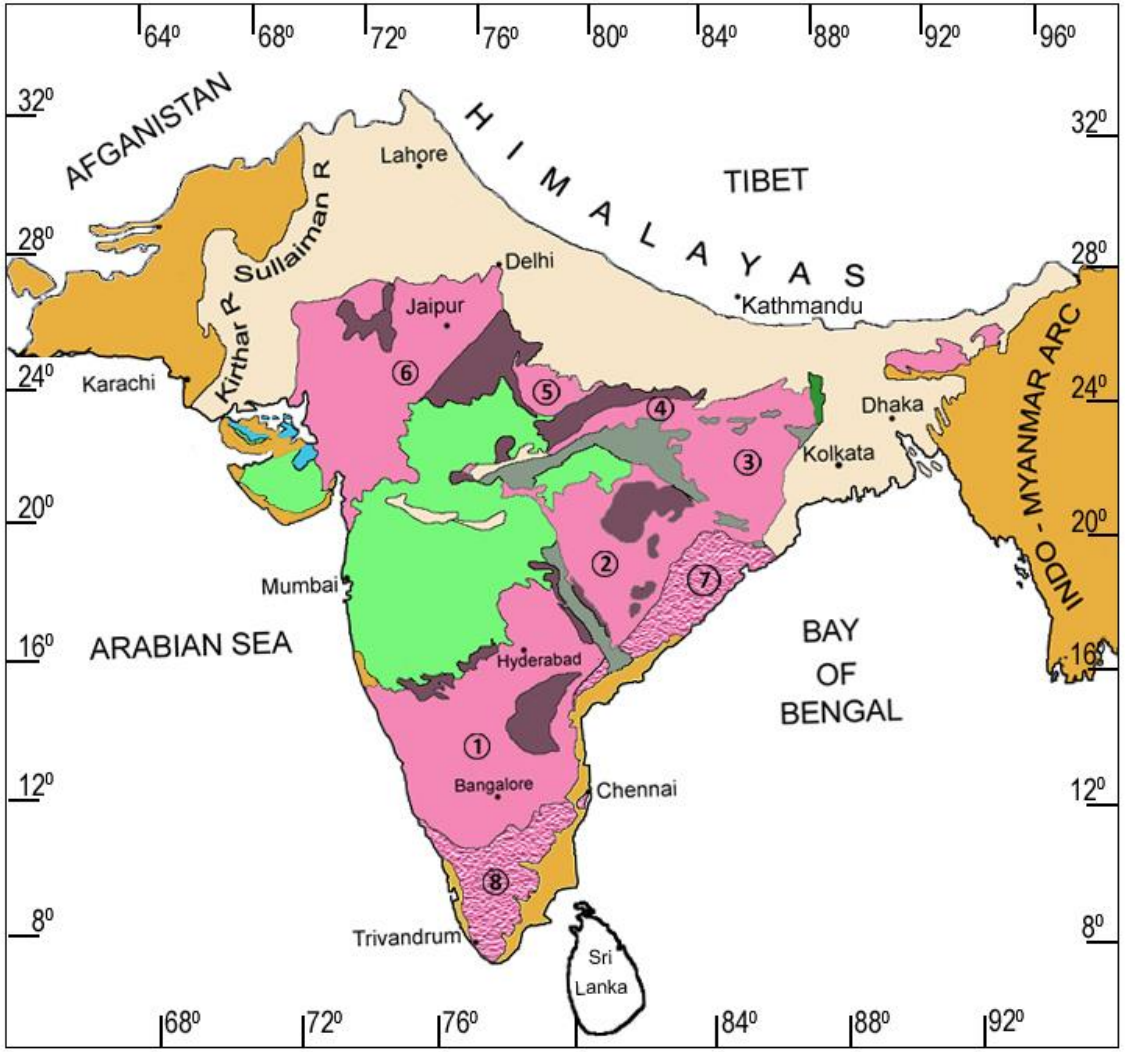
Banded Gneissic Complex

Presentation by

Ritesh Purohit

Precambrian rocks of the Indian Shield is made of several Protocontinents and accreted terranes

