Air Quality Improvement During COVID-19 & its likely Impacts on the melting cryosphere in the UIB

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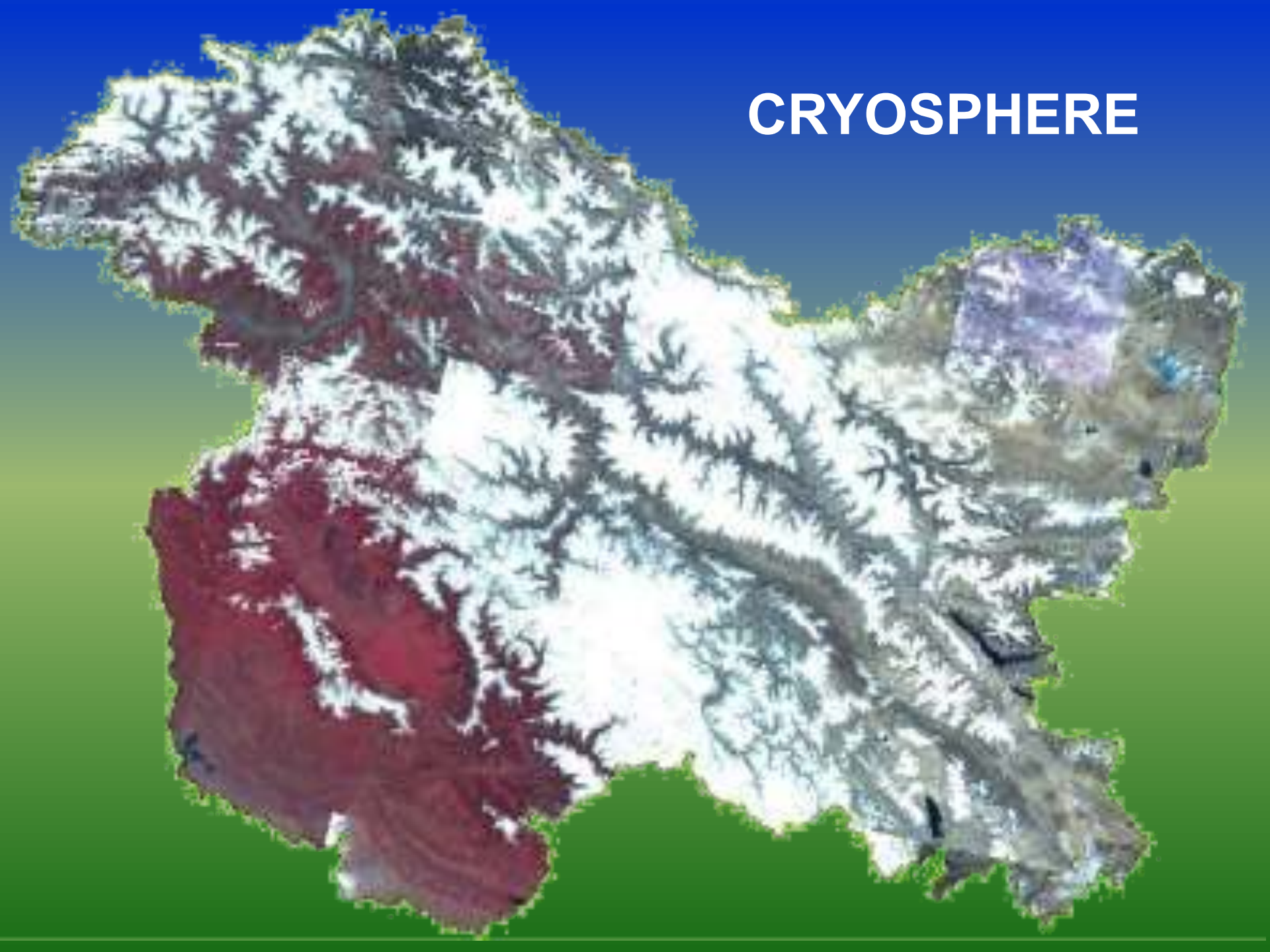
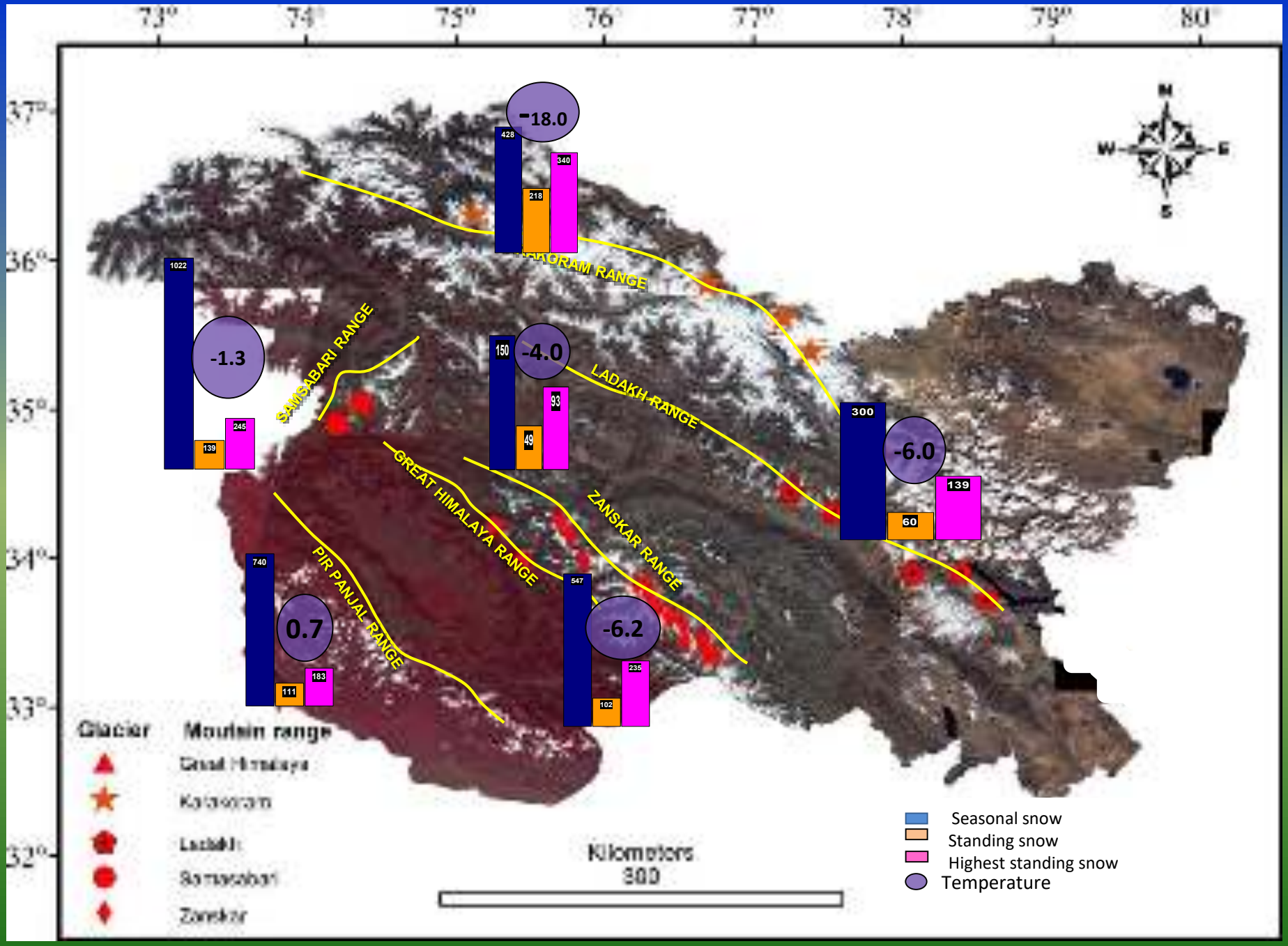
A few Thoughts…..

