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Scopus-based Indices of Indian Earth and Planetary Sciences Journals: An Analytical Study

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Abstract

Background: The mandate of journal metrics is to measure the performance of journals indexed in the concerned databases based on their citation impact. Such measurements are essential to understand the quality of research output and assess the quality of the journals in which such research gets reported.

There are several such journal metrics in use and include Journal Impact Factors (JIF), CiteScore, Article Influence Factor, Eigenfactor (EF), Source Normalized Impact per Paper (SNIP), SCImago Journal Rank (SJR), *h*-index, *i*-10 index, Altmetric Attention Score, and PlumX metrics. Journal metrics help decide which journal to choose to publish one's manuscript in.

Objective*:* The purpose of this paper is to highlight the Scopus journal metrics of Indian Earth and Planetary Sciences journals and to identify the top Indian Earth and Planetary Sciences journals based on their journal indices in Scopus for the period 2011 to 2020.

Method*:* Data on the Scopus-indexed Indian Earth and Planetary Sciences journals from SCImago Journal and Country Rank databases available at https://www.scimagojr.com/journalrank.php was collected. These journals' metrics were collected from Scopus Source List available at https://www.scopus.com/sources.uri.

Results*:* Indian Earth and Planetary Sciences Journals in Scopus are ranked based on their journal metrics in Scopus for the period 2011 to 2020.

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Conclusion*:* Based on the bibliometric parameters used, the *Journal of Geological Society of Indi*a and the *Journal of Earth System Sciences* are the most impactful journals in Earth Science published in India. *Journal of the Indian Society of Remote Sensing* follows. Both journals are published on behalf of the most influential scientific societies in Earth Science in India by Springer. Several Indian Earth and Planetray Science journals have over four decades of publishing records but have impact factors <1.5. When the journal's prestige is considered, these three journals are joined by the *Journal of Astrophysics & Astronomy* also.

Keywords: Indian Earth and Planetary Science Journals, Journal Indices, Scientometric Indicators, SCImago Journal and Country Rank database, CiteScore, SNIP, SJR, Scopus Journal Metrics

1. Introduction

Scientometric indicators are measures based on the publication performance from a quantitative perspective. The study of the quantitative features of science as a communication system is known as scientometrics. Generally, scientometric tools and instruments are used to assess the quality of research and scientific journals. Research performance measurement and evaluation have increasingly gained importance in recent years, especially with the competition for attracting the best brains to universities and research institutes worldwide. Several citation databases are available for evaluating scholarly communication in various fields, with Scopus being one of the largest. Scopus is an abstracting and indexing database of Elsevier Publishers with full-text links.

Citations take a long time to accumulate, as the scientific publishing process can take years. To counter this time delay, journal-based metrics have been developed (Fersht, 2009). Journal Impact Factor (JIF), CiteScore, Eigenfactor Score (ES), and SCImago are some of the most extensively used bibliometric and scientometric metrics. The assumption with journal-based impact metrics is that "better" journals have a more rigorous peer review process and that only the "best" research will be published in them. Metrics were developed to better classify and understand the journal system (Garfield, 1972), and journal metrics have been developed in several contexts. Furthermore, journal-based metrics can provide a deeper insight into the similarity of journals (D'Souza & Smalheiser, 2014).

In light of the continually escalating subscription costs, the identification of pivotal journals preferred by scholars holds significant value. This quandary is compounded by an ever-expanding journal landscape, which makes achieving a comprehensive overview devoid of rankings and metrics seemingly insurmountable. While the objective assessment of journal quality necessitates perceptive scrutiny of

published articles, the prevalent adoption of computational rankings and metrics for journal classification is a customary practice. Research and scientific journal quality standards are commonly appraised using robust scientometric tools and instruments. Notwithstanding their inherent advantages, these bibliometric indicators and methodologies are also accompanied by certain limitations.

2. Review of Literature

Various metrics used for the quantitative evaluation of scholarly journals are reviewed by Kim and Chung (2018), wherein the Web of Science journal indices such as Impact Factor (IF), Eigenfactor score and related metrics, including the Immediacy Index and the aggregate impact factor, are explained in detail. In addition, Scopus journal metrics such as CiteScore, Source Normalized Impact per Paper (SNIP), and SCImago Journal Rank (SJR) are also discussed. Limitations and problems of these metrics are also pointed out. Roldan-Valadez et al. (2019) provide a brief review of the current bibliometric tools used by authors and editors and propose an algorithm to assess the relevance of the most common bibliometric tools to help researchers select the fittest journal and know the trends of published submissions by using self-evaluation.

