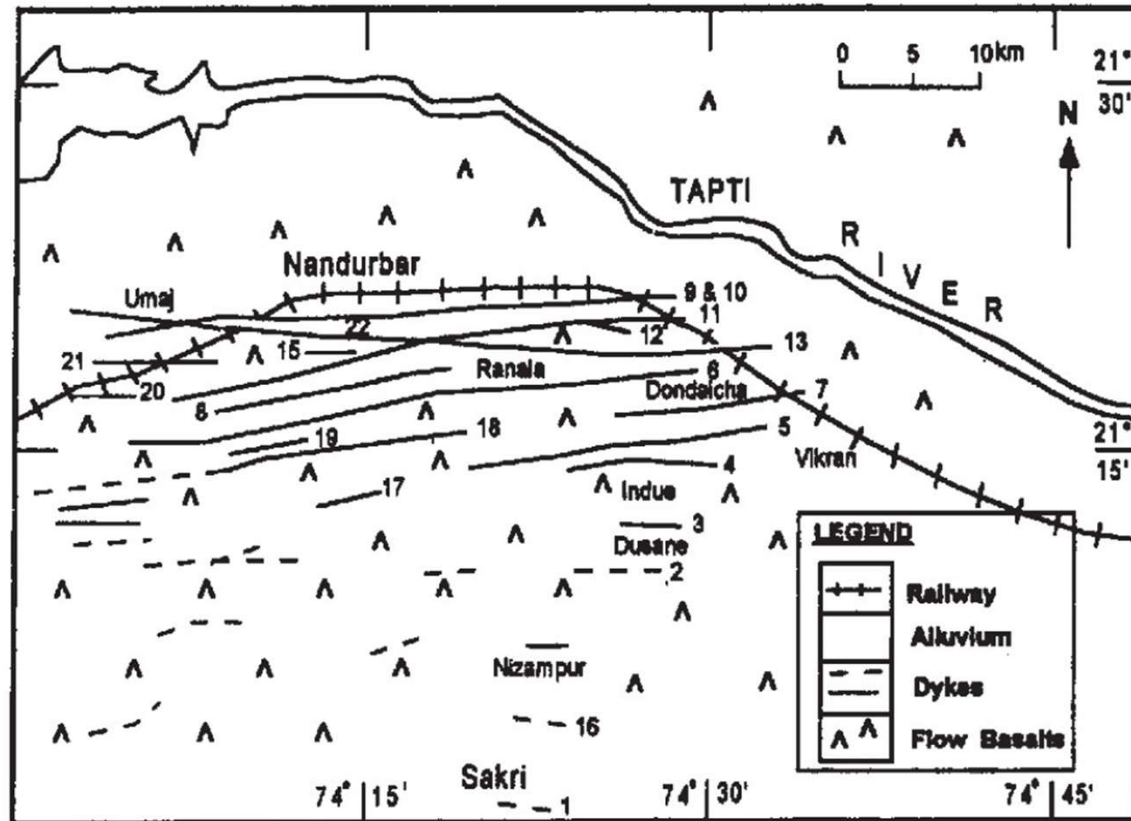


Geophysics presentation

Palaeomagnetic studies of intrusives in the Deccan Trap around Nandurbar area, south of Tapti Valley, District Dhule, Maharashtra

Group E:

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Geological map of study area around Nandurbar
S F Sethna and others

INTRODUCTION

Lithology

- Country rock consists of fine grained, vesicular Deccan Trap basalts, which form compound lava flows.
- Lava flows are intruded by dykes.
- Dykes are medium grained dolerites.
- Dykes are quite fresh in comparison to lava flows which are invariably weathered.
- Trend of the dykes is practically east-west.
- Some dykes have vertical layering of alternating Plagioclase and Pyroxene rich layers.

