Dr. Ravi Shankar

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Google Scholar: **https://scholar.google.co.in/citations?user=lU_mJNEAAAAJ&hl=en**

Citations: 327

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- **Educational background**

I earned the **Ph.D**. (Academy of Scientific and Innovative Research at CSIR-National Geophysical Research Institute) in **2017**. The title of the Ph.D. thesis was "**Geochronology &Paleomagnetic study of the Newer Dolerite Dyke Swarms from the SinghbhumCraton:- Implications to Proterozoic continental reconstruction.**" It followed an 11-month stay as **Project Scientist-B** at NCESS, Trivandrum. Presently I am working as a **Scientist** at CSIR-National Geophysical Research Institute. Earlier I finished my master's (**M.Sc. Geology, in 2011**) and graduated (**B.Sc. (Hons.) Geology, in 2009**) from HNB Garhwal University and Banaras Hindu University, respectively.

- **Research Interests**

My research's primary focus is on understanding the geodynamic conditions responsible for repeated disintegration and amalgamation of Proterozoic/Archean supercontinents/Supercratons. To address this, I am using an integrated approach of Pb-Pb Geochronology, Geochemistry, Isotope geochemistry (Sr-Nd), and Paleomagnetism.

- **Projects:**

1. Proterozoic mantle evolution: Dharwar and Bastar connection
2. Metallogenic Processes in Selective Precambrian Terranes of the Indian Shield: Magmatic, sedimentary, metamorphic, and structural controls

- **Present Role and responsibilities**

I have establsihed the isotope analysis facility (mainly focused on Sr and Nd isotopes) at Thermal Ionisation Mass Spectrometer Laboratory (CSIR-NGRI), along with Pb-Pb baddeleyite geochronology.

  - **As Supervisor/Mentor**
  - Summer and winter trainee: 11
  - Master Dissertation students: 3

- **Publications**

1. **Ravi Shankar**, DS Sarma, A. Panda, AG Panicker, S. Augustine (2024). Determining high-precision Sr-Nd isotopic ratios of certified reference materials using Thermal Ionization Mass Spectrometry. Journal of Analytical Atomic Spectrometry, DOI: 10.1039/D4JA00162A.
2. AG Panicker, M Ram Mohan, **Ravi Shankar** (2024). Transition from vertical to horizontal tectonic regime during the Paleo-Mesoarchean: Evidence from mafic-ultramafic rocks of the Holenarsipur Greenstone Belt, Western Dharwar Craton, Southern India. Precambrian Research, 411, 107942.
3. Mahesh Kapawar; Varun Kumar; **Ravi Shankar**; Venkateshwarlu Mamilla, (2024). Environmental magnetic and morphological characteristics of topsoils from the Coal Capital of India-Dhanbad. Water, Air, & Soil Pollution, 235, 670.
4. **Ravi Shankar**., R. Sreenivas, V. Parashuramulu, D. S. Sarma (2023). Precise Pb-Pb baddeleyite ages and petrogenesis of NW-SE trending Paleoproterozoic mafic dyke swarm from Bundelkhand craton, India. Journal of Asian Earth Sciences, 246, 105579.
5. Aurovinda Panda, **Ravi Shankar**, D. Srinivasa Sarma, Rahul Patel. Precise Pb-Pb baddeleyite geochronology, geochemistry, and Sr-Nd isotopic constraints on the 2.36 & 1.88 Ga mafic dykes from the Bastar craton, India: Implications for their petrogenesis in conjunction with the Dharwar mafic dykes. Precambrian Research, 393, 107090.