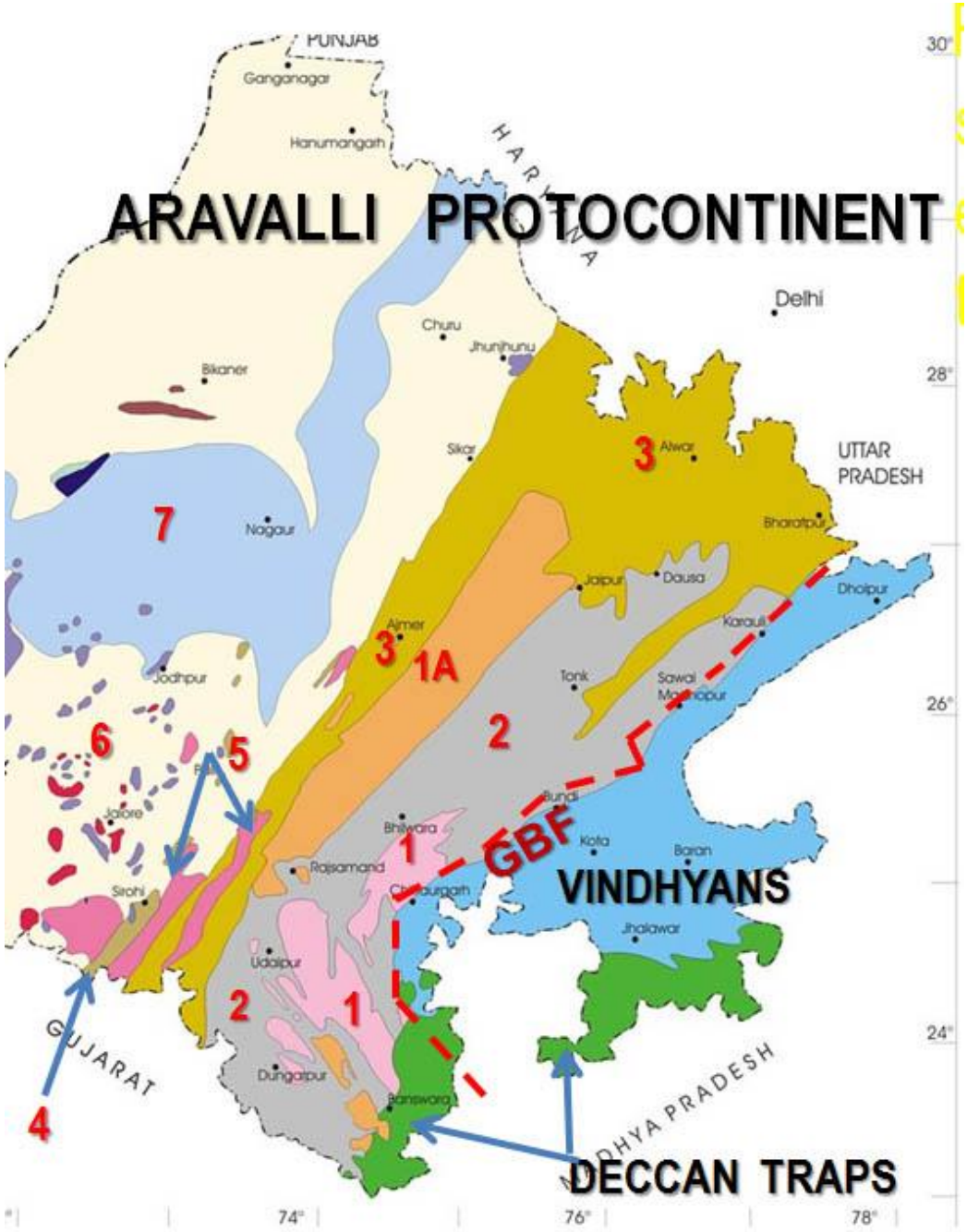


Protocontinents

1. Dharwar
2. Bastar
3. Singhbhum
4. Rajmahal
5. Bundelkhand
6. Aravalli

Accreted terranes

7. Eastern Ghats Granulite Belt
8. Southern Granulite Belt



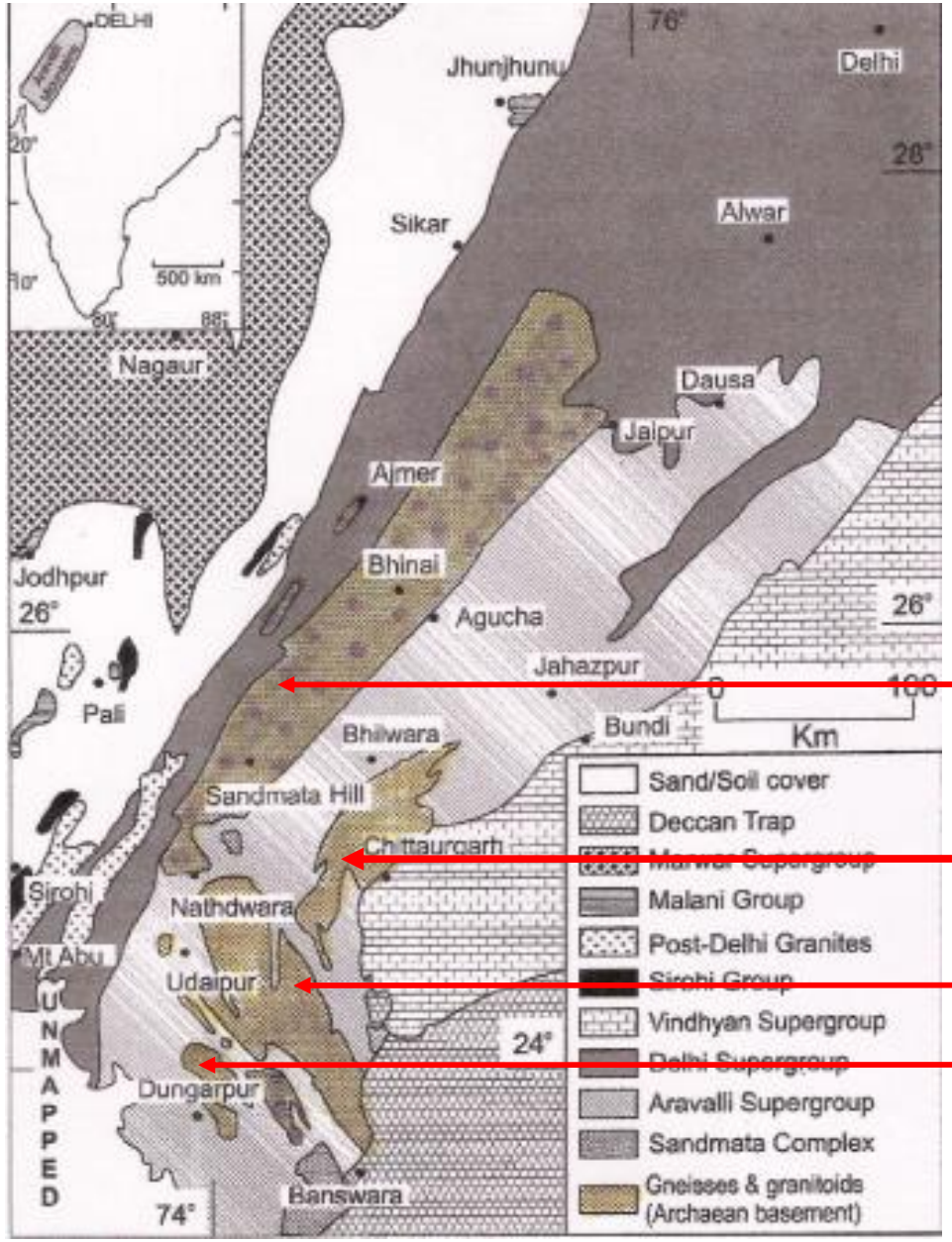
Aravalli Protocontinent constitutes of -

7. Marwar Supergroup
6. Malani Group
5. Erinpura Granite
4. Sirohi Group
3. Delhi Supergroup
2. Aravalli Supergroup

1,1A Archaean Basement (partially reconstituted)

- Aravalli Mts and adjacent areas covering Rajasthan and parts of neighbouring states has well-preserved records of continuous geological history from about 3500 million years bp to the present day.