Renjith et al. (2021) analyzed the Web of Science (WoS)-indexed Library and Information Science (LIS) journals in Scopus in terms of their journal metrics available in these two database platforms. Two data sources used were Scopus CiteScore metrics of Scopus and the Journal Citation Report (JCR) of WoS. The basic data regarding the WoS-indexed journals were derived from SCImago 2020. Another study by Vijayan and Renjith (2021) aimed to identify the growth pattern of Q1 LIS journals in the SCImago Journal and Country Rank database from 1999 to 2020. The top Q1 journals in LIS were discussed in the study in terms of scientometric measures such as SJR, H index, CiteScore, and Impact Factor. The authors identified that the journal '*Information Systems Research'* has the highest SJR value of 3.507, and the journal '*IEEE Transactions on Information Theory*' has the highest H-index value of 286.

3. Objectives of this study

Scopus-indexed Indian Earth and Planetary Science journals are analyzed using their scientometric indicators in Scopus in this work.

The specific objectives of the study are:

1) To identify the characteristics of Scopus-indexed Indian Earth and Planetary Science journals.
2) To identify the top Scopus-indexed Indian Earth and Planetary Science journals based on their Scopus scientometric indicators such as SJR, CiteScore and SNIP.

4. Materials and Methods

4.1 Data Collection

Data about the Scopus-indexed Indian Earth and Planetary Sciences journals were collected from SCImago Journal and Country Rank databases available at https://www.scimagojr.com/journalrank.php. There are only 12 Indian Earth and Planetary Sciences journals which are included in the SCImago databases through the period from 2011 to 2020. Hence these 12 journals were selected for the present study. Journal metrics were collected from Scopus Source List available at https://www.scopus.com/sources.uri. Scopus provides journal metrics of its indexed journals from 2011 onwards.

Out of these 12 Indian Earth and Planetary Sciences journals, two journals, i.e. *Himalayan Geology* and *Journal of the Paleontological Society of India,* have journal indices for nine years only. Data for 2016 is unavailable for *Himalayan Geology,* while data for 2011 is unavailable for the *Journal of the Paleontological Society of India.* The *Journal of Earth System Science* has journal indices only from 2017 to 2020.

The journal indices discussed in the present study are CiteScore, Source Normalized Impact Factor (SNIP), SCimago Journal Rank (SJR) and SCImago Journal Quartiles. CiteScore, SJR and SNIP are collected from Scopus Source List and SCImago Journal Quartiles are collected from SCImago Journal and Country Rank databases. The journal index SJR is available both in SCImago Journal and Country Rank database and Scopus Source List.
The list was filtered to determine the Open Access (OA) journals among the 12 journals. These are recognized as OA if the journal is listed in the Directory of Open Access Journals (DOAJ) and/or the Directory of Open Access Scholarly Resources (ROAD).

4.2 Variables (Journal Indices)

For each journal, the following variables were extracted:

- **CiteScore**: CiteScore measures the average citations received per document published in the serial.

- **SCImago Journal Rank (SJR)**: SCImago Journal Rank measures weighted citations received by the serial. Citation weighting depends on the subject field and prestige (SJR) of the citing serial.
- **Source Normalized Impact per Paper (SNIP)**: Source Normalized Impact per paper measures actual citations received relative to citations expected for the serial's subject field.
- **SCImago Quartiles**: Quartile 1 (Q1) = 99^{th} – 75^{th} CiteScore percentile. Quartile 2 (Q2) = 74^{th} – 50^{th} CiteScore percentile. Quarter 3 (Q3) = 49^{th} – 25^{th} CiteScore percentile and Quartile 4 = 24^{th} – 0 CiteScore percentile.

4.3 Advantages and Disadvantages of Scopus Journal Indices

Table 1 compares the advantages and disadvantages of the Scopus journal metrics.

