Analysis of the 2022 Application and Funding Status for Regular Projects in the Astronomy Discipline of the National Natural Science Foundation of China (Postprint)

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Abstract

This paper presents a detailed overview and analysis of the application and funding status of regular projects in the astronomy discipline of the National Natural Science Foundation of China for 2022, and proposes recommendations for the funding work in the astronomy discipline for 2023.

Full Text

Analysis of the Application and Funding of Regular Projects in the National Natural Science Foundation of China Astronomy Discipline in 2022

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Abstract: This paper introduces and analyzes the application and funding status of regular projects in the National Natural Science Foundation of China (NSFC) astronomy discipline in 2022, and presents recommendations for the funding work in 2023.

Keywords: National Natural Science Fund; astronomy; application; funding

1 Application Status and Analysis of the Astronomy Discipline in 2022

During the 2022 NSFC centralized project acceptance period, the astronomy discipline received a total of 1,258 regular project applications, requesting direct funding of 1.70574 billion yuan. The detailed breakdown of applications

by program type is shown in Table 1 , which also includes application data from the past five years for comparison. As evident from Table 1, the number of applications in 2022 increased by 13.95% compared to 2021. Specifically, applications for the General Program grew by 17.42%, exceeding the growth rates of the NSFC as a whole (4.61%) and the Department of Mathematical and Physical Sciences (9.27%). Applications for the Young Scientists Fund increased by 13.08%, also surpassing the overall NSFC (6.00%) and departmental (7.30%) growth rates. Similar to 2021, the astronomy discipline continued to see substantial growth in applications for General, Young Scientists, and Key Programs. This growth can be attributed not only to the cancellation of the Astronomy Joint Fund but also to the continued rapid expansion of the astronomy research community.

1.2 Distribution of Applications by Discipline, Applicant Age, and Institution

To better understand the basic characteristics of 2022 applications, we conducted a preliminary statistical analysis from three perspectives: applicant age, discipline distribution, and institutional affiliation. The results are presented in Tables 2 , 3 , and 4 .

The age distribution statistics for General, Young Scientists, Regional, and Key Program applications in 2022 reveal that the majority of General Program applicants fall within the 36–40 and 41–45 age brackets, accounting for 41.39% and 29.85% respectively (compared to 43.01% and 27.96% in 2021). For the Young Scientists Fund, applicants aged 26–30 and 31–35 constitute the vast majority, representing 22.17% and 66.99% respectively (compared to 23.16% and 65.40% in 2021).

Table 3 shows that for General Programs, applications in "Astronomical Technology and Methods" and "Stellar Physics and Interstellar Medium" were relatively numerous, comprising 36.45% and 21.61% of the total respectively. For Young Scientists Fund applications, these same two categories also dominated, representing 27.47% and 27.71% respectively. The high number of applications in technology and methods reflects the current abundance of astronomical instrumentation projects.

In 2022, researchers from 108 institutions (20 Chinese Academy of Sciences institutes, 81 universities, and 7 other organizations) submitted 546 General Program applications in astronomy. CAS institutes, universities, and other organizations accounted for 377, 161, and 8 applications respectively, representing 69.05%, 29.49%, and 1.47% of the total (compared to 64.52%, 34.41%, and 1.08% in 2021). CAS researchers remain the primary applicants for General Programs.

Table 4 demonstrates that in 2022, the National Astronomical Observatories, Shanghai Astronomical Observatory, Yunnan Observatories, and Purple Mountain Observatory each submitted more than 30 General Program applications,

collectively accounting for 53.85% of all General Program applications (up from 47.53% last year), with the National Astronomical Observatories leading at 166 applications.