- Such a long and protracted Precambrian geological history is unknown in any other comparable region in the world.



Before discussing about the basement it would be better to highlight the main basement outcrops

Sandmata Complex
(BGC II of B C Gupta)

Bundelkhand granite

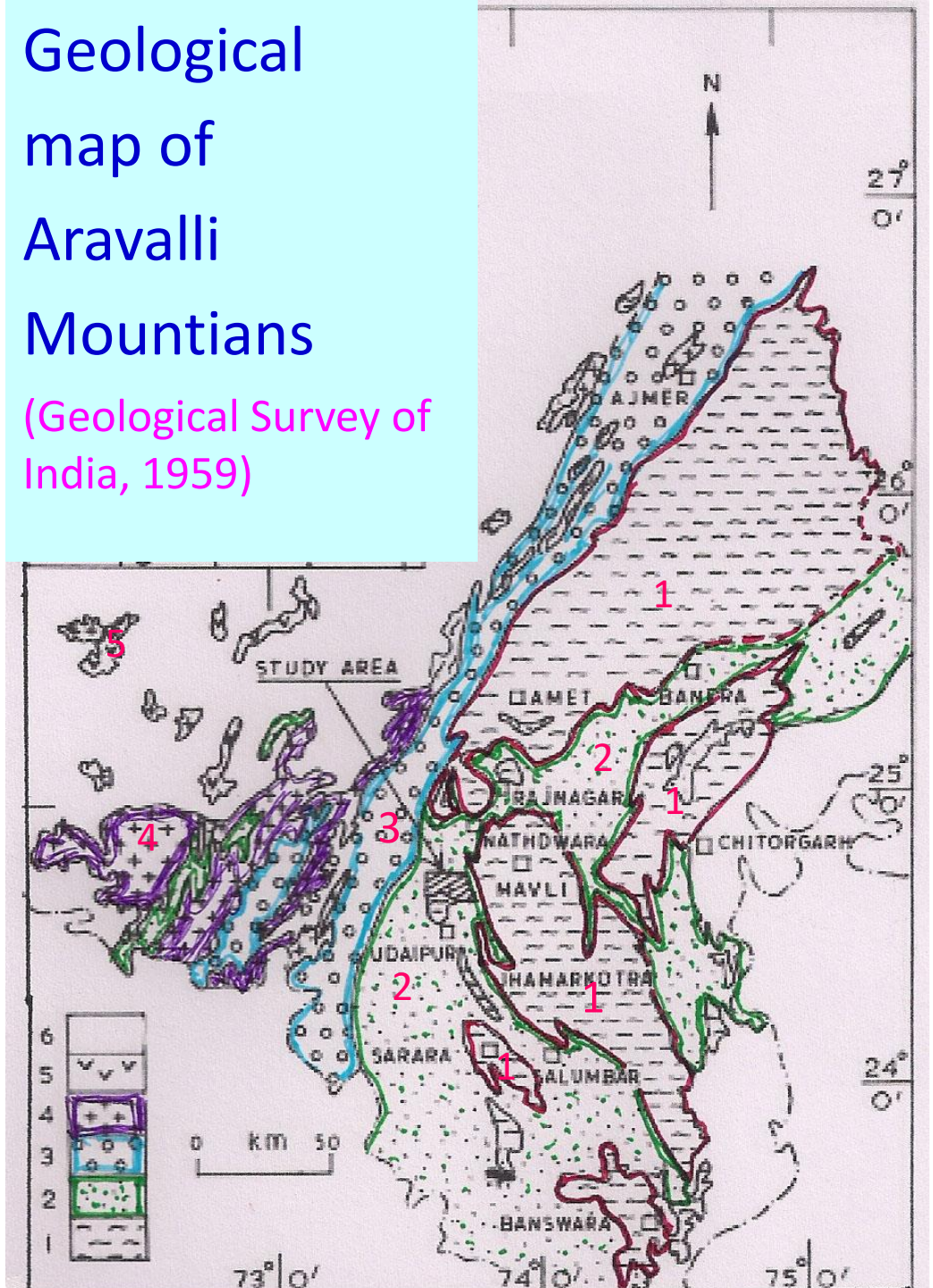
Mavli block of Archaean basement

Sarara inlier

(BGC I of B C Gupta)

Geological map of Aravalli Mountians

(Geological Survey of India, 1959)



Heron & colleagues recognised following stratigrahic formations:

6.Post Malani rocks & sand-soil cover

5. Malani rhyolites

4.Erinpura granite

3. Delhi system

2. Aravalli system

1.Banded Gneissic Complex, Bundelkhand granite

Stratigraphic succession of the Aravalli Mountains according to AM Heron & colleagues

	Malani rhyolites
	Jalore & Siwana granites
	Erinpura granite
Puranas (=Algonkian)	Delhi system

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Eparchaean Interval	Raialo series