Table 1. Advantages and Disadvantages of Scopus Journal Indices *

Scopus Journal Indices	Advantages	Disadvantages
SCImago Journal Rank (SJR)	• It includes more journals than Clarivate Analytics' Web of Science. • It covers a more extended period (3 years). • It limits self-citations. • It ponders citations based on the importance of the journal. • The SJR database is freely available online.	• SJR omits a large amount of information, putting into question its current form's transparency, reliability, and suitability for evaluative purposes.
Source-Normalized Impact per Paper (SNIP)	• It measures the influence a journal has while also accounting for the variation in citation norms among disciplines. • Calculated on a journal-by-journal basis, it is suitable for comparing one discipline with another or interdisciplinary titles that fall between subject categories.	• Citations from selected sources and selected document types only. • Journals with high SNIP values do not correlate as well with citation indicators as journals with high SJR values.

CiteScore	• It gives a more comprehensive, transparent and current view of a journal's impact. • It provides insights into the citation impact of more than 22,220 titles. • Using a three-year (now four-year) time window best fits all subject areas. • Its database is freely available online.	• CiteScore cannot modify the data published until the next publication, even when an error is identified. • The vast quantity of titles included may dilute the quality of its outcomes. • It skews against journals with much front matter. • It seems to favour journals that fall under the Elsevier umbrella and Emerald, which claims to have assisted in CiteScore's development.

*** (**Source: Roldan-Valadez et al., 2019)

5. Analysis and Interpretation

5.1 Preliminary Details of the Journals

The preliminary details of the Scopus-indexed Indian Earth and Planetary Sciences journals are shown in table 2.

Table 2. Preliminary Details of the Journals

Sl. No.	Journal & Impact Factor (2022)	Subject Area in Earth & Planetary Sciences	Publisher	OA/ Non-OA	Coverage in Scopus (Years)	Highest SCimago Quartile during 2011-2020	Lowest SCimago Quartile during 2011-2020
1	Journal of Astrophysics & Astronomy (1.1)	Space and Planetary Science	Springer Nature (for Indian Academy of Sciences and Astronomical Society of India)	OA	1980 to Present (44)	Q3	Q4
2	Himalayan Geology (1.2)	Earth and Planetary Sciences (miscellaneous)	Wadia Institute of Himalayan Geology	Non-OA	from 2007 to 2018, from 2020 to Present (16)	Q2	Q4
3	Journal of Earth System Science (1.9)	General Earth and Planetary Sciences	Springer Nature for Indian Academy of Sciences	OA	from 2005 to Present (19)	Q1	Q2

4	Journal of the Palaeontological Society of India (0.6)	Palaeontology	The Palaeontological Society of India	Non-OA	from 2011 to present (13)	Q3	Q4
5	Journal of Geological Society of India (1.3)	Geology	Springer Nature for Geological Society of India, Bangalore	Non-OA	from 1979 to Present (45)	Q2	Q3
6	Disaster Advances	Earth and Planetary Sciences (miscellaneous)	Disaster Advances	Non-OA	from 2009 to Present (15)	Q2	Q4
7	Journal of the Indian Society of Remote Sensing (2.5)	Earth and Planetary Sciences (miscellaneous)	Springer Nature for Indian Society of Remote Sensing.	Non-OA	from 1973 to Present (51)	Q2	Q3
8	Journal of Mines, Metals and Fuels	Geotechnical Engineering and Engineering Geology	Books and Journals Pvt. Ltd.	Non-OA	from 1968 to 1990, from 1993 to Present (54)	Q3	Q4
9	Journal of Agrometeorology	Atmospheric Science	Association of Agrometeorologists, Department of Agricultural Meteorology Agricultural University, Anand, Gujarat	Non-OA	from 2008 to Present (16)	Q3	Q4
10	Indian Journal of Radio and Space Physics	Earth and Planetary Sciences (miscellaneous)	National Institute for Science Communication and Information Resources (NISCAIR)	OA	from 1996 to present (28)	Q2	Q4
11	Indian Journal of Geo-marine Sciences (0.5)	Oceanography	National Institute for Science Communication and Information Resources (NISCAIR)	OA	from 2007 to 2010, from 2012 to Present (16)	Q4	Q4
12	Mausam (0.6)	Geophysics, Atmospheric Science	India Meteorological Department (IMD).	OA	1979, 1981, 1983, 1985, from 2008 to	Q3	Q4

					Present (20)		