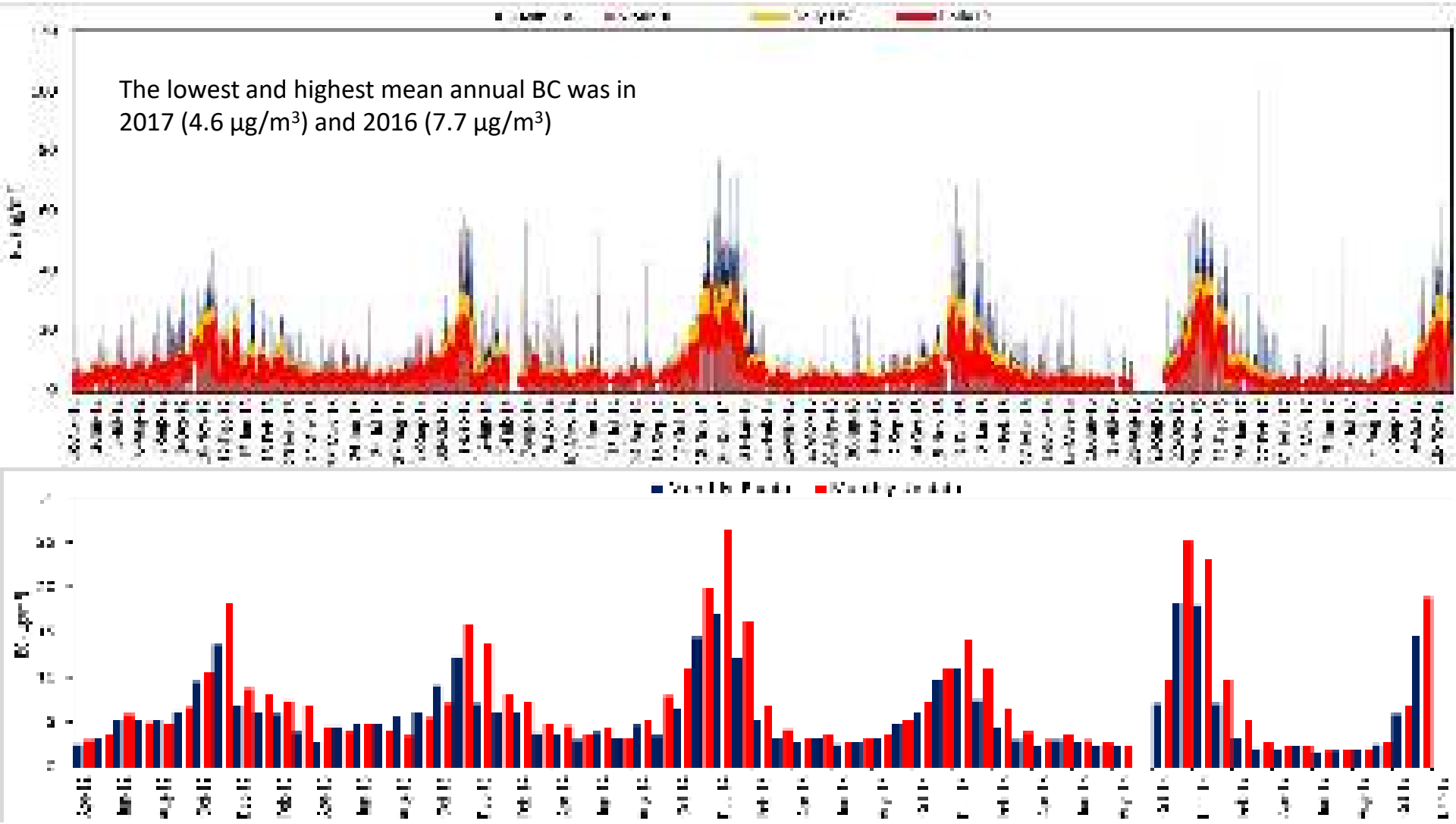
- How much of the glacier melting in the UIB is driven by the GLOBAL CC and LOCAL atmospheric pollution is UNKNOWN?
- Along with CC, BC has been reported as a significant factor responsible for the cryosphere depletion in the HKH
- The understanding of climatic and atmospheric processes in the UIB is constrained due to the scanty network of observation (Climatic, glaciological, hydrologic, AQ etc.)
- Implications of depleting cryosphere under changing climate/air pollution on water, energy and food security are far-reaching
- Climate change and atmospheric pollution is a common concern in the South Asia and should be used to foster cooperation among countries on addressing various issues confronting the HKH region.
- Lesson from the COVID-19