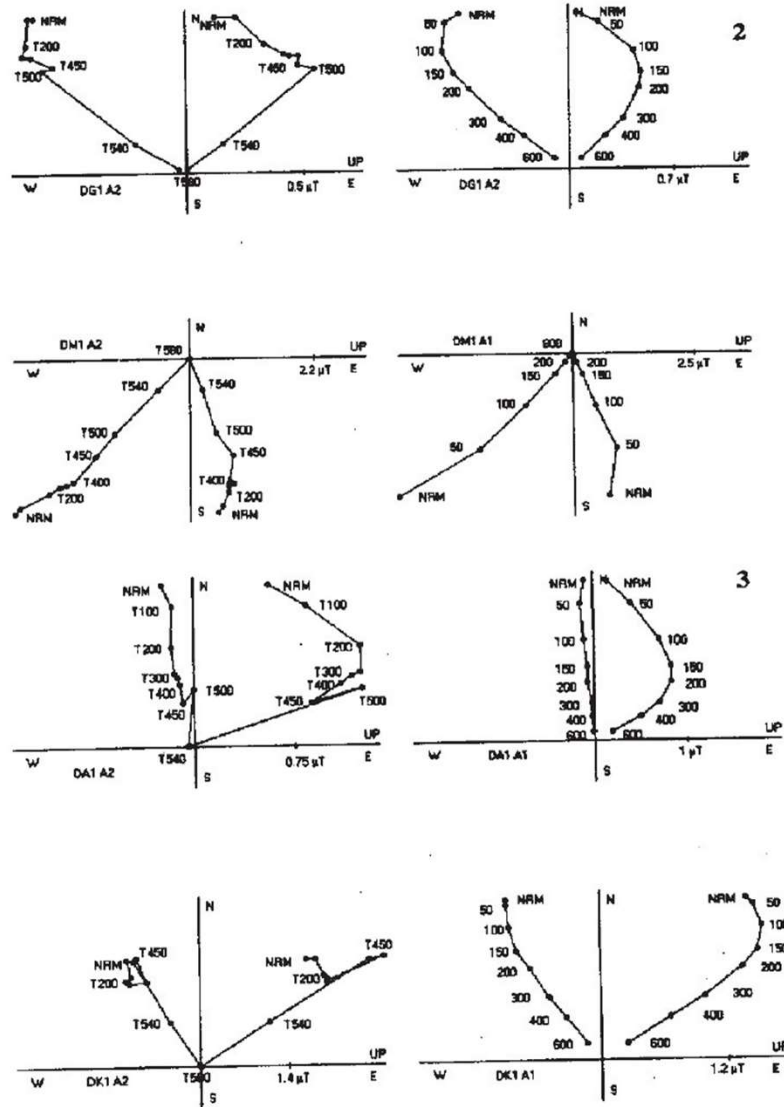
Paleomagnetic measurements

- The measurements were taken using an astatic magnetometer (LAM-24) and a spinner magnetometer (JR4). The intensity in case of astatic magnetometer was measured in n t/Kg (nano Tesla / Kg) and in case of spinner magnetometer it was measured in Tesla .

Thermal cleaning

- Thermal cleaning was carried out for 57 pilot specimens , in order to test the stability of NRM of the specimens.
- It was carried out in a magnetic vaccum using MAVCAS (Magnetic Vaccum Control System) starting at 50 degree celsius to 100 degree celsius .
- After each step of thermal cleaning ,measurements were taken on the astatic magnetometer or the spinner magnetometer .

- The NRM measurements showed less amount of scatter for the dykes and a very large scatter for the country rocks .
- The measurements on the pilot samples were used to plot zijderveld and vector migration diagrams, which indicated that the temperature for obtaining stable directions generally ranged from 300–500 °C.
- The paleomagnetic directions would later on stabilize as the thermal cleaning progressed in the range of 300–500 °C.
- From the plots it becomes evident that the dykes show a better stability in paleomagnetic directions when compared to country rocks .
- The flow samples also showed high inclinations . This could be due to the presence of a strong secondary magnetization component (directed northwards) which is opposed to the primary component (directed southwards) .
- Most of the dykes showed good stability of palaeomagnetic directions .



- Comparison of zijderveld plots for thermally demagnetized and alternating field demagnetized specimens from the same dyke sample.

- Closed circle represent projections on the horizontal plane while open circles represents projection on N-S vertical plane.

- Fig. on left represent specimens which have been thermally demagnetized and typically show stable directions in the range of 300 to 400 °C. Figures on the right specimens from the same dyke sample which have been demagnetized using alternating field and show stability in the range of 200 to 600 Oe . The AFD plots prove to be better than those produced by thermal demagnetization .