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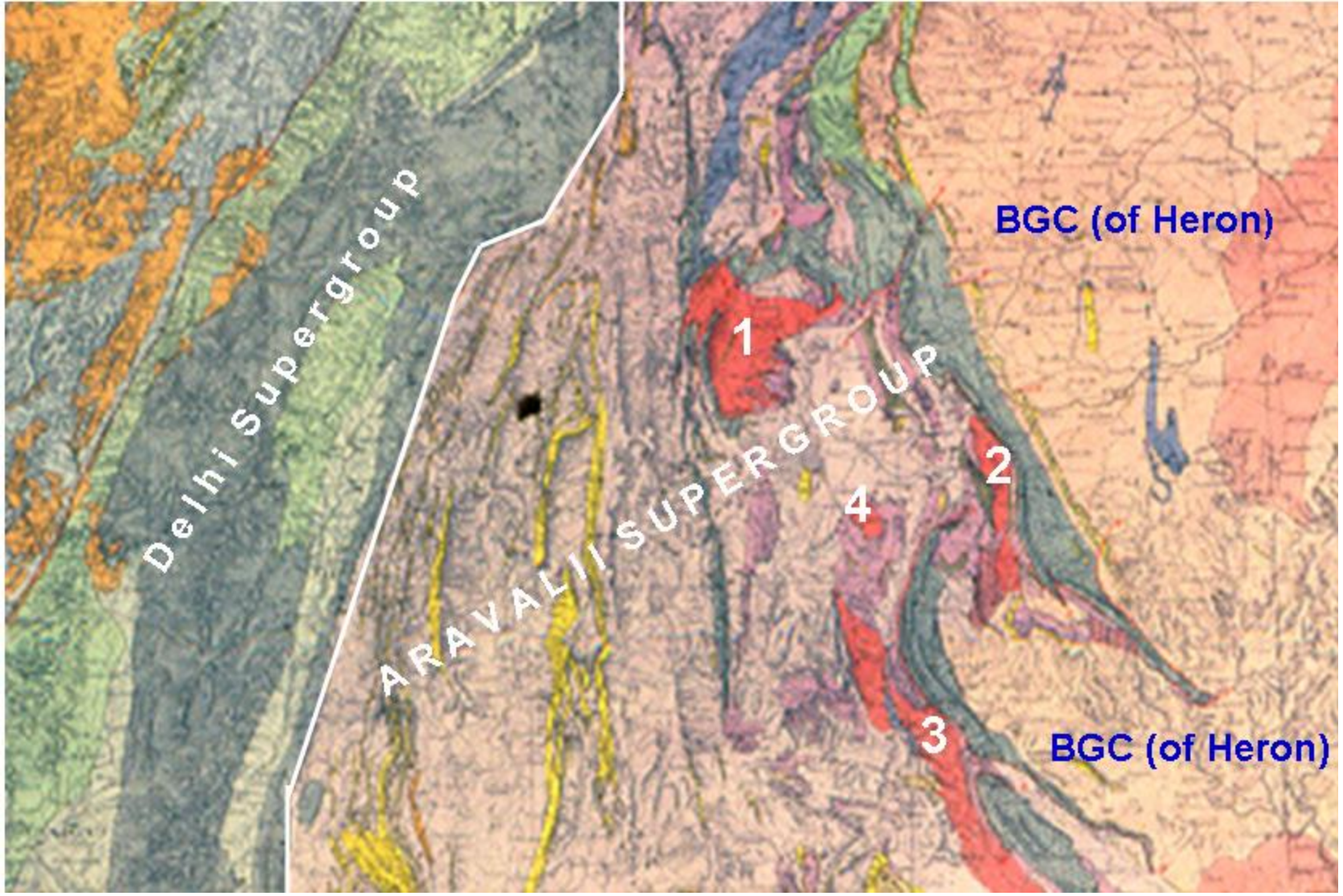
Post-Aravalli, pre-Delhi granitoids

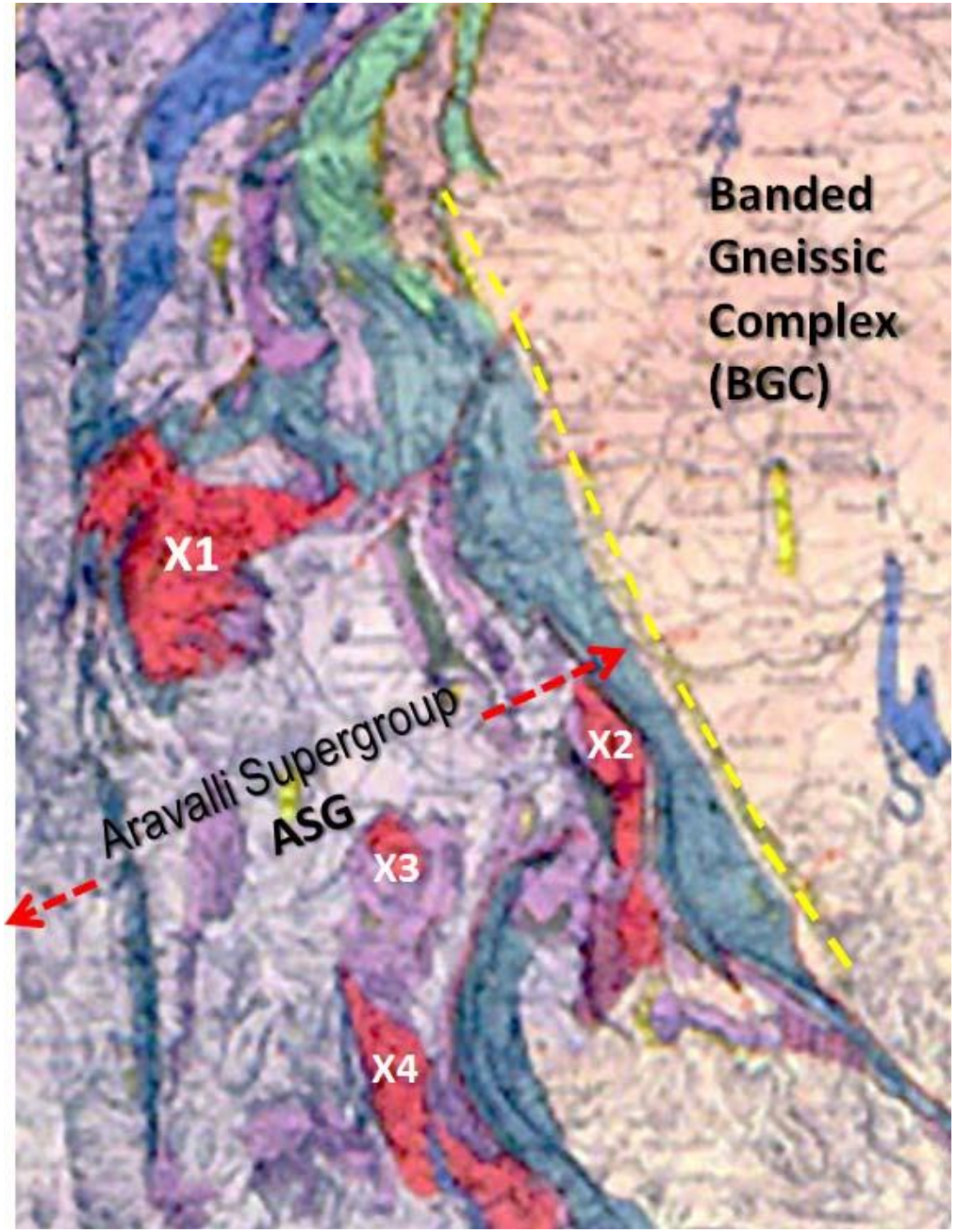
|	Aravalli system
Archaean |	Banded Gneissic Complex,
|	Bundelkhand gneiss



Heron recognised four granite-gneiss masses around Udaipur as ‘intrusive bodies’ within the Aravalli ‘system’. These are:

1. Ahar River granite; 2. Udaisagar granite;

3. Jaisamand Road granite; and 4. Titardi granite



- Map shows BGC as basement over which formed the sedimentary-volcanic formation , the Aravalli Supergroup
- Some granite bodies marked X1, X2, X3, X4 are also present, conceived earlier as younger granitic intrusions into Aravalli Supergroup.