CRYOSPHERE

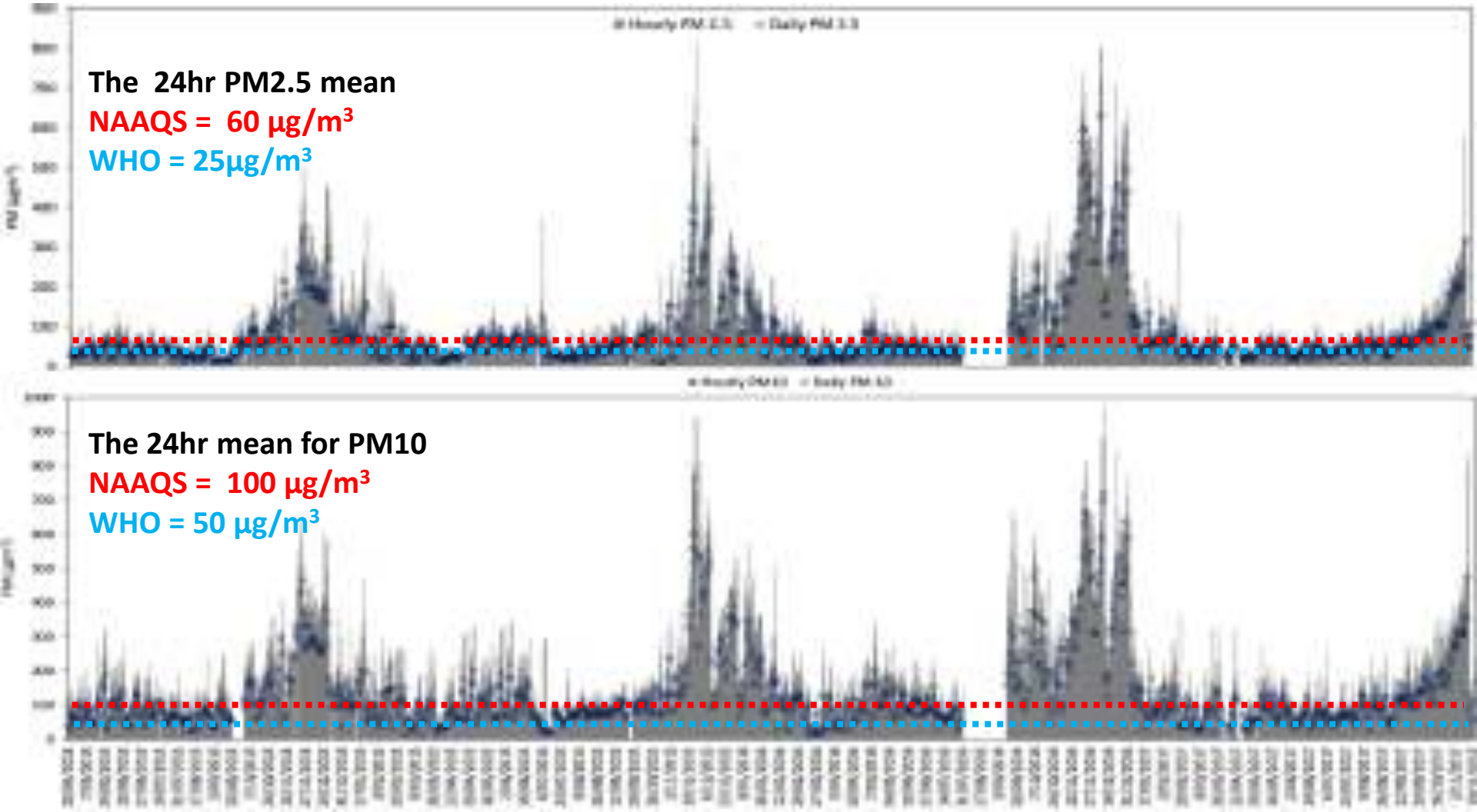



73°
74°
75°
76°
77°
78°
79°
80°
37°
36°
35°
34°
33°
32°
N
W
E
S
-18.0
428
218
340
KARAKORAM RANGE
1022
-1.3
139
245
SAMSABARI RANGE
150
-4.0
49
93
LADAKH RANGE
300
-6.0
60
139
GREAT HIMALAYA RANGE
ZANSKAR RANGE
740
0.7
111
183
PIR PANJAL RANGE
547
-6.2
102
235
Glacier
Mountain range
Great Himalaya
Karakoram
Ladakh
Samaschan
Zanskar
Kilometers
300
Seasonal snow
Standing snow
Highest standing snow
Temperature

