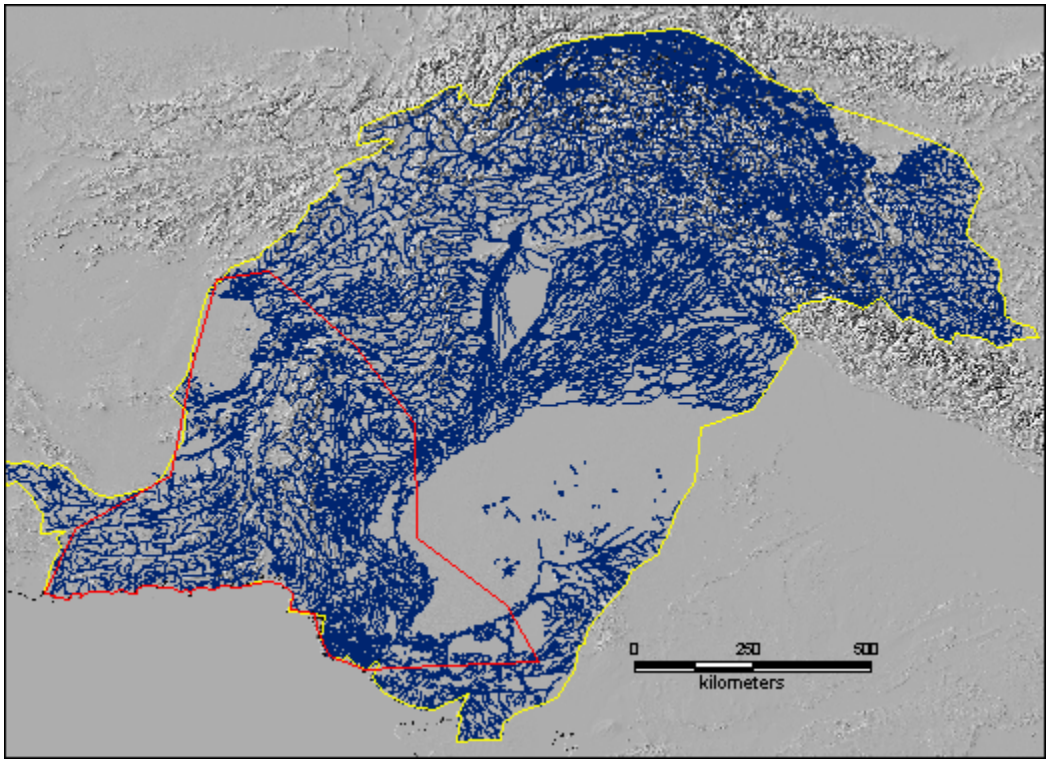
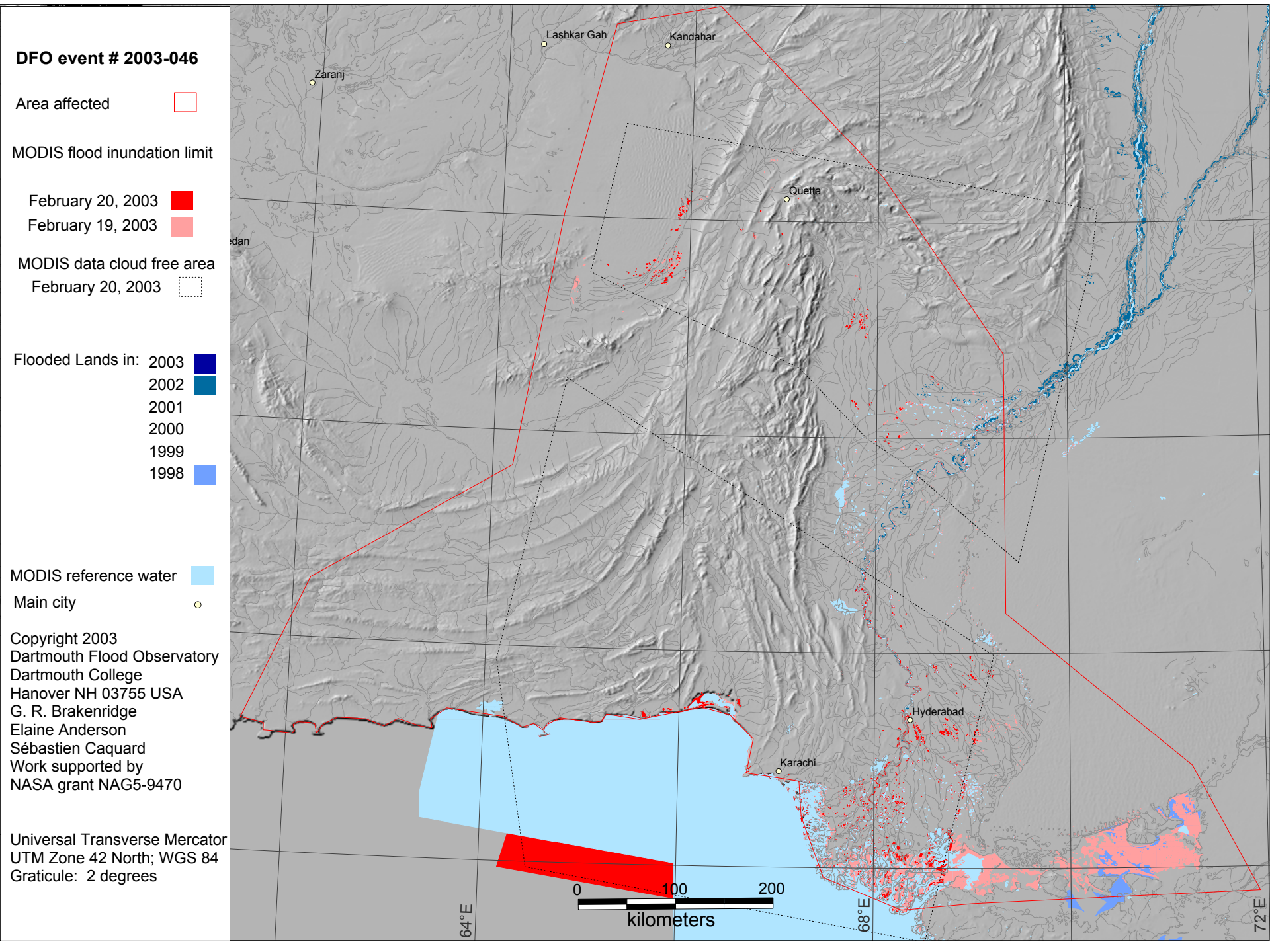


Figure 3. Flood-generating watershed for this flood event.


DFO event # 2003-046
Area affected
MODIS flood inundation limit
February 20, 2003
February 19, 2003
MODIS data cloud free area
February 20, 2003
Flooded Lands in:
2003
2002
2001
2000
1999
1998
MODIS reference water
Main city
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Dartmouth Flood Observatory
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Elaine Anderson
Sébastien Caquard
Work supported by
NASA grant NAG5-9470
Universal Transverse Mercator
UTM Zone 42 North; WGS 84
Graticule: 2 degrees
Lashkar Gah
Kandahar
Zaranj
Quetta
Hyderabad
Karachi
0
100
200
kilometers
64°E
68°E
72°E