Oldest dates (ca 3.3 Ga) were recorded from the TTG components of the Udaisagar granite (earlier thought as intrusive into cover the Aravalli rocks). Leucocratic trondjhemite bands (locally showing intrusive relationship with TTG gneiss) yielded younger 3.24 Ga date.

Oldest rocks have been dated from outcrops of Udaisagar granite, once considered intrusive into Aravalli (system) rocks. Another such outcrop yielding Archaean age is the Ahar River Granite at Udaipur

Grey biotite gneiss intruded by trondjhemite veins

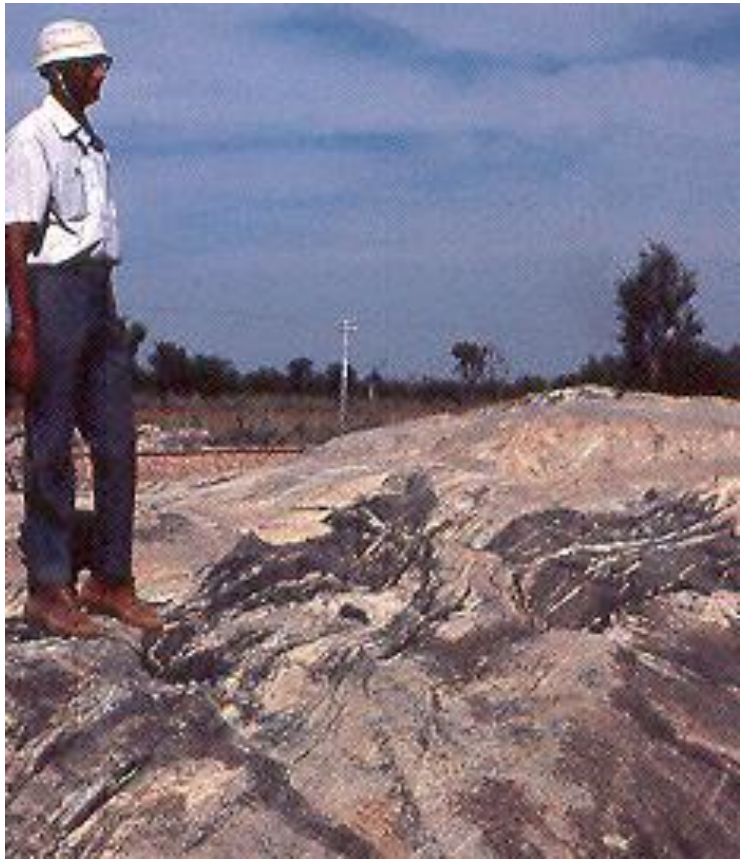
Typical banded gneiss

Udaisagar granite

Vestiges of greenstone enclaves in banded gneiss

Single zircon age of banded gneisses is around 3.3 Ga

Late-Archaean granite (ca.2.5 Ga) replacing banded gneiss



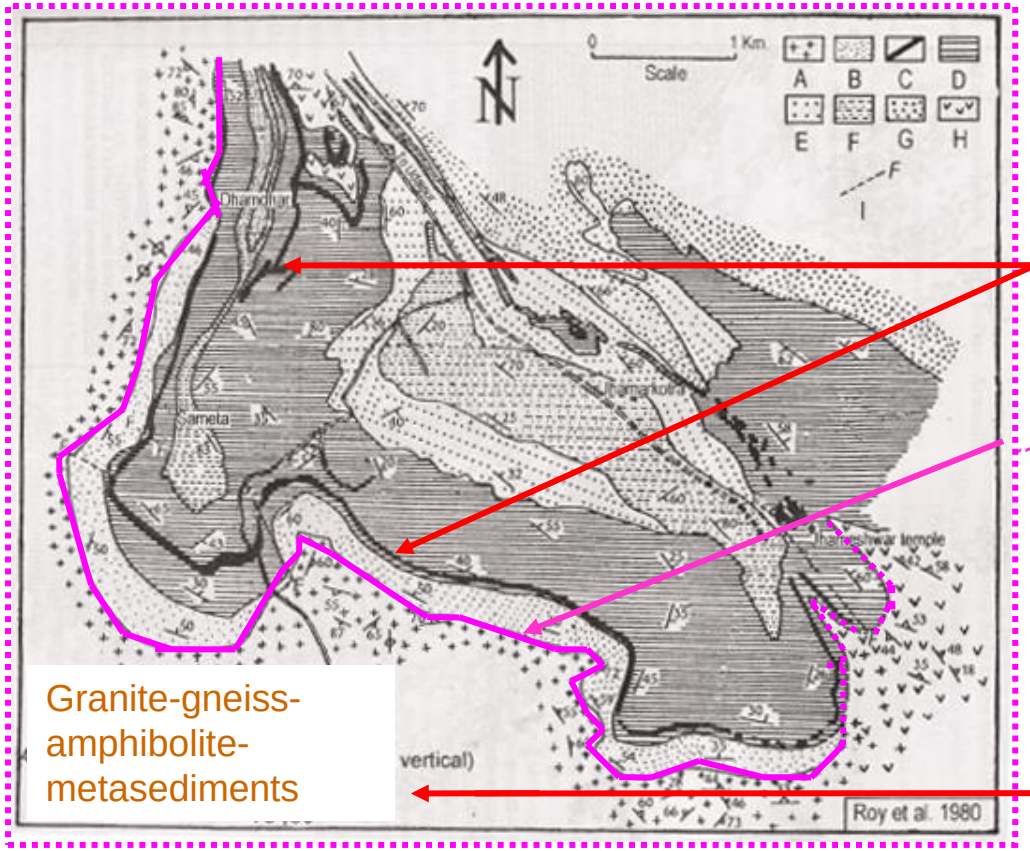
Untala granite (~ 2.5 Ga) replacing dark coloured banded gneiss

- Similar Archaean dates (2800 to 2500 Ma) have been detected from the Ahar River granite at Udaipur.