6. V Parashuramulu, E Nagaraju, **Ravi Shankar**, NB Ramesh, DS Sarma Paleogeography of India at ~1.8 Ga: New constraints from baddeleyite geochronology and paleomagnetism of mafic dykes from the Dharwar craton. Precambrian Research, 395, 107146.
7. Ajay Dev Asokan, M. Ram Mohan, S. N. Mahapatro, **Ravi Shankar**, K. Rasheed (2023). Petrogenesis of metavolcanics and detrital zircon geochronology of the Mesoarchean western Iron Ore Group supracrustals, Singhbhum Craton (India): Evidence for an intracontinental extension setting. Precambrian Research, 396, 107157.
8. **Ravi Shankar**, DS Sarma, A Panda, AG Panicker, S Augustine (2023). High-precision analysis of the Sr-Nd isotopic compositions of Rock Certified Reference Materials using Column Chromatography and Thermal Ionization Mass Spectrometry. 34th ISMAS Symposium on Mass Spectrometry 1 (2023), 92-95.
9. A Panda, DS Sarma, **Ravi Shankar** (2023). Geochronology, isotope geochemistry, and petrogenesis of the Paleoproterozoic mafic dykes from the central Bastar craton, India. 34th ISMAS Symposium on Mass Spectrometry 1 (2023), 96-98
10. AG Panicker, M Rammohan, **Ravi Shankar** (2023). Petrogenesis of mafic-ultramafic rocks from the Mesoarchean Holenarsipur Greenstone Belt. 34th ISMAS Symposium on Mass Spectrometry 1 (2023), 160-163
11. V Parashuramulu, **Ravi Shankar**, DS Sarma, E Nagaraju, BN Ramesh (2021). Baddeleyite Pb-Pb geochronology and paleomagnetic poles for ~1.89–1.86 Ga mafic intrusions from the Dharwar craton, India, and their paleogeographic implications. Tectonophysics 228789.
12. R Patel, **Ravi Shankar**, DS Sarma, A Panda (2021). Geochemistry and petrogenesis of tholeiitic dykes from the Chotanagpur Gneissic Complex, Eastern India. Journal of Earth System Science 130 (160), 1-24.
13. Kumar Batuk Joshi, Vineet Goswami, Upasana S. Banerji, and **Ravi Shankar** (2021). Recent Developments in Instrumentation and its application in absolute geochronology: Historical perspective and Overview. Journal of Asian Earth Sciences, 104690.
14. Rajesh K. Srivastava, Amiya K. Samal, Richard E. Ernst, Ulf Söderlund, and **Ravi Shankar** (2020). Spatial and Temporal Distribution of Large Igneous Provinces in the Indian Shield – Highlights of Recent Indian Investigations. Proceedings of the Indian National Science Academy, 86 (1), 313-330.
15. **Ravi Shankar**, D SrinivasaSarma, N Ramesh Babu, V Parashuramulu (2018). Paleomagnetic study of 1765 Ma dyke swarm from the Singhbhum Craton: Implications to the paleogeography of India. Journal of Asian Earth Sciences, 157, 235-244.
16. N Ramesh Babu, M Venkateshwarlu, **Ravi Shankar**, E Nagaraju, V Parashuramulu (2018). New paleomagnetic results on 2367 Ma Dharwar giant dyke swarm, Dharwar craton, southern India: implications for Paleoproterozoic continental reconstruction. Journal of Earth System Science, 127 (1), 3.
17. Anil Kumar, V Parashuramulu, **Ravi Shankar**, Jean Besse (2017). Evidence for a Neoarchean LIP in the Singhbhum craton, eastern India: implications to Vaalbara supercontinent. Precambrian Research, 292, 163-174.
18. **Ravi Shankar**. (2016). Dyke Map of Indian Cratons. Acta Geologica Sinica (English Edition), 90, Supp.1, p19.
19. **Ravi Shankar**, D Srinivasa Sarma (2016). Palaeomagneticstudy on a 1765 Ma Dyke Swarm from Singhbhum Craton: Implications to the Paleogeographic Position of India. Acta Geologica Sinica (English Edition), 90, Supp.1, p44.
20. A Kumar, **Ravi Shankar**, V Parashuramulu, J Besse (2016). Evidence for A Neoarchean LIP Remnant in the Singhbhum Craton, Eastern India: Implications to Vaalbara Supercontinent. Acta Geologica Sinica (English Edition), 90, Supp.1, p66.
21. **Ravi Shankar**, B Vijayagopal, Anil Kumar (2014). Precise Pb–Pbbaddeleyite ages 1765 Ma for a Singhbhum' newer dolerite' dyke swarm. Current Science, 106 (9), 1306-1310.