The Scopus journal classification system is called the "All Science Journal Classification (ASJC)". It consists of two levels. The bottom level has 304 categories. The top level includes 27 categories. We collected data about the included journals from the top-level category "Earth and Planetary Sciences". In Scopus, under the top-level category "Earth and Planetary Sciences", the sub-disciplines (bottom-level category) included are 'General Earth and Planetary Sciences', ' Earth and Planetary Sciences (miscellaneous)', 'Atmospheric Science', 'Computers in Earth Sciences', 'Earth-Surface Processes', 'Economic Geology', 'Geochemistry and Petrology', 'Geology', 'Geophysics', 'Geotechnical Engineering and Engineering Geology', 'Oceanography', 'Paleontology', 'Space and Planetary Science', and 'Stratigraphy'. Here four journals come under the subject category 'Earth and Planetary Sciences (miscellaneous)', two journals in 'Atmospheric Science', and one journal each in 'Geophysics', 'Oceanography', 'Geotechnical Engineering and Engineering Geology', 'Geology', 'Paleontology', 'General Earth and Planetary Sciences' and 'Space and Planetary Science'. The journal *Mausam* comes under two subject areas, i.e. 'Geophysics' and 'Atmospheric Science' of "Earth & Planetary Sciences".

'Springer Nature' publishes four of the Indian EPS journals, and individual publishers publish the remaining 8 journals. Out of these 12 journals, five are open access (OA). Regarding the coverage in years of these Indian Earth & Planetary Science journals in the Scopus database, the *Journal of Mines, Metals and Fuels* has the longest coverage of 54 years, followed by the *Journal of the Indian Society of Remote Sensing* (51), *Journal of Geological Society of India* (45), *Journal of Astrophysics & Astronomy* (44), *Indian Journal of Radio and Space Physics* (28), and *Mausam* (20). The remaining six journals have less than 20 years of coverage in the Scopus database.

All the journals in different subject categories are categorized into four quartiles (Q1, Q2, Q3 & Q4) in SCImago Journal and Country Rank database based on their CiteScore percentile. Only the *Journal of Earth System Science* has a position in the highest quartile, i.e. Q1, during the study period. Most journals have fallen into the lowest quartile category in Q4 based on their CiteScore percentile.

5.2 Journal Indices

The Scopus journal indices of Indian Earth & Planetary Sciences journals are categorized under the following headings.

5.2.1 CiteScore of Indian Journals in Earth & Planetary Sciences in Scopus

CiteScore is the youngest metric and was published on December 2016. It is a free measure for the average number of citations received per document issued in a serial. It is one of the three major indices included in Scopus by Elsevier to rank publication sources. It is calculated as the average value of citations per item received by the items published in the journal in four previous years. The 4-year CiteScore time window provides a robust assessment of citations to papers after their publication. A 4-year publication window is a good fit for all subject areas and is long enough to capture the citation peak of most disciplines (Meho, 2019).

CiteScore 2020 is based on the number of citations received in 2017-2020 to five peer-reviewed document types (articles, reviews, conference papers, data papers, and book chapters) by a journal in the same four years, divided by the number of peer-reviewed documents indexed in Scopus and published in those same four years.

Table 3 shows the ranking of Indian Earth and Planetary Sciences journals in Scopus based on their mean CiteScore values from 2011 to 2020.

Table 3. CiteScore of Indian Journals in Earth & Planetary Sciences in Scopus

Sl. No.	Journal	Mean CiteScore	Min	Max	Rank
1	Journal of Earth System Science	1.925**	1.8	2.2	**1**
2	Journal of the Indian Society of Remote Sensing	1.32	0.5	2.2	**2**
3	Journal of Geological Society of India	1.19	0.8	2.1	**3**
4	Journal of Astrophysics & Astronomy	1.17	0.6	2.8	**4**
5	Himalayan Geology	0.856*	0.5	1.3	**5**
6	Indian Journal of Radio and Space Physics	0.83	0.1	1.3	**6**
7	Journal of the Palaeontological Society of India	0.822*	0.3	1.2	**7**
8	Indian Journal of Geo-marine Sciences	0.63	0.5	0.9	**8**
9	Disaster Advances	0.62	0.3	0.9	**9**
10	Mausam	0.54	0.2	0.9	**10**
11	Journal of Agrometeorology	0.48	0.2	1	**11**
12	Journal of Mines, Metals and Fuels	0.1	0.1	0.1	**12**

**4 year average *9 year average

During the 2011 to 2020 period, the Journal '*Journal of Earth System Science'* had the highest mean CiteScore of 1.925, followed by '*The Journal of the Indian Society of Remote Sensing*' (1.32) and '*The Journal of Geological Society of India'* (1.19). The least mean CiteScore (0.1) during the period is for the journal '*Journal of Mines, Metals and Fuels'*.