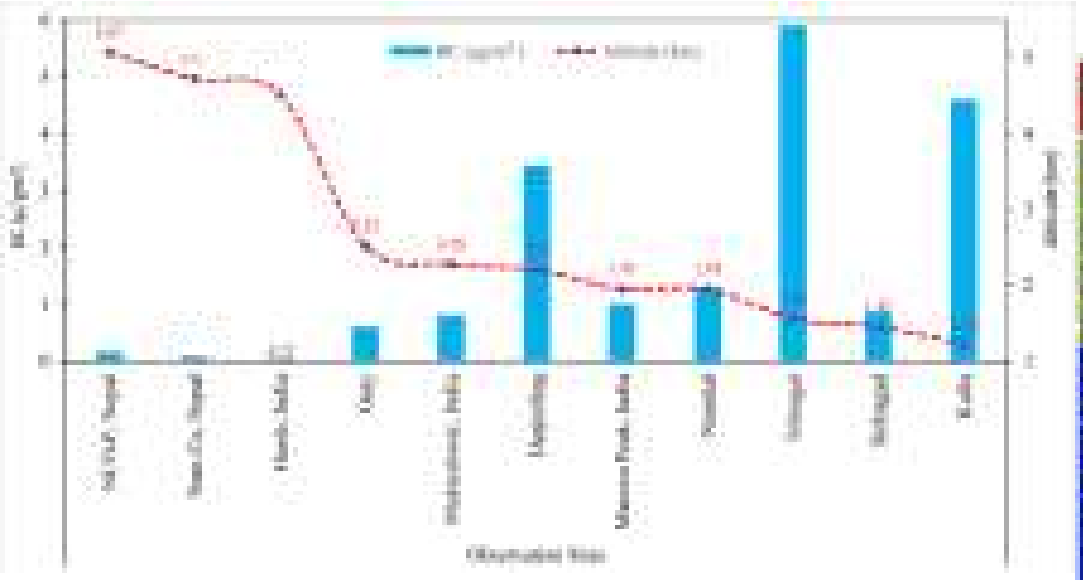
BC variability from 2012-2017



PM variability from 2013-2017

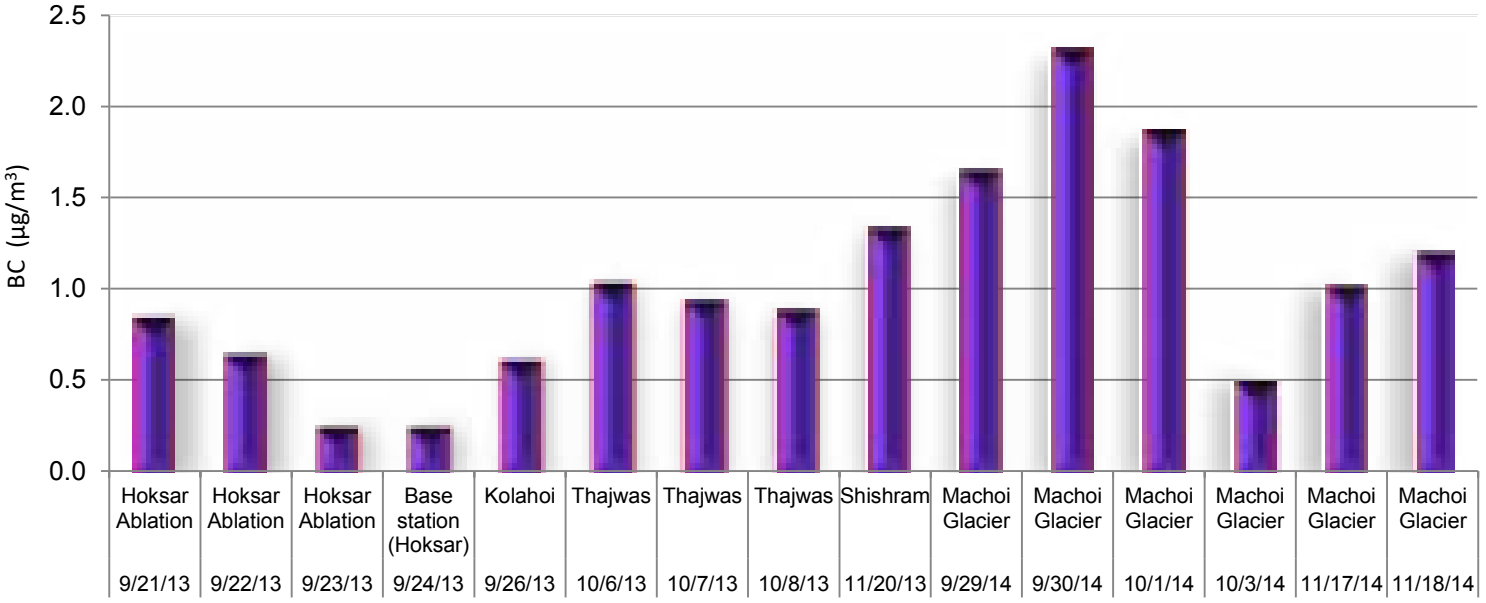


BC STUDIES IN KASHMIR HIMALAYA



Glacier	Altitude asl (m)	BC (ng/m³)	Observation Period (hrs)	Possible Reasons
Hoksar	3500	600	72	Low anthropogenic interference
Kolahoi	3480	625	24	Low lift of BC
Machoi	3500	1304	96	Close of National highway
Thajwas	3530	950	48	NH Vicinity+Local sources
Satopanth glacier	3215-4300	227	168	Badrinath showing high conc.(1430 ng)

Nair VS, Babu SS, Moorthy KK, Sharma AK (2013) Black carbon aerosols over the Himalayas: direct and surface albedo forcing. Tellus B, 65, 19738, http://dx.doi.org/10.3402/tellusb.v65i0.19738