- **Awards/Recognition:**

- September 2018: Awarded fully funded international travel grant to present research work at AGCC-2018 (International travel support by DST-SERB)
- May 2018: Outstanding contribution in reviewing by Precambrian Research
- August 2014: CSIR-Senior Research Fellow
- September 2012: NGRI Golden Jubilee Award
- July 2012: CSIR-Junior Research Fellow
- July 2010: Summer Research Fellowship by Indian Academy of Sciences, Bangalore

- **Presentation and Lectures**

•"Paleogeographic Reconstruction of Supercontinets using Paleomagnetism and Geochronology," at the training programme on 'Paleomagnetism and its Applications in Geology, Geophysics, and Geochronology,'at CSIR-NGRI on 4th January 2024.

•"Analysis of the Sr-Nd isotopic compositions using Column Chromatography and Thermal Ionization Mass Spectrometry," at Advanced Training Program on Analytical Geochemistry at CSIR-NGRI on 12th March 2024.

•"Petrography, Mineral chemistry and Whole Rock geochemistry of MMEs and associated granitoids from Bundelkhand craton, Central India" at GOLDSCHMIDT, 2023.

•Presented my research work titled "Reconstructing Earth's Paleogeography" at CSIR Young Scientists Conclave Meet 2021 (Series 12) 03/12/2021.

•Presented my research at DG's meeting with Directors under "Presentation by Young Scientist on New / Futuristic Idea" held through MS-TEAMS on 23/12/2021.

•Presented research paper titled "Pb-Pb baddeleyite Geochronology and paleomagnetic study for mafic intrusions from the Dharwar craton: Implication to Paleogeographic position of India during ~1.90-1.80 Ga" at Young Geo-scientists Academic (YOGA) seminars.

- **Scientific contribution**

I have demonstrated an integrated approach, by using precise Pb-Pb baddeleyite geochronology, paleomagnetism, and geochemistry to address the issues related to the paleoposition of India during Archean-Proterozoic. I have contributed to enhancing the state of knowledge on the mafic dykes of Singhbhum craton, India. Previously published ages on these rocks varied from 2600 to 950 Ma (by K–Ar and Rb-Sr whole-rock methods) with poor precision of ±100 Ma. There was very limited information concerning the paleomagnetic study of these rocks. Moreover, there was no paleogeographic reconstruction attempted earlier to constrain the position of the Singhbhum craton.

The research work carried out has resulted in the identification of four mafic dyke swarm events from the Singhbhum craton, based on precise Pb-Pb baddeleyite geochronology using TE-TIMS for the first time. The TE-TIMS the baddeleyite Pb age dating is done only in very few laboratories around the globe. These mafic dyke swarms are (a) 1766.0±1.0 Ma WNW-ESE trending dyke swarm, (b) 2752.0±0.9 Ma NNE-SSW trending dyke, (c) 2762.4±2.0 Ma NNE- SSW trending dyke swarm and (d) 2800.2±0.7 Ma NNE-SSW trending dyke. It is noteworthy that the nominee has discovered the oldest mafic dyke event (i.e., 2800.2±0.7 Ma NNE-SSW trending dyke swarm) from India, which is the oldest mafic magmatic dyke emplacement event comparable to that of Kaapvaal. The subsequent paleomagnetic studies on these newly discovered mafic dyke swarms (i.e., 1766.0±1.0 Ma WNW-ESE trending dyke swarm and 2762.4±2.0 Ma NNE-SSW trending dyke swarm) have led to two very important paleogeographic reconstructions of India during Paleoproterozoic and Neoarchean. The pole position of Singhbhum craton at ~1765 Ma was 43.4oN, 308.7oE (dp=6.3 and dm=11.6). The pole position of Singhbhum craton at ~2762 Ma was 14oN, 78oE (dp=11 and dm=12). Based on the ~1766 Ma pole position of Singhbhum and coeval poles from Baltica and North China cratons, coupled with correlatable geological, tectonic, and metallogenic features, a paleogeographic reconstruction was