Zijderveld plots
S F Sethna and others

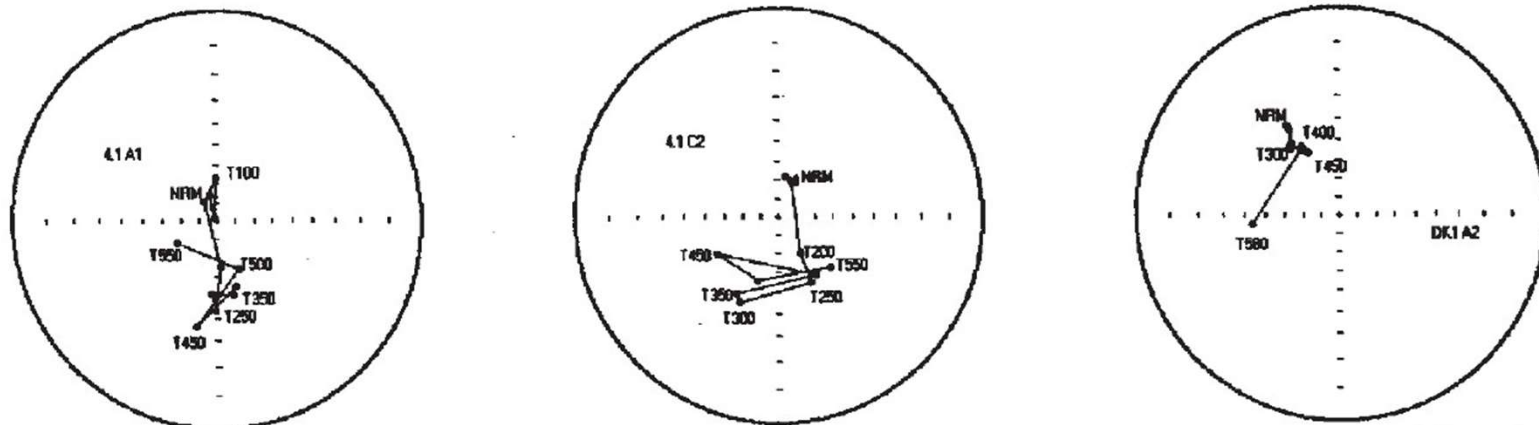
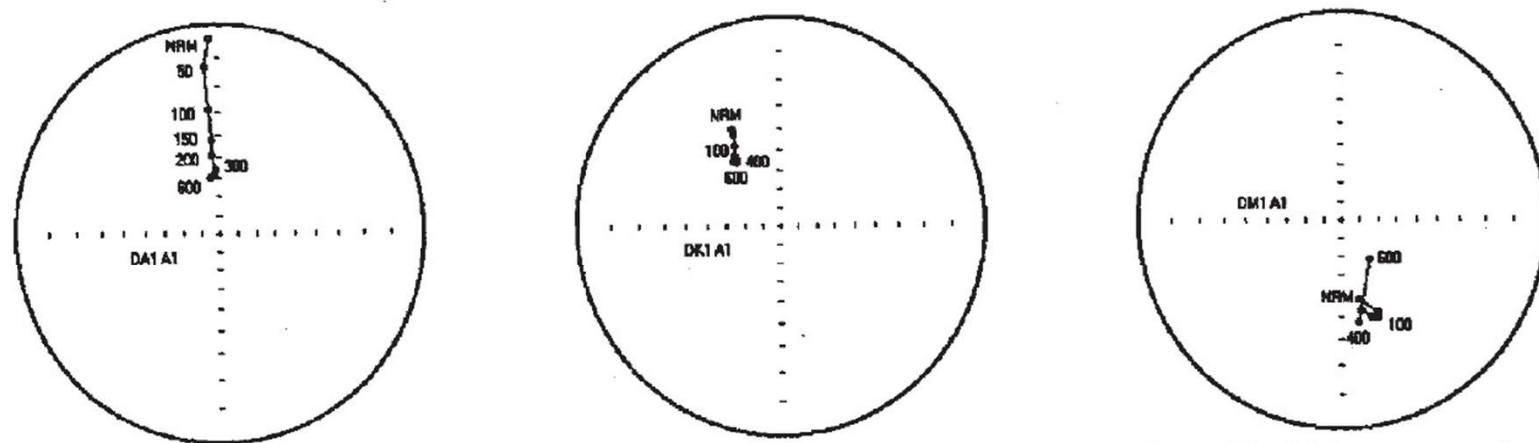