5.2.2 SNIP of Indian Journals in Earth & Planetary Sciences in Scopus

The Source Normalized Impact per Paper was proposed by Moed (2010) as a metric that adjusts for different citation patterns across different academic disciplines. SNIP measures a source's contextual citation impact by weighting citations based on the total number of citations in a subject field. It helps to make a direct comparison of sources in different subject fields.

SNIP considers characteristics of the source's subject field, which is the set of documents citing that source. SNIP especially considers:

- ❖ The frequency at which authors cite other papers in their reference lists;
- ❖ The speed at which citation impact matures; and
- ❖ The extent to which the database used in the assessment covers the field's literature

SNIP is the ratio of a source's average citation count per paper and the citation potential of its subject field. SNIP is an indicator of the scientific impact of scientific journals that uses a source-normalized approach to correct for differences in citation practices between scientific fields. It is defined as the ratio of a journal's raw impact per paper (RIP) and a journal's relative database citation potential. The measure is calculated as SNIP = RIP/(R/M), where R = citation potential and M = median database citation potential (Moed, 2010; Waltman et al., 2013).

Table 4 and Fig.1 show the ranking of Indian Earth and Planetary Sciences journals in Scopus based on their mean SNIP values from 2011 to 2020.

Table 4. SNIP of Indian Journals in Earth & Planetary Science in Scopus

Sl. No.	Journal	Mean SNIP	Minimum	Maximum	Rank
1	Journal of Earth System Science	0.875	0.777	0.992	**1**
2	Journal of the Indian Society of Remote Sensing	0.726	0.609	0.874	**2**
3	Journal of Geological Society of India	0.695	0.499	0.870	**3**
4	Journal of Agrometeorology	0.627	0.189	1.799	**4**
5	Disaster Advances	0.503	0.168	1.634	**5**
6	Mausam	0.488	0.237	0.813	**6**
7	Indian Journal of Geo-marine Sciences	0.486	0.323	0.701	**7**

8	Journal of the Palaeontological Society of India	0.479*	0.160	0.890	**8**
9	Himalayan Geology	0.465*	0.169	1.242	**9**
10	Journal of Astrophysics & Astronomy	0.397	0.153	0.708	**10**
11	Indian Journal of Radio and Space Physics	0.382	0.063	0.625	**11**
12	Journal of Mines, Metals and Fuels	0.155	0.008	0.340	**12**

*9 years average

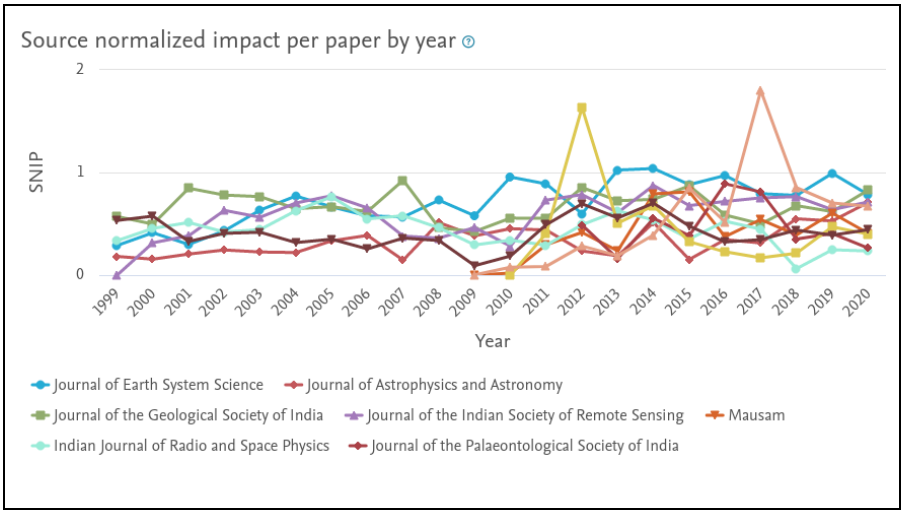

Fig.1 SNIP values for the journals based on Scopus data.

As in the case of CiteScore, the top three ranked journals based on their SNIP values are '*Journal of Earth System Science'* (0.837), '*Journal of the Indian Society of Remote Sensing*' (0.726), and 'Journal *of Geological Society of India'* (1.19). Here also, the least mean SNIP value (0.155) is for the oldest journal, *'The Journal of Mines, Metals and Fuels'*.