proposed. This reconstruction has constrained the position of India within supercontinent Columbia with two important findings, i.e., a) there was an extended spatial link between Baltica craton and India for ~370Ma and b) India-North China craton spatial proximity at ~1770 Ma. Based on precise geochronology, tt was demonstrated that Singhbhum and Vaalbara have a shared ancestry. This inference is further constrained by high-quality palaeomagnetic data and similarities in the Archean evolutionary history of the Singhbhum with Kaapvaal and Pilbara cratons.

Paleomagnetic studies on mafic dykes from the Dharwar craton have demonstrated the spatial linkage of India with Zimbabwe, Kola-Karelia, and Yilgran cratons at ~2400 Ma.

The NW-SE trending mafic dykes from the Bundelkhand craton were assigned an emplacement age of 1979 ± 8 Ma, based on a similar structural trend. Many geochemistry and paleomagnetic studies on these dykes have proposed the presence of more than one mafic dyke event within the NW-SE trending mafic dyke swarm. Still, until now this suggestion was not supported by precise geochronology. In this study, we present TE-TIMS Pb-Pb baddeleyite ages of 2001.5±1.3 Ma, 2005.0±0.8 Ma, and 2004.5±0.7 Ma from the NW-SE trending dykes located towards the southeast margin of the Bundelkhand craton. The mean age of 2004.3±3.5 Ma is inferred as the emplacement age of these dykes. This dyke event is hitherto unknown and the oldest in the Bundelkhand craton. Further, we present the major and trace element geochemistry data on 34 samples from NW-SE trending dykes. These results suggest the presence of three distinct groups of dykes from NW-SE trending dykes. Two groups, i.e., GD2, and GD3, were emplaced at ca. 2 Ga and ca. 1.98 Ga, respectively. The third group, i.e., GD1, seems to be of older but unidentified age, and their geochemical signature is unique as existing literature lacks a similar dataset. Further, the geochemical modeling of studied dykes suggests their derivation from subcontinental lithospheric mantle sources enriched by subduction-derived fluids at different depths and times.

We present a new key paleomagnetic pole at 13°S, 152°E (k = 21, A95 = 7.8°) for the recently identified 1864.4 ± 2.7 Ma (weighted mean age of four Pb-Pb ages) mafic magmatic event, based on a detailed paleomagnetic study of dolerite dykes and sills intruding Archean basement rocks and Tadipatri formation of the Cuddapah basin, Dharwar craton respectively. The Pb-Pb baddeleyite geochronology yields a crystallization age of 1867.1 ± 1.0 Ma (MSWD = 1.02) for the N77°E trending dyke in the southern region Cuddapah basin. This new age obtained, confirms the presence of ~1864 Ma magmatic episode with a spatial extent of ~400 km in the Eastern Dharwar craton, within the brief period of ~5 Ma. The paleomagnetic results in these dykes revealed reverse polarity magnetisation direction with mean D = 107°, I = 24° (N = 13 sites, α95 = 10°). Here, we also update the normal polarity magnetic directions on ~1.89 Ga swarm, and the corresponding paleopole at 21°N, 336°E (N = 79 sites, A95 = 3.6°). The paleoposition of India is constrained around the equator during ~1.89–1.86 Ga time. The paleogeographic reconstructions were also been attempted at ~1.89 Ga and ~ 1.86 Ga with available key poles from other cratons, indicating the possibility of a single plume acting as a source for two distinguishable radial emplacement of mafic dyke swarms across India (Dharwar and Bastar craton) and Western Australia (Yilgarn craton) within a period of ~35 Ma. The individual movement of India, Baltica, and Siberia with a drift rate of ~5.55 cm/yr towards the south, whereas Amazonia craton has moved rapidly to the north (~24.9 cm/yr), does not suggest the amalgamation of a supercontinent (Columbia/ Nuna) during ~1.88–1.86 Ga time.