- The basement status two other granite bodies, Jaisamand Road granite and Titardi granite, could be confirmed from their geological relationship with the associated meta-sedimentary-meta-volcanic rocks.

- These gneiss-granite bodies, earlier thought as younger post-Aravalli intrusive granitoids are renamed as the **Mewar Gneiss Complex.**

Angular unconformity between the Archaean gneiss-amphibolite-metasediment complex underlying the phosphatic stromatolite bearing Palaeoproterozic Aravalli sequence is observed at Jhamarkotra



~~~~~~~~~~~Unconformity~~~~~~~~~~~~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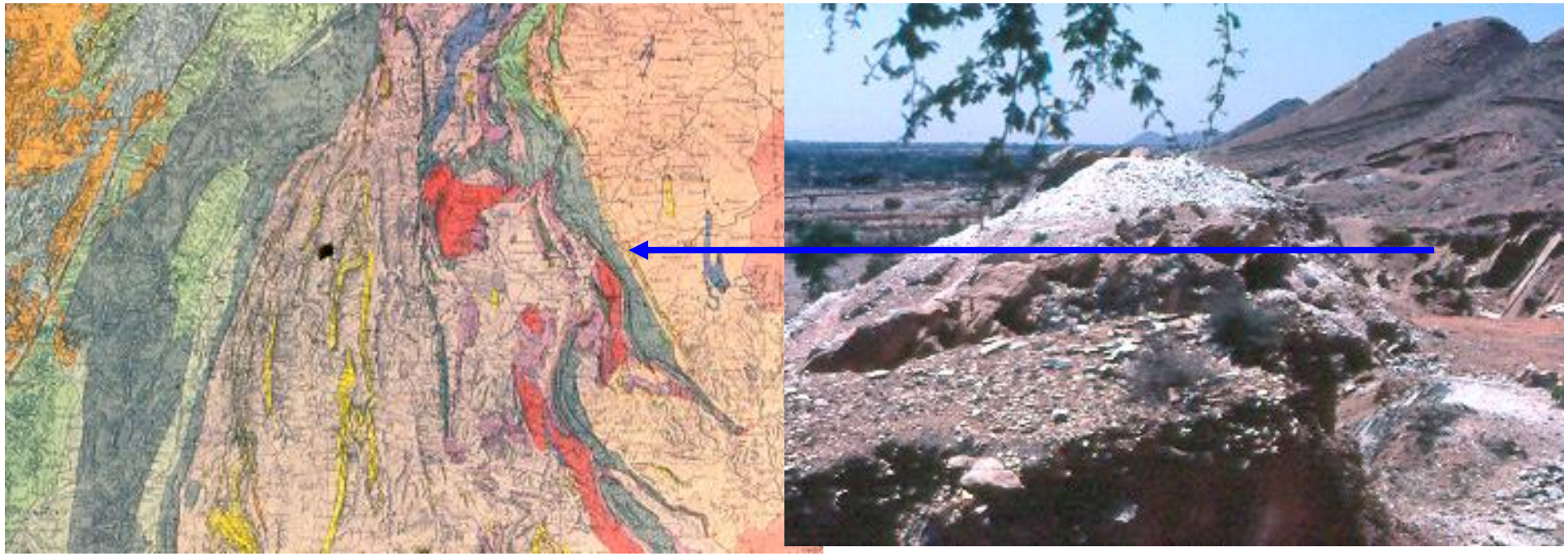
Basement-cover relationship is blurred at several places because of structural homogenisation during the later deformation and migmatisation of the basement

Homogenisation of early structures during AF1 folding at ca. 1900 Ma

Flattened eyed folds at tectonised zone