BIOMASS BURNING


HAZE OVER KASHMIR 28 NOV 2018


KASHMIR VALLEY

90% of Himalayan Glacier Melting Caused by Aerosols & Black Carbon

Mat McDermott (@matmcdermott)
Science / Natural Sciences
February 9, 2010

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India pollution linked to Himalaya glacier melt

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Last updated on 10/03/2014, 3:40

Kolkata's choking street
region's long term prosp

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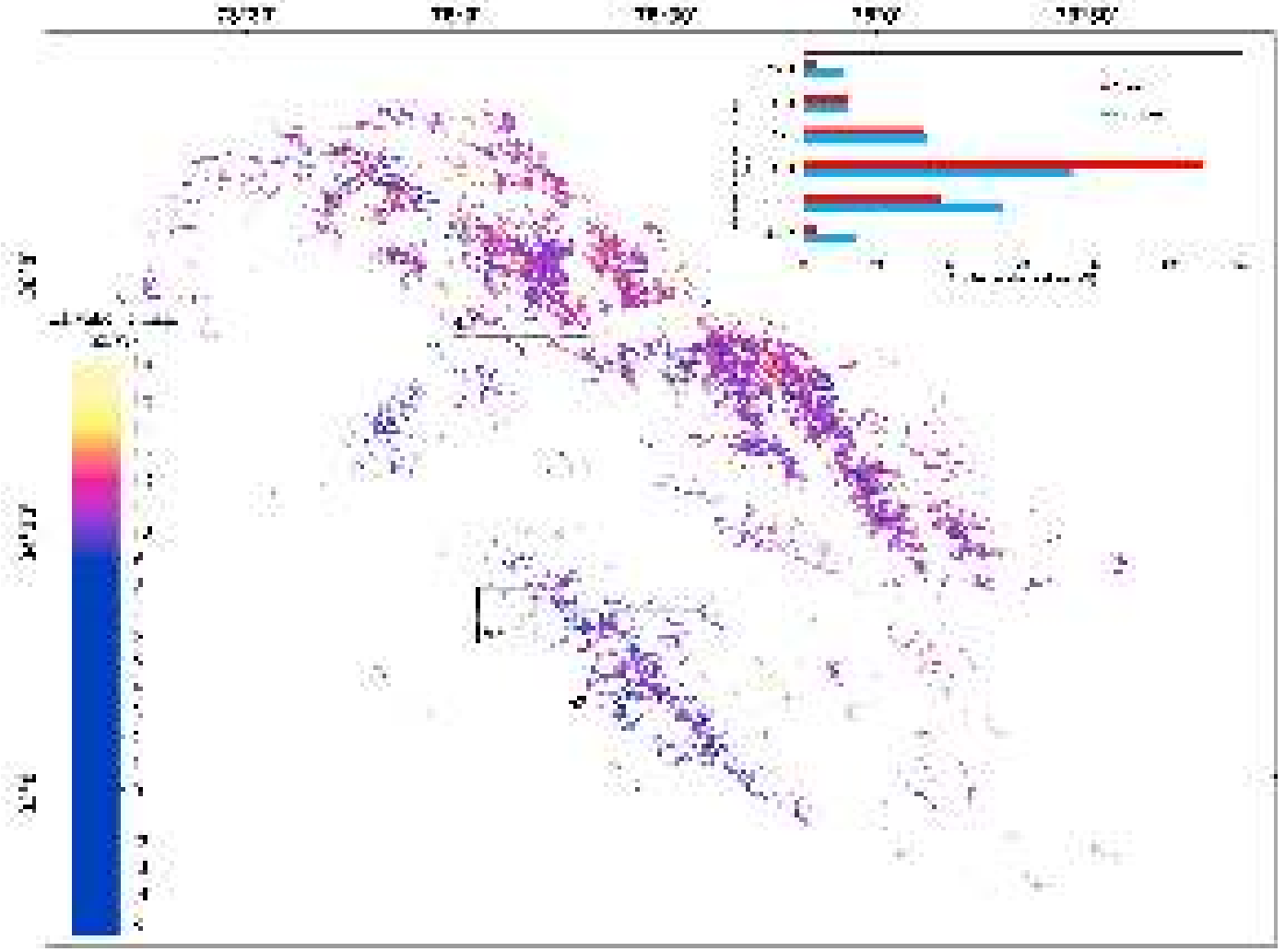
Black Carbon a Significant Factor in Melting of Himalayan Glaciers