Detailed analysis of Geochemistry data on Neoarchean mafic dykes, ca. 2.80-2.75 Ga, from Singhbhum craton, have indicated them to be emplaced in at least two pulses from Spinel-Garnet lherzolite source. The dykes show a younging trend from the western margin of craton to the eastern margin. Rock magnetic and anisotropy of magnetic susceptibility (AMS) results of 2.8 Ga Singhbhum mafic dykes reveal that a mixture of a single domain (SD) and pseudo-single domain (PSD) grains of magnetite carries AMS, and the magma was vigorously introduced vertically from the source point of the dyke swarm.

The Singhbhum Craton of eastern India, consisting of well-preserved Paleo- to Mesoarchean granitoids, volcanic and sedimentary rocks, is an excellent archive of early earth processes. In this contribution, we investigated the geological evolution of the Noamundi-Jamda-Koira IOG Basin (WIOG) using detrital zircon U-Pb ages, whole rock geochemical

and Nd isotopic data on metavolcanic rocks from this belt including the Jagannathpur volcanics. The metavolcanics of the WIOG and Jagannathpur are compositionally basaltic andesites with enriched LREE and negative anomalies of Nb-Ta and Ti. The ratios of crustal contamination sensitive elements such as La/Sm, Sm/Nd, Nb/La, Th/Yb and Nb/Yb are close to that of bulk continental crust. The Nd isotopic composition of these basaltic andesites are broadly chondritic (εNdt = +0.93 to □ 1.20). The geochemical and isotopic signatures are consistent with significant assimilation of Paleoarchean granitoids of the Singhbhum Craton. The overlapping geochemical and isotopic compositions support the view that Jagannathpur volcanics is an eastward extension of the ~3.04 Ga WIOG metavolcanics and shouldn't be considered as a separate stratigraphic unit. The presence of pillowed structures, vesicularity, absence of volcanic breccia, and their association with clastic sediments clearly indicate a subaqueous and shallow marine eruption for the WIOG basaltic andesites. The deposition of clastic sediments before basaltic magmatism points towards lithospheric thinning and basin opening. The detrital zircon ages from the WIOG ranges from 3.51 to 2.96 Ga and the detritus was mainly sourced from the adjacent Singhbhum granite and Bonai granite. The petrogenesis of the WIOG metavolcanics can be attributed to assimilation-fractional crystallisation of a depleted mantle derived tholeiitic mafic-ultramafic magma in an intracontinental extension setting.

The paleogeographic position of Dharwar Craton/India within Paleoproterozoic supercontinent configurations has been well demonstrated using highly reliable key paleopoles from ~2.37 Ga to ~1.86 Ga mafic events in recent studies. Here, we report a paleomagnetic pole for the first time at ~1.8 Ga mafic magmatism, as a result of precise Pb-Pb baddeleyite age and high-quality paleomagnetic directions on several mafic dykes in the periphery of Cuddapah basin, Eastern Dharwar Craton. The emplacement age of NW-SE trending dolerite dyke yields a weighted mean age of 1799± 0.8 Ma (MSWD=0.7), which almost coincides with earlier reported U-Pb baddeleyite age (1794±7 Ma), and confirms the existence of significant emplacement of Pebbair dyke swarm at ~1.8 Ga. Paleomagnetic results of fourteen dykes shows mean D= 314°, I=29°, α95=9° (k=22), and corresponding paleopole is calculated at 46°N, 356°E (dp=5.2° and dm= 9.5°). These directions are carried by the pseudosingle domain (PSD) magnetite or titanomagnetite and supported by a positive baked contact test, which proves their primary nature of remanence. This pole passes the paleosecular variation test of the geomagnetic field and fulfills six reliability criteria (Q = 6) of Van der voo (1990) and Meert et al., (2020), so, suggested to be a key pole for Dharwar Craton/ India (~1.8 Ga). The paleopositon of India is occupied at shallow paleolatitude (~16°N) and drifted towards the north with normal velocity (~ 6.6 cm/yr) from ~1.86 Ga to ~1.80 Ga. The paleogeographic reconstruction model at ~1.8 Ga has been attempted with available coeval paleopoles from other global Archean Cratons. Based on the matching of dyke trends, the configuration showing a radial pattern of mafic dykes from the Eastern Dharwar Craton (NW trending Pebbair dyke swarm), the São Francisco Craton (NW-SE trending Pará de Minas dyke swarm), and Rio de la Plata Craton (ENE-WSW striking Florida mafic dyke swarm), indicates the possibility of a common plume source for the emplacement of these dyke swarms in the respective Cratons at that time.