Migmatitisation of sheared gneisses

Separation of the cover Aravalli rocks from the basement is possible where pockets of palaeosol occurs along the interface of the basement gneisses and the cover Aravalli Supergroup marking unconformity



Chronology of the first billion year crustal history of the Aravalli Mountains

~2500 Ma Cratonisation of Archaean Aravalli Crust
(Intrusion of youngest granite (Untala type)

~2650 Ma Crustal melting & emplacement of
Gingla-type granite

~2850 Ma Evolution of greenstone sequences

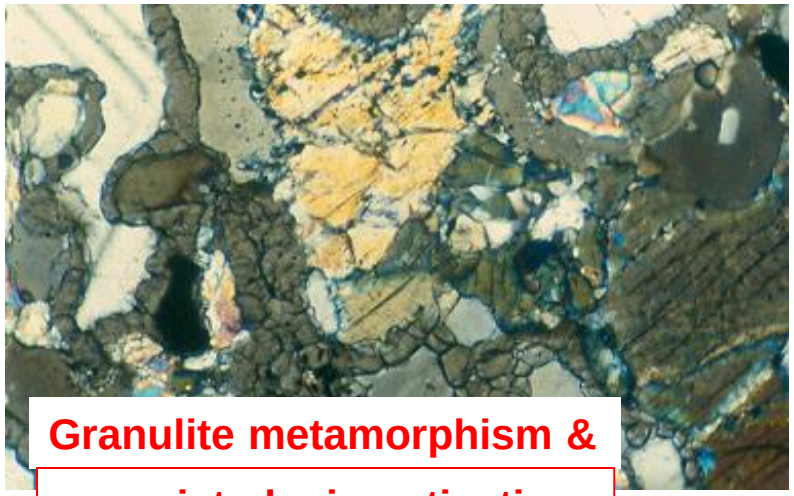
~3280 Ma Intrusion of trondjhemite

~3300 Ma Emplacement of TTG Jhamarkotra Gneiss

~3500 (?) Ma Formation of oldest sialic crust

Archaean basement suffered extensive reconstitution in & around the Sandmata Hill

Sandmata Hill



Granulite metamorphism &

associated migmatisation

Aravalli 1st folding related melting
Single zircon age ~ 1900 Ma

Single zircon ages –1650-1675 Ma