Feature Story Julie Chao 510-486-6491 • FEBRUARY 3, 2010

OVERALL GLACIER THICKNESS AND MASS CHANGES



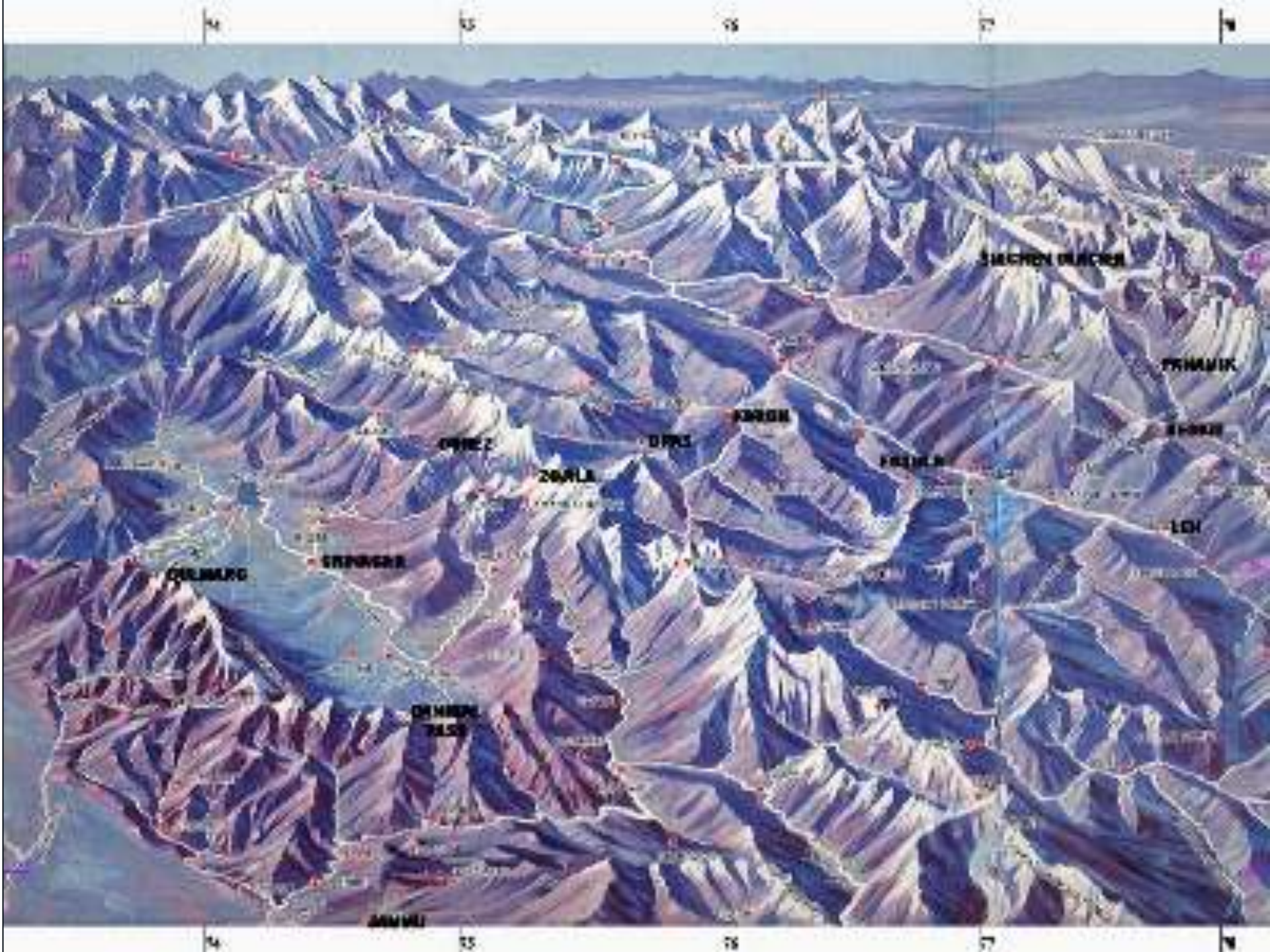
b1 *b2-b3*

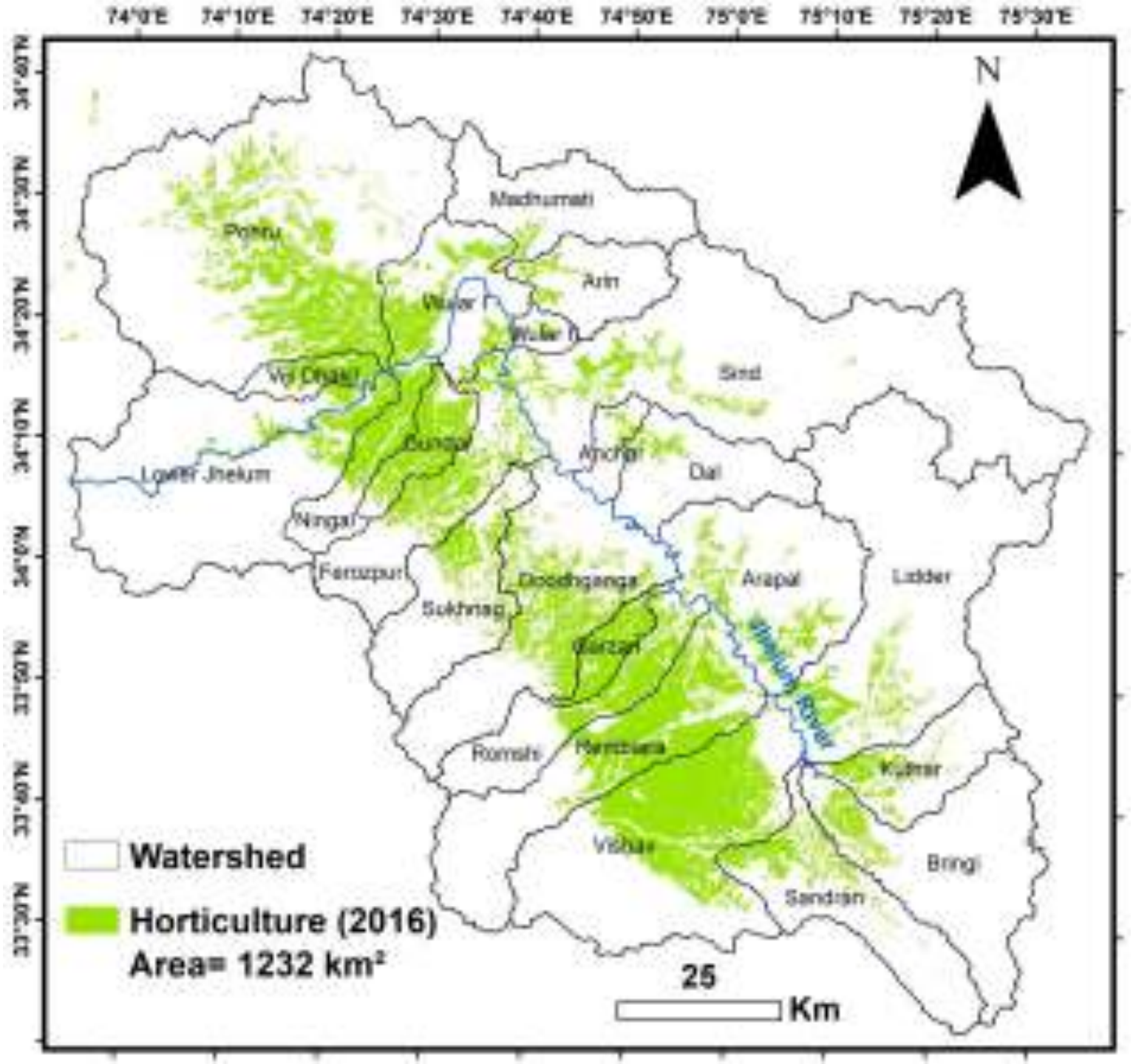
dH/dT (m a^{-1})	Mass balance m w.e. a^{-1}	Cumulative mass change Gt	Mass change Gt a^{-1}	Specific mass change kg a^{-1} m^{-2}
-0.40 ±0.37	-0.34 ±0.31	-67.07 ±5.08	-4.7±0.36	- 242.85

GLCIER ELEVATION CHANGES ACROSS DIFFERENT MOUNTAIN RANGES in UIB

Mountain	**Area**	**dH/dT**	**Mean Elevation**	**Mean slope**	**Debris cover**		**Area** (south aspect)	
Range	km^2	$m\ a^{-1}$	m asl	°	km^2	%	km^2	%
KKR(5579*)	14142.67	-0.04 ±0.49	5259	31.62	1281.3	9.07	3438.00	24.33
LR(3717)	2469.76	-0.33 ±0.14	5684	24.43	136.47	5.53	182.16	7.38
ZR(1720)	2355.40	-1.15 ±0.35	5032	23.59	309.42	13.14	622.06	26.41
SR(878)	639.61	-1.31 ±0.43	4724	22.27	94.48	14.77	122.71	19.19
GHR(243)	93.16	-1.03 ±0.37	4459	22.58	5.53	5.14	15.69	14.58
PPR(106)	26.48	-1.84 ±65	4153	20.68	2.30	8.69	2.26	8.53

**number of glaciers in each mountain range*




74°0'E
74°10'E
74°20'E
74°30'E
74°40'E
74°50'E
75°0'E
75°10'E
75°20'E
75°30'E
N
Madhumati
Pohru
Arin
Sind
Dal
Lidder
Arapal
Ronnis
Kulnar
Bringi
Sandran
Vishaw
Watershed
Horticulture (2016)
Area= 1232 km²
25
Km

Statement Showing the Year-wise Area, Production and Yeild of Important fruits of J&K State.