5.2.3 SJR of Indian Journals in Earth & Planetary Sciences in Scopus

The prestige of a journal weights SJR. The subject field, quality, and reputation of the journal directly affect the value of a citation (Nundy et al., 2022).

SJR assigns relative scores to all of the sources in a citation network. Its methodology is inspired by the Google PageRank algorithm, in that not all citations are equal. A source transfers its prestige or status to another source by citing it. A citation from a source with a relatively high SJR is worth more than one from a source with a lower SJR.

Table 5 shows the ranking of Indian Earth and Planetary Sciences journals in Scopus based on their mean SJR values from 2011 to 2020.

Table 5. SJR of Indian Journals in Earth & Planetary Sciences in Scopus

Sl. No.	Journal	Mean SJR	Minimum	Maximum	Rank
1	Journal of Earth System Science	0.459	0.366	0.624	**1**
2	Journal of Astrophysics & Astronomy	0.386	0.229	0.631	**2**
3	Journal of Geological Society of India	0.364	0.289	0.425	**3**
4	Journal of the Indian Society of Remote Sensing	0.327	0.293	0.371	**4**
5	Mausam	0.239	0.158	0.337	**5**
6	Indian Journal of Radio and Space Physics	0..236	0.108	0.417	**6**
7	Journal of the Palaeontological Society of India	0.223*	0.161	0.314	**7**
8	Disaster Advances	0.213	0.137	0.337	**8**
9	Journal of Agrometeorology	0.209	0.120	0.295	**9**
10	Indian Journal of Geo-marine Sciences	0.207	0.169	0.245	**10**
11	Himalayan Geology	0.202*	0.130	0.309	**11**
12	Journal of Mines, Metals and Fuels	0.134	0.102	0.136	**12**

**9 years average

From 2011 to 2020, the journal '*Journal of Earth System Science'* had the highest mean SJR of 0.459, followed by '*Journal of Astrophysics & Astronomy*' (0.386) and '*Journal of Geological Society of India'* (0.364). The least mean SJR (0.134) during the period is for the '*Journal of Mines, Metals and Fuels'*.

6. Conclusion

Assessment of the 12 Indian Earth and Planetary Sciences journals indexed in Scopus based on three journal quality indices (CiteScore, SNIP and SJR) has revealed that the top cited Indian Earth and Planetary Sciences journal in Scopus is '*Journal of Earth System Science'*.

The "*Journal of Earth System Science*" has a mean CiteScore of 1.925 during the assessment period, with a mean SNIP value of 0.875 and a mean SJR value of 0.459. The SJR value of *Journal of Earth System Science* is better than that of Geofluids (Hindawi) and Arabian Journal of Science (Springer). The mean number of publications of the journal with an average impact per publication of 1.241 from 2011 to 2020 is 332.1. The mean percentage of the journal's self-citation during the period is 7.03%. The highest average CiteScore of the Earth and Planetary Science journals in the whole world for the period 2011 to 2020 is 10.39. However, the mean CiteScore of the journal "*Journal of Earth System Science*" is 1.925, a difference of 8.465 from the journal with the highest CiteScore.

The SNIP approach focuses on the citation context of a subject field. In this case, the impact of a single citation depends on the total citation context of a subject field; that is, the value of a single citation is higher in areas where citations are less likely, and vice versa. Similarly, the highest average SNIP value of the Earth and Planetary Science journals for the period is 3.83 for the whole world. When comparing with the mean SNIP value of the journal "*Journal of Earth System Science*" (0.875) (Fig.1), the highest average SNIP value of Earth and Planetary Science Journals differs by 2.96.

For a given number of citations, citations from highly cited journals will result in higher values of SJR. The mean SJR value of the journal "*Journal of Earth System Science*" (0.444) differs from the highest average SJR value of the Earth and Planetary Science Journals (5.435 for Nature; https://www.scimagojr.com/journalrank.php?category=1901) by 4.991. Among Indian Earth and Planetary Science journals, the "*Journal of Earth System Science*" is cited more than the other Indian Earth Science journals, by highly cited journals in Earth and Planetary Science Journals. Authors can thus make learned choices on the journals they prefer to publish their Earth and Planetary Science findings in India.

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