Analysis of Applications and Funding for Regular Projects in the Astronomy Discipline of the National Natural Science Foundation of China in 2023 (Postprint)

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Abstract

This paper presents the application and funding status of regular astronomy projects under the National Natural Science Foundation of China (NSFC) in 2023. Combined with historical data, it analyzes the distribution and evolution of project applications and funding across research fields, age demographics, and other dimensions. It highlights issues identified during the 2023 project application and review process, and concludes with recommendations for the funding of astronomy projects in 2024.

Full Text

Preamble

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Analysis of the Application and Funding of Regular Programs in the NSFC Astronomy Discipline in 2023

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Abstract: This paper describes the application and funding status of regular programs in the NSFC astronomy discipline in 2023. By combining historical data, we analyze the distribution and trends of applications and funding across research fields and age groups. We identify problems encountered during

the 2023 application and review process, and finally propose considerations for funding astronomy programs in 2024.

Keywords: National Natural Science Fund; Astronomy; Application; Funding

The 2023 NSFC project review process has been completed. This paper provides a statistical analysis of applications and funded projects in the astronomy division, reporting the annual review outcomes to the astronomical community. We also summarize new policies, trends, and emerging issues encountered during the application and review process for researchers' reference. The astronomy division' s work has received strong support from experts in the astronomical community, to whom we express our sincere gratitude.

2 Funding Scope

The Astronomy Division of the NSFC Department of Mathematical and Physical Sciences (hereinafter referred to as the Astronomy Division) primarily funds six first-level codes: Cosmology and Galaxies, Stars and Interstellar Medium, Solar Physics, Planetary Science, Fundamental Astronomy, and Astronomical Technology and Methods, encompassing 21 second-level codes. The division encourages research integrated with established or under-construction large-scale observational facilities, as well as studies on new astronomical technologies and methods.

3 Overview of 2023 Project Applications and Funding

During the 2023 centralized acceptance period, the Astronomy Division received 536 General Program applications, 402 Young Scientists Fund applications, and 57 Regional Fund applications. These three categories, collectively referred to as "General-Young-Regional" programs, constitute the main body of regular programs. In addition, the division received 69 applications for the National Science Fund for Distinguished Young Scholars, 79 for the Excellent Young Scientists Fund, 62 for Key Programs, and 18 for the National Major Scientific Research Instrument Development Program (6 department-recommended and 12 free-application). All regular program applications in 2023 passed formal review, with no applications rejected.

Under the unified deployment of the Department of Mathematical and Physical Sciences, the Astronomy Division conscientiously implemented classification-based review and the Responsible, Credible, and Contributive (RCC) reform principles, strictly following regulations to conduct project review and management. The NSFC review principles are: relying on experts, promoting democracy, selecting the best for support, and ensuring fairness and reasonableness. The correspondence review process fully utilized an intelligent assignment system. For applications with similar research content, the same group of correspondence reviewers was selected whenever possible, combining specialists with broader expertise. The division strived to select peer experts from different

institutions, regions, and age groups, while avoiding conflicts of interest such as same-institution relationships, teacher-student relationships, direct relatives, and collaborators. During classification and panel review, priority was given to academic excellence. At equivalent academic levels, appropriate consideration was given to coordination across different fields and overall development, with appropriate support for relatively weak disciplines, non-major astronomical institutions, and remote regions. Priority was also given to female applicants and younger researchers, with the Young Scientists Fund showing particular preference for regional applicants.

Based on these principles and following correspondence and panel reviews, the Astronomy Division funded 116 General Programs, 106 Young Scientists Funds, 11 Regional Funds, 13 Key Programs, 5 Distinguished Young Scholars, and 8 Excellent Young Scientists in 2023.

As shown in , the number of applications and funded projects for General and Young Scientists programs in 2023 decreased slightly compared to 2022, while Regional Fund applications increased significantly. The overall funding rate for General-Young-Regional programs remained essentially unchanged. Applications for Key and Excellent Young Scientists programs decreased notably, while Distinguished Young Scholar applications increased substantially. The number of funded projects for these three categories remained consistent with the previous year. The total number of applications across these six program types was 1,205, with 259 funded projects, both showing a slight decrease from 2022 but within the fluctuation range of the past five years.

4.1 Statistics by Field, Age, and Gender for General, Young Scientists, and Key Programs

General Programs, Young Scientists Funds, and Key Programs represent the largest volume of applications and funding in the Astronomy Division and currently constitute the main body of science fund programs. We categorized and statistically analyzed the 2023 applications and funding for these program types according to the six first-level discipline codes (A14–A19), comparing them with 2022 data.

As shown in , application numbers across first-level codes remained essentially consistent with the previous year. The fields with the most applications were Cosmology and Galaxies, Stars and Interstellar Medium, and Astronomical Technology and Methods. Planetary Science applications increased compared to last year, but its funding rate decreased. The funding rate for Cosmology and Galaxies projects also decreased compared to the previous year. Compared with recent data, differences in funding rates across first-level codes remain within the fluctuation range. The astronomy discipline' s funding rates are higher than the average across all disciplines. However, compared with longer-term historical data, funding rates for both General and Young Scientists programs show a declining trend, reflecting increasingly fierce competition in the field.

The funding rate for Astronomical Technology and Methods is lower than that for Cosmology and Galaxies, Stars and Interstellar Medium, and Solar Physics. We attribute this to three factors: first, the content and methods in Astronomical Technology and Methods vary greatly, making it difficult to identify appropriate specialist reviewers; second, correspondence review opinions show significant divergence; and third, some young researchers have excellent achievements but lack sufficient influence in the academic community.