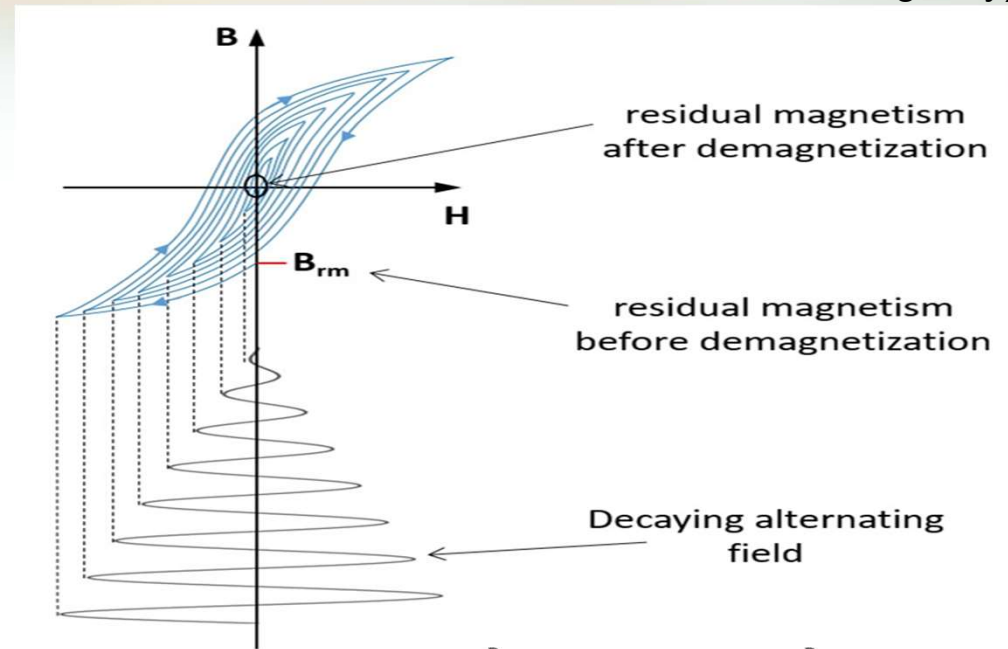
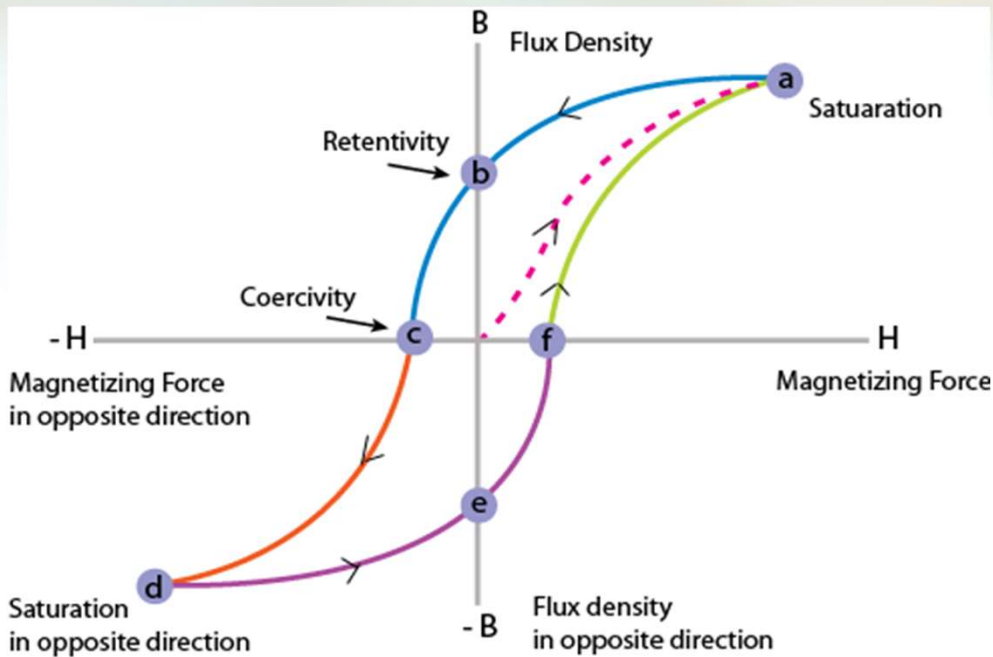
Fig. 4. Vector migration plots showing behaviour of the vectors on demagnetization for thermally demagnetized lava flow specimens (4.1A1 and 4.1C2) and dyke specimen (DK1A2). Open and closed circles represent negative and positive inclinations respectively. Dyke shows greater stability on demagnetization when compared to lava flow specimens.