The weighted mean 207Pb/206Pb ages of baddeleyite grains obtained from the Tuskal, Pakhanjore, and Gariaband regions were 2365.25±0.54 Ma, 2365.70±0.48 Ma, and 2363.85±0.79 Ma, respectively. Baddeleyite grains from a mafic dyke near Narayanpur-Kondagaon yielded a weighted mean 207Pb/206Pb age of 1886.5±1.8 Ma. In the TAS (Total Alkali Silica) diagram, the 2.36 Ga and 1.88 Ga mafic dykes have basalt to basaltic andesite composition. Dykes from both age groups are represented by the tholeiitic magma series in the AFM diagram. In the spidergrams, the dykes show LREE and LILE enrichment, with the 2.36 Ga dykes showing flat HREE and the 1.88 Ga dykes showing slightly inclined HREE patterns. The REE non-modal batch melting model indicates derivation of the 2.36 Ga mafic dykes from a shallower spinel lherzolitic source, whereas the 1.88 Ga mafic dykes were derived from a deeper spinel-garnet lherzolitic mantle source. The 2.36 Ga dykes have near chondritic to slight super chondritic initial Nd isotopic values (εNd(2.36 Ga) = -0.95 to 2.36), whereas the 1.88 Ga dykes have sub chondritic initial Nd isotopic values (εNd(1.88 Ga) = -2.37 to -9.67). Present-day orientations and similar precise ages of the mafic dykes reported from the Bastar and Dharwar cratons indicate the counterclockwise rotation of the Bastar craton during the Paleoproterozoic.

A comprehensive study of rock magnetic characteristics and magnetic mineral morphology of topsoils from Dhanbad of Jharkhand, India, indicates that local anthropogenic sources influence topsoils. The environmental magnetic study reveals that the pseudosingle domain state, fine-grained, low-coercive magnetite controls magnetic mineralogy, which is essentially due to coal combustion and related activities and moderate vehicular movements. These results are accompanied by scanning electron microscopy with energy-dispersive X-ray spectroscopic analyses, suggesting the occurrence of principally spherule and accessorily angular anthropogenic magnetic grains in topsoils, indicating that local anthropogenic sources influence topsoils. The environmental magnetic and morphological characteristics of topsoils positively complement each other and conclude that magnetic grains from different sources show distinctly dissimilar morphologies agrees with the literature. Some porous polygonal spherule-shaped magnetic grains are also identified, which could host potentially toxic elements and pose a threat to locals in the form of cardiovascular, respiratory and neurological health consequences. These anthropogenic magnetic grains stand distinctive in pollution source identification, where coal combustion and related infrastructure in and around Dhanbad city are recognized as major anthropogenic sources.