Department of Horticulture Kashmir — Area in Hects/Production in M.Tonnes

Year	Apple			Pear			Cherry			Walnut			Almond			Others			Total		
	Area	Prod.	Yeild	Area	Prod.	Yeild	Area	Prod.	Yeild	Area	Prod.	Yeild	Area	Prod.	Yeild	Area	Prod.	Yeild	Area	Prod.	Avg. Yeild
1953-54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12400	16000	1.29
1955-56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14000	18000	1.28
1960-61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16000	33000	2.06
1965-66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23000	47000	2.04
1969-70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45600	93000	2.03
1970-71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48000	128000	2.66
1971-72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52000	134000	2.57
1972-73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56000	183000	3.26
1973-74																					
1974-75																					
1975-76																					
1976-77																					
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1978-79																					
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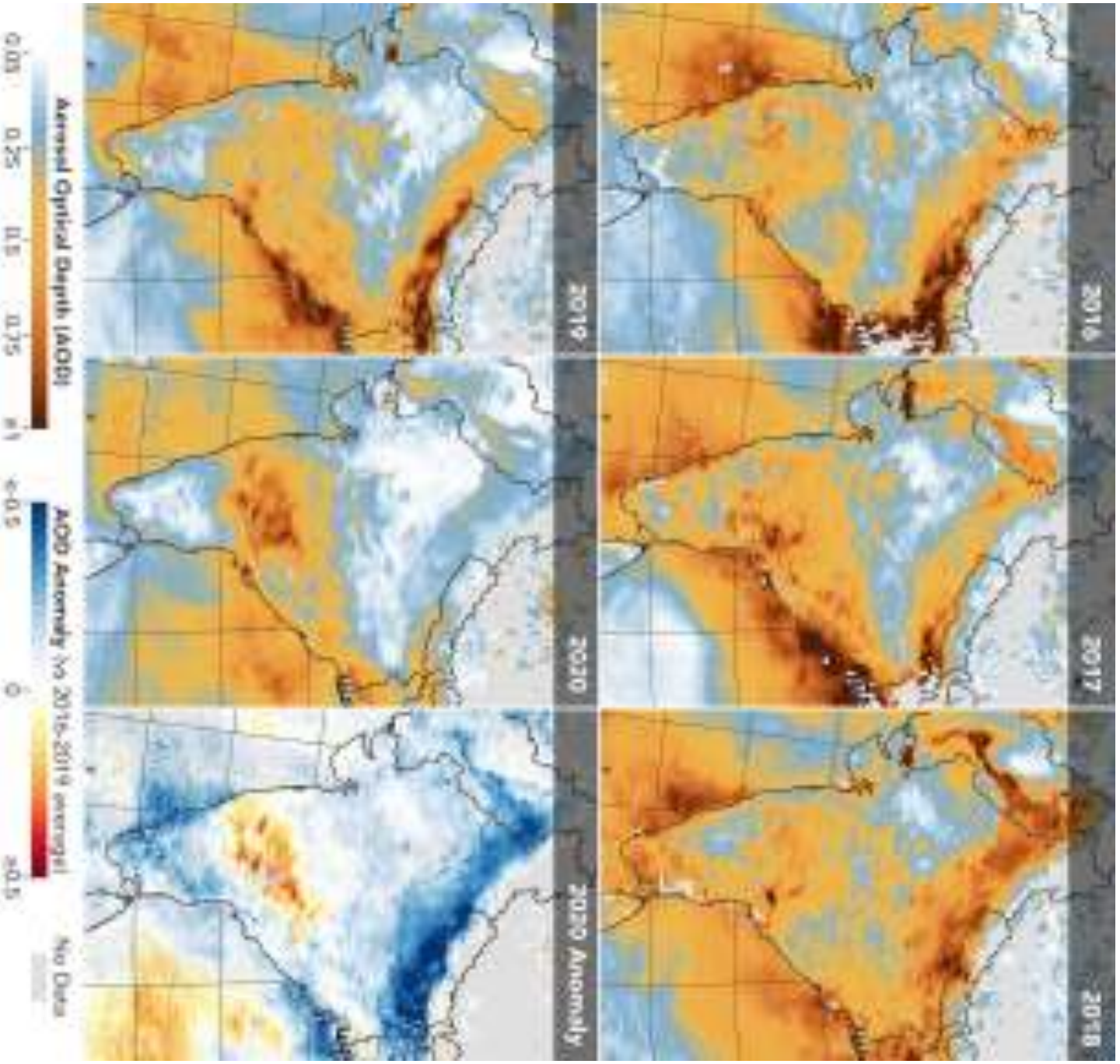
1995-96																					
1996-97																					
1997-98																					
1998-99																					
1999-2000																					
2000-2001																					