Deformation of basement produced superposed folding and bent lineations in the Sandmata Complex (BGC II)

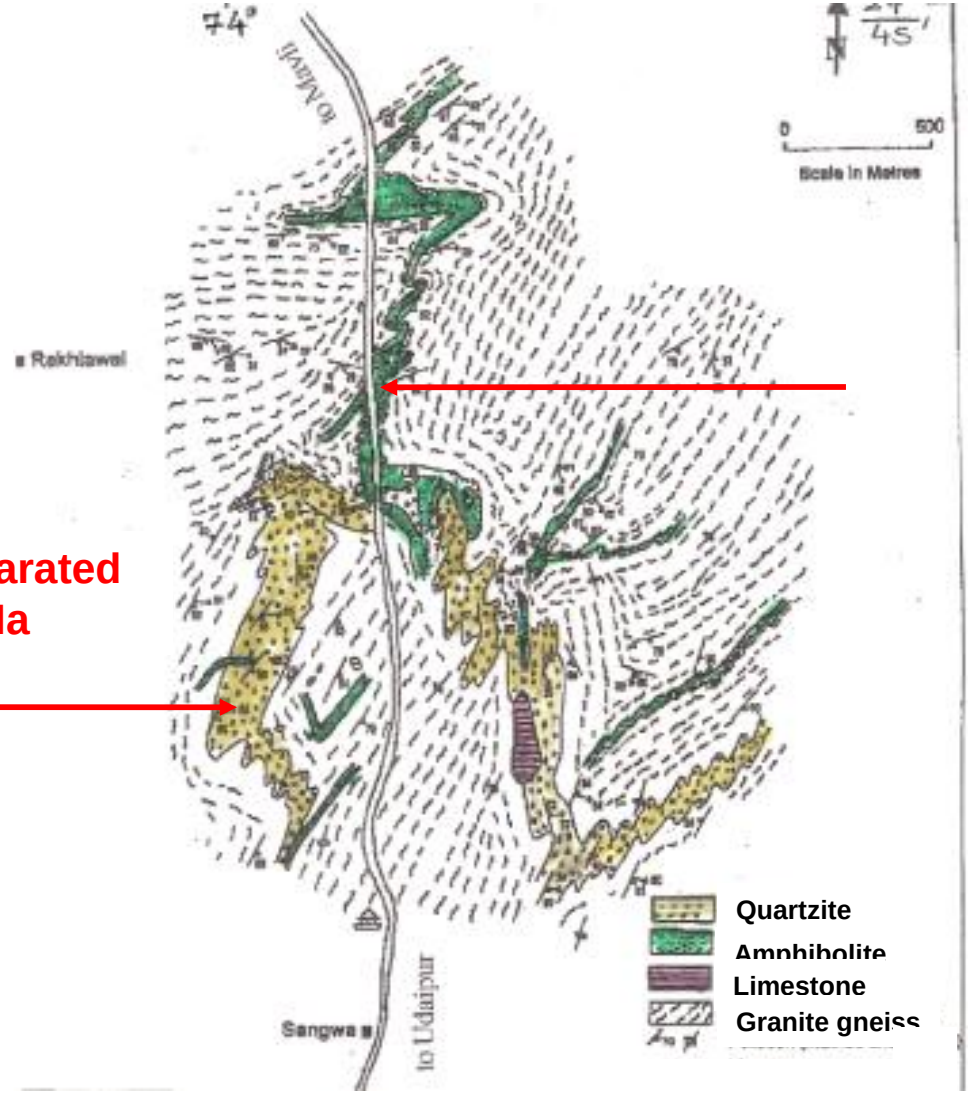
Coaxially refolding

Deformation of early lineation by F2

Drooping reclined folding

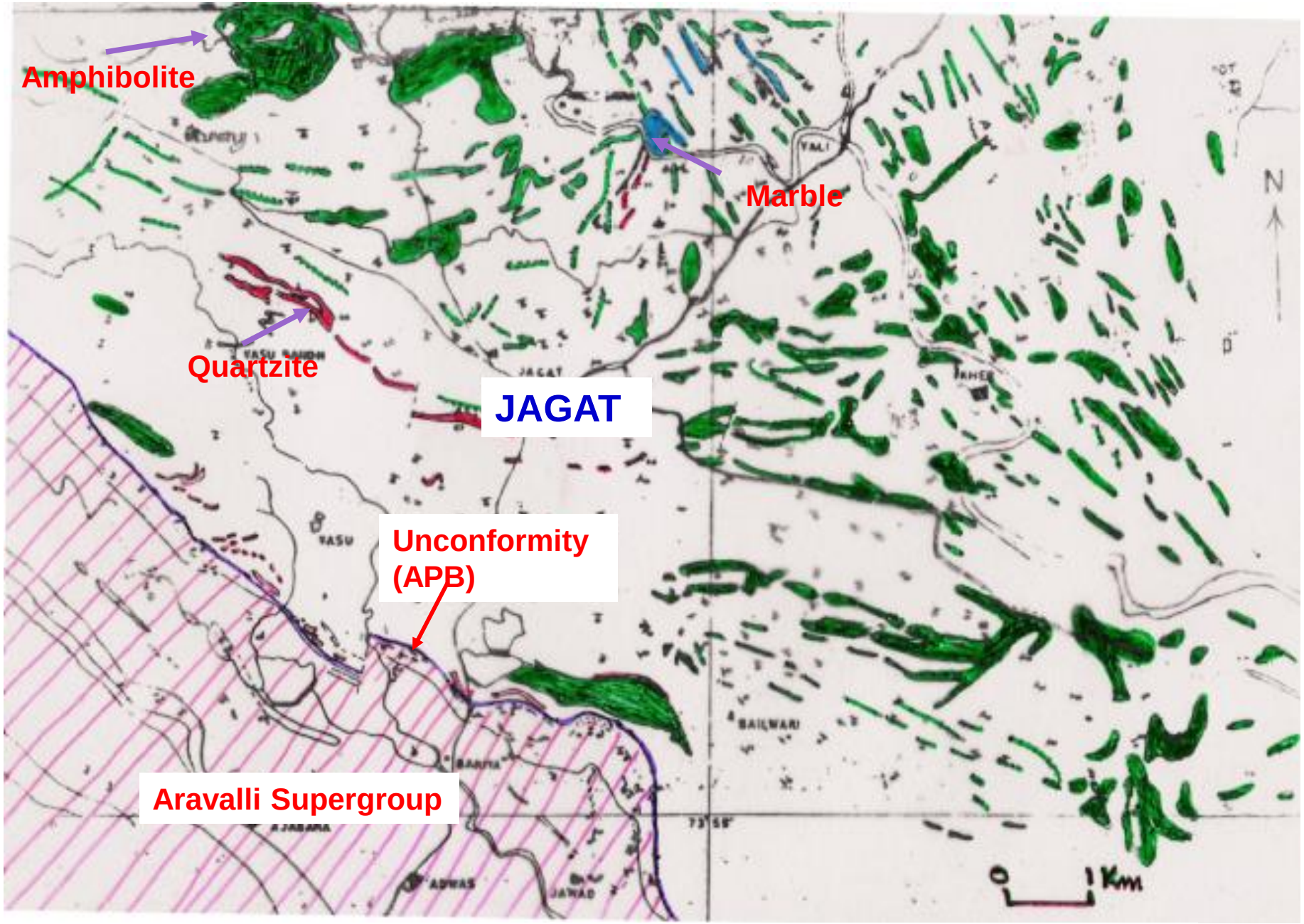
Complex deformation of early lineation

Rakhiawal greenstone belt within gneisses of BGC I



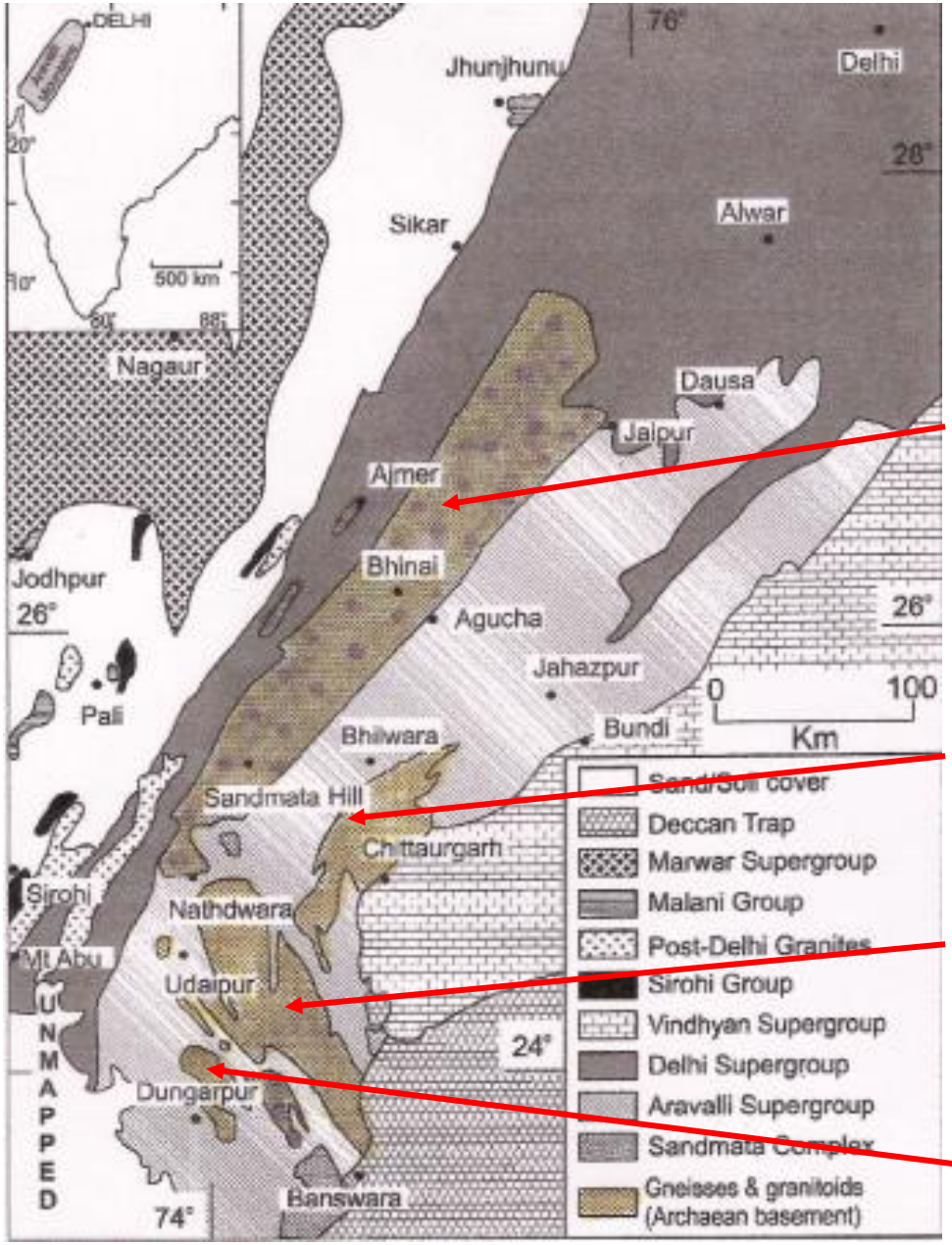
Amphibolites (2.8 Ga Sm/Nd isochron age)

Age detrital zircon separated from Quartzite– 3300 Ma



Greenstone belt in Archaean basement at Jagat

States of basement reconstitution



Sandmata Complex
Very significant reconstitution during Aravalli folding (1850 Ma) followed by granulite exhumation during 1725-1650 Ma

Bundelkhand granite
Mineral scale isotopic reconstitution

Mavli block of BGC I
Maintained pristine Archaean character

Sarara inlier (of BGC I)
Partial mineral scale isotopic reconstitution