The Dharwar Craton (DC) in southern India is one of the classic Archean terrains, preserving an evolutionary history from the Paleo-Mesoarchean. The present study attempts to understand the origin and evolution of mafic (amphibolites) and ultramafic (harzburgite) rocks from the Holenarsipur Greenstone Belt (HGB), aiming to decipher the evolution of the cratonic core of the Western Dharwar Craton. Field, petrographic and Nd isotopic evidence reveals that harzburgites from the HGB represent a preserved section of the early Archean mantle, re-fertilized by fluid/rock interaction during serpentinization. The ultramafic and mafic rocks from the southern and northern parts of the belt, considered to represent two stratigraphic units (Sargur and Bababudan), exhibit coherent whole-rock geochemical and Nd isotopic compositions. Ultramafic rocks were derived from a depleted mantle source ($\varepsilon Nd(t=3300)$= +0.65 to +8.70) while, the amphibolites were generated by partial melting of an enriched mantle source ($\varepsilon Nd(t=3300)$= -4.16 to +0.92) at shallow level conditions. The ultramafic rocks with fore-arc affinity may signify the initiation of a nascent subduction setting during the early stages of the first accretionary event in the WDC. The compositionally uniform mafic rocks from the HGB, with oceanic plateau affinity, affirm the existence of a plume environment. Our study establishes the transition from vertical to horizontal tectonics during the Paleo-Mesoarchean evolution of the WDC. The existence of mantle duality and distinct geodynamic environments for mafic and ultramafic rocks point towards a possible analogue of the Archean ophiolite suite.

The Thermal Ionization Mass Spectrometry Laboratory at CSIR-National Geophysical Research Institute, Telangana, Hyderabad, India (CSIR-NGRI) has undertaken a systematic analysis of the isotopic (Sr and Nd,) compositions of the eight most frequently used CRMs used for in-house geochemical analyses. This investigation improves upon the existing database for the isotopic community. This study uses a two-step Sr–Nd separation procedure to purify Sr and Nd from the geological sample chemically digested using a modified HF-HNO3-HCl scheme. The TIMS (TRITON Plus, Thermo Fisher Scientific, Waltham, MA, U.S.A.) at CSIR-NGRI was used to measure the Sr–Nd isotope compositions of CRMs. The replicate analyses of SRM 987 and La Jolla yielded an $^{87}Sr/^{86}Sr$ ratio of 0.710246 ± 0.000006 (n = 8, 2SD), and an average $^{143}Nd/^{144}Nd$ ratio of 0.511844 ± 0.000008 (n = 8, 2SD) which agrees with the well-accepted value of 0.710245 ± 0.000003 and 0.511846 ± 0.000002 respectively. We report precise Sr-Nd isotopic compositions of CRMs with the 2SD of the mean of the Sr-Nd isotope analysis, always less than or equal to 10. This study presents a procedure for purifying Sr and Nd using ion exchange column chromatography. This study's Sr-Nd isotopic compositions of CRMs match well with the published literature. Using ion exchange column chromatography and TIMS, we report the first precise and reliable Sr-Nd isotope data for STM-1.

- **Extra-Curricular Activities**
  - Participated in CSIR-SSBMT as a member of the NGRI cricket team.

- Member of Grievance Redressal Cell, HNB Garhwal University, for completing Student Union Elections in session 2010-11.
- Participated in National Workshop and Brain Storming Session on the topic "Landslides along NH-58, NH-109" in 2009 organized by the Department of Geology, HNBGU.
- Participated in the DST-sponsored INSPIRE-(2009-10) and INSPIRE-(2010-11) as a volunteer organized by the Department of Geology, HNBGU.
- Participated in ANNUAL GAMES AND SPORTS EVENTS of the faculty of Science and was part of the winning football team (as a goalkeeper) in the 2007-2008 sessions.
- As the Flight Cadet (Regimental Number UPJA/98/99332) under "15 Jd Air Tp Central Hindu School Kamaccha, Varanasi", participated in the Combined National Training Camp Of NCC held at Mirzapur, and also participated in NATIONAL INTEGRATION CAMP (JD. Boys- 2nd) of NCC held at Kanpur and finally successfully achieved the 'A' certificate of NCC in 2000.

- **Declaration**

I affirm that the mentioned details in this document are correct and accurate to the best of my knowledge and belief.

Place: Hyderabad

Dr. Ravi Shankar

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