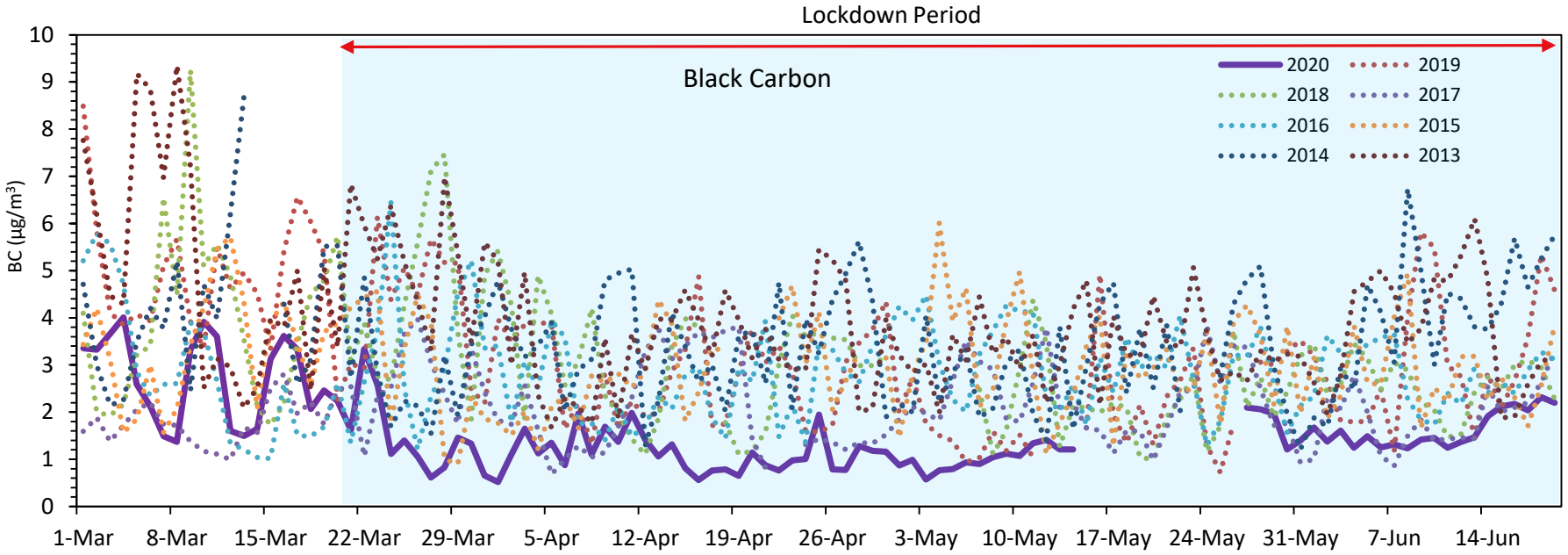
12,400 hectares in 1953

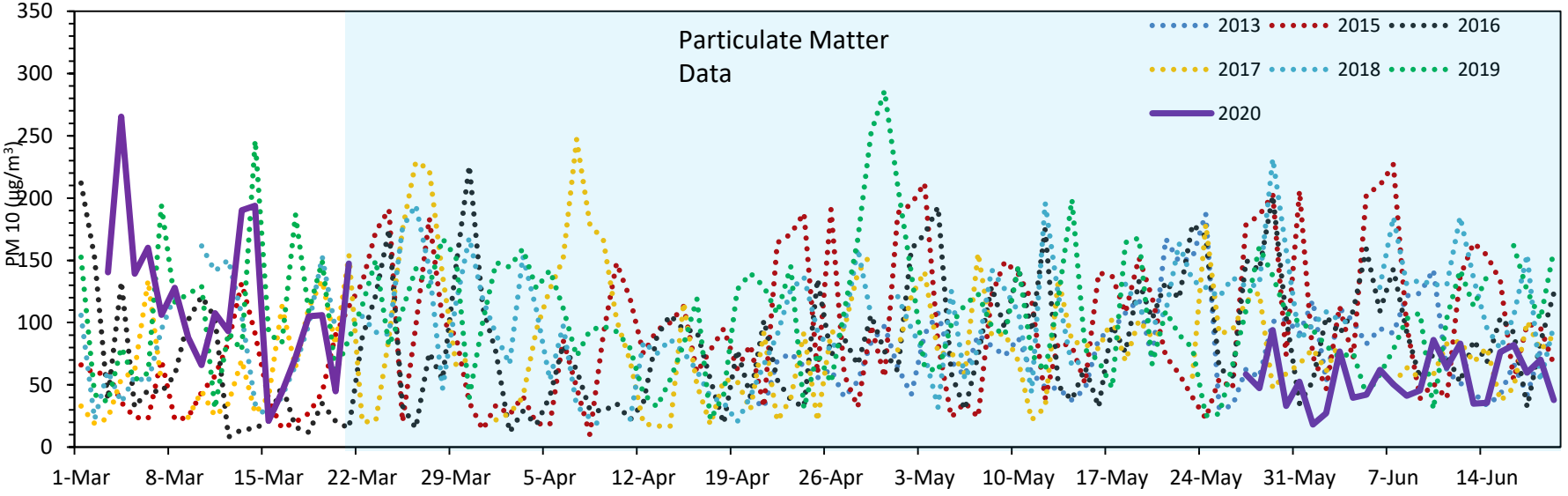
338528 hectares in 2017

AIR QUALITY BEFORE & DURING COVID

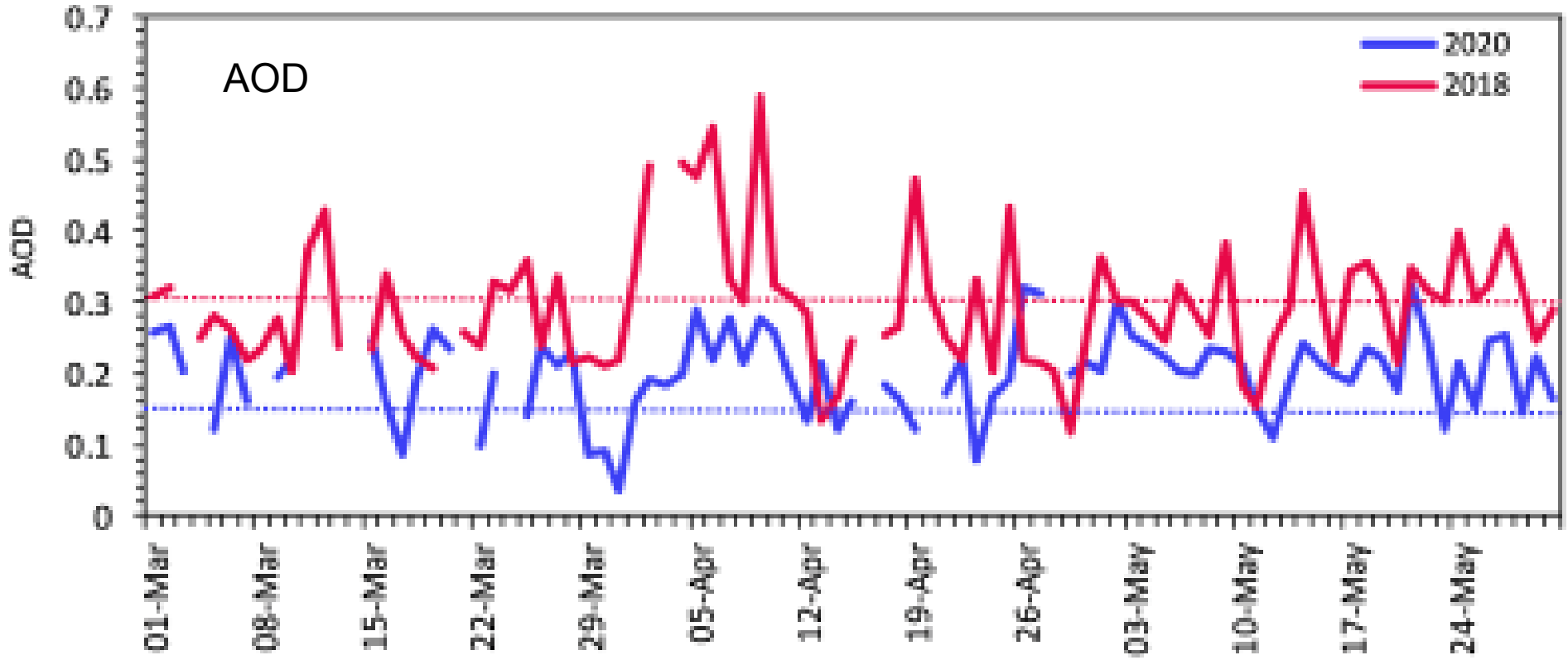


Air Pollution in Kashmir during the LOCKDOWN Period





Air Pollution in Kashmir during the LOCKDOWN Period




THANKS