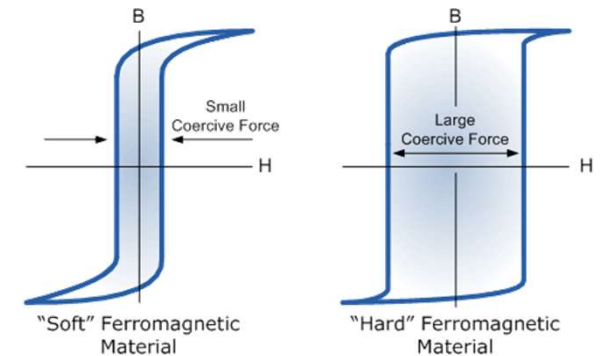
Vector migration plot. S F Sethna and others

Alternating Field Demagnetization

Om Vahnalli 18376 (presented on behalf of Anand S R 18031 due to his medical emergency)



- Magnetic Coercivity: Field Strength / Resistance to demagnetization. (units = Oersted)
- $1 \text{ Oe} = 10^{-4} \text{ T}$



Discussion

- Most dykes are normally magnetized and show negative inclinations.
- Country flows (Basalts): No stable directions = Spectra of coercivity overlap completely.
- The paleomagnetic parameters like mean declination, inclination are calculated by the stable directions which is obtained using techniques like thermal cleaning and AF demagnetization.

Dyke No.	N	D	I	α_{95}	d_p	d_m	R	K	Paleo-latitude	VGP Lat.	VGP Long.
D2	5	7	-55	6.71	6.75	9.52	7.9	69.18	36 S	33N	112 W
D3	2	324	-64	12.13	15.39	19.32	5.84	31.44	45 S	15N	80 W
D5	1	339	-39	3.97	2.82	4.74	4.99	372.40	22 S	42N	79 W
D18	2	322	-50	4.79	4.23	6.33	5.97	197.02	31 S	26N	69 W
D11	4	326	-34	6.56	4.28	7.50	10.80	49.46	19 S	38N	63 W
D12	4	338	-30	5.47	3.37	6.07	7.93	103.51	16 S	47N	74 W
D13	6	180	43	8.02	6.15	9.94	7.86	48.18	25 S	44N	106 W
D9	3	329	-31	11.79	7.36	13.17	9.43	17.76	17 S	41N	65 W
D22											
Avg. Norm	21	334	-42	4.72	3.55	5.79	50.02	17.79	24 S	37N	75 W
D13	7	176	43	7.03	5.40	8.71	9.81	48.18	25 S	43N	101 W
D6											
Avg. Flow	6	161	59	11.55	12.86	17.24	12.99	12.82	40 S	27N	90 W

The paleomagnetic properties are summarized in the table which are for the dyke and country rock samples of Nandurbar.

- The calculations also utilizes some of the readings that are obtained using blanket cleaning as they are in agreement with those obtained using thermal cleaning of the pilot specimen and were good in the directions in the same dyke using different specimens as well as sample for different specimens.

Conclusion

- It is evident from data presented above that the dolerite dykes have intruded the Deccan Trap lava flows as two distinct phases, The older phase of dykes being intersected by younger phase of dykes.
- **These two intrusive phases show following characters :**
- The older phase of dykes shows distinct **high Ti contents.**
- The younger phase of dykes on other hand shows **low Ti contents.**
- The older dykes phase shows normal magnetic declination which averages at about 334 degree with mean inclination of -42 degree.
- The younger phase of dykes is reversely magnetized with average declination of 176 degree and a mean inclination of 43 degree.

- As the lava flows of the area show reversed magnetization of the 29R epoch, the normally magnetized dykes are distinctly younger and may belong to the 29N epoch or an even younger epoch.
- The reversely magnetized dykes, being younger than the ones showing normal directions, cannot be considered to belong to 29R epoch but should belong to either the 28R or an even younger epoch.
- It thus becomes evident that intrusive phase that shows normal magnetization could possibly be feeders to the younger lava flows or may be Post-Deccan Trap, while the reversely magnetized phase is definitely younger than Deccan Trap in Age.



Thank you