We also analyzed the age distribution of applicants and funded investigators for General, Young Scientists, Regional, and Key Programs in 2023 (considering only the applicant/principal investigator' s age when other team members are involved), as shown in and . The statistics reveal that for General and Regional Programs, the 36–40 and 41–45 age groups had the most applicants, together accounting for over 60% of the total. For the Young Scientists Fund, the 31–35 age group dominated, representing over 60% of applicants. For Key Programs, the age distribution of applicants was relatively broad. shows the average age of applicants for the four program types: 32.6 years for Young Scientists programs, 41.5 and 41.6 years for General and Regional Programs respectively, and 47.8 years for Key Programs.

As shown in , the age distribution of funded applicants follows a similar pattern.

We further analyzed the gender distribution of applicants and funded investigators for the four program types (considering only the applicant' s gender when other team members are involved), as presented in . The proportion of female applicants was lower than male applicants across all program types. The Young Scientists Fund had the highest proportion of female applicants at nearly 40%, with funded female investigators exceeding 40%. For the other three program types, the overall proportion of female applicants was essentially the same as the proportion of female funded investigators.

4.2 Distinguished Young Scholars and Excellent Young Scientists Programs

In 2023, the Astronomy Division received 69 applications for the National Science Fund for Distinguished Young Scholars, an increase of 15 from 2022. After peer review and departmental voting, seven candidates participated in the defense. Following panel review, five applicants were funded at 4 million yuan per project.

The division received 79 applications for the Excellent Young Scientists Fund, a decrease of 13 from 2022. After peer review and departmental voting, 11 applicants participated in the defense. Following panel review, eight applicants were funded at 2 million yuan per project.

4.3 Problems Identified in Application and Review

During formal review, correspondence review, and panel review, we identified problems in four main areas.

4.3.1 Application Quality

Some applications were overly brief or incomplete. Among this year' s submissions, some applications were significantly shorter than the average for similar programs, with missing sections, no references, or incomplete content. Younger applicants accounted for the majority of these cases. Correspondence reviewers identified these issues in their evaluation comments.

4.3.2 Similarity Checking

Similarity checking aims to avoid duplicate funding and detect academic misconduct such as plagiarism. We conducted similarity checks on all applications by matching them against submissions from the past five years, examining cases where overall similarity or section similarity exceeded 50%. We considered whether high-similarity applications were from the same applicant, had already been funded, or involved collaborative relationships. According to relevant regulations, we flagged high-similarity applications and provided this information to panel reviewers for reference.

4.3.3 Citation Verification

We compared author order, journal volume, and publication year information listed in applications' representative works with actual published articles to verify the authenticity and completeness of references. We identified several issues: (1) some applicants omitted certain authors from references, artificially elevating their own or team members' ranking; (2) some applicants reversed author order in reference lists to improve their own ranking; (3) some provided incorrect volume, issue, or publication year information; (4) some omitted "et al." from author lists; and (5) discrepancies in whether and how team/collaboration names appeared. We flagged these issues and provided the information to panel reviewers for reference.

4.3.4 Mismatch Between Review Comments and Ratings

Panel reviewers identified cases where correspondence reviewers' comments were clearly inconsistent with their overall evaluation/funding recommendation ratings. Upon careful reading of correspondence reviews, we found similar mismatches. For example, some correspondence reviewers gave very positive comments without identifying weaknesses but assigned low ratings, while others denied funding to Young Scientists or General Program applications on the grounds that the applicant had also applied for talent programs, despite talent

programs being extremely competitive. This sometimes resulted in applicants receiving no funding for any of their applications.

We encourage correspondence reviewers to be concise and direct, avoiding formulaic language, and to clearly identify weaknesses and provide constructive suggestions for applications with genuine deficiencies.

5 Summary and Outlook

1. **Funding Orientation**: In 2024, the astronomy discipline will continue to follow Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, fully implementing new requirements for basic research and science fund development in the new era. We will maintain a funding orientation that combines free exploration with goal-directed research, and promotes balanced and coordinated development across sub-disciplines, as well as among theoretical, observational, and technical methods in astronomy.

2. **Expert Database Development**: Based on frequently occurring keywords in recent applications, we will supplement and refine keywords and research directions in the review system. We will remind reviewers to maintain their personal information to improve the accuracy of intelligent assignment. We will maintain the expert database by adding young, active researchers and outstanding overseas Chinese experts. Researchers found guilty of research misconduct will be flagged and prohibited from serving as correspondence or panel reviewers.

3. **Panel Review**: When selecting panel reviewers, we will strictly implement NSFC' s conflict-of-interest avoidance system and follow the "2024 Science Fund Project Review Guidelines." We will comprehensively consider distribution across fields, regions, and research institutions. Under equivalent conditions, we will prioritize relatively young, active researchers and encourage greater participation by female researchers. A certain proportion of young researchers will be selected, with those under 45 years old comprising at least one-third of panel reviewers for General, Young Scientists, and Regional Programs.

4. **Anti-Canvassing Special Campaign**: In 2023, NSFC conducted an intensive special campaign against the persistent problem of reviewers being canvassed, implementing a four-party commitment system and meticulous on-site supervision during panel reviews to foster a clean research environment. Under NSFC' s strict requirements and publicity, research integrity issues have significantly decreased, and the problem of reviewers being canvassed has been fundamentally curbed. In 2024, the Astronomy Division will continue to take proactive measures to leverage the guiding role of the science fund and maintain a clean research environment.

Note: Figure translations are in progress. See original paper for figures.