2 Funding Status and Analysis of the Astronomy Discipline in 2022

2.1 Funding Principles and Scale

The funding orientation of NSFC in the new era emphasizes encouraging exploration and highlighting originality; focusing on frontiers and forging unique paths; addressing national needs and breaking bottlenecks; and promoting cross-disciplinary integration. In 2022, NSFC continued advancing systematic reforms to the Science Fund, steadily expanding the pilot program of the "Responsible, Credible, and Contributing" (RCC) review mechanism. Building on three consecutive years of RCC pilot participation, the astronomy discipline expanded the pilot to include General, Young Scientists, Regional, and Key Programs in 2022.

Under the unified deployment of the Department of Mathematical and Physical Sciences, the astronomy division conscientiously implemented the RCC reform spirit and classification-based review, strictly conducting project evaluations according to regulations. The overarching NSFC review principles are: relying on experts, promoting democracy, selecting the best for support, and ensuring fairness and reasonableness. Based on expert opinions and the overall disciplinary development status, the astronomy discipline also appropriately considers coordinated development across different fields and sub-disciplines, providing modest support for relatively weak sub-disciplines, non-primary astronomical institutions, and remote regions to ensure appropriate layout for astronomy development. Under equivalent academic standards, priority is given to female applicants and younger researchers.

According to the 2022 NSFC funding plan and the Department of Mathematical and Physical Sciences' allocation, the astronomy discipline received 140.33 million yuan in direct funding for regular projects, including 67.8 million yuan for General Programs (123 projects, 17 more than last year), 31.8 million yuan for Young Scientists Fund (106 projects, 10 more than last year), 2.9 million yuan for Regional Fund (9 projects, 2 more than last year), and 37.83 million yuan for Key Programs (13 projects, 2 more than last year).

2.2 Analysis of 2022 Funding

Following formal review, peer communication review, specialized expert panel discussion and voting, and committee approval, the astronomy discipline selected 253 projects for funding in 2022, with total direct funding of 140.33 million yuan. Details are provided in Tables 5 and 6 . Since Young Scientists Fund projects receive fixed funding amounts, the average funding intensity in Table

5 refers to the direct funding intensity for a three-year duration (following the implementation of the new funding management policy, Young Scientists Fund projects operate under a "lump-sum system" with an average annual funding of 100,000 yuan; Table 5 still uses the pre-lump-sum average funding amount). Additionally, because some Young Scientists Fund principal investigators are postdoctoral researchers who only applied for two-year funding, the total number of funded projects exceeded the original plan by 2 while maintaining the same total budget.

Table 5 shows that the average funding rates for General, Young Scientists, and Regional Programs in 2022 all decreased compared to last year, while the Key Program funding rate increased slightly. In 2022, 55.28% of funded General Program principal investigators were under 40 years old, a decrease from last year but slightly higher than the proportion of applicants in that age range.

Table 6 indicates that, accounting for statistical fluctuations, funding across sub-disciplines for General and Young Scientists Programs remained basically balanced. As in previous years, the new research direction "Planetary Science" maintained a higher funding rate than other directions, reflecting the astronomy discipline's support for this field. The table also reveals that the funding rate for the "Astronomical Technology and Methods" direction in General Programs was below the average, primarily because some proposals' content was not closely related to this direction. Experts made comprehensive considerations during review, and applicants are advised to select appropriate research directions when completing their proposals.

In addition, the astronomy discipline funded 5 National Distinguished Young Scientists Fund projects, 8 Excellent Young Scientists Fund projects, 1 Key International (Regional) Cooperative Research project, 1 Innovative Research Group project, 2 Major Research Instrumentation projects (free application), 1 Major project, and several special projects (including research projects and science activities) in 2022.

2.3 Problems Identified During Review

During formal review, peer communication review, and specialized expert panel review, we identified persistent common issues similar to previous years, including: incomplete or inaccurate personal information, non-standard recommendation letter content, overly simple or careless proposal writing, and improperly formatted research achievements (papers, patents, awards, etc.). These issues will not be elaborated here; interested readers may consult previous summary articles. This phenomenon warrants attention from applicants and their host institutions, which should devote more effort to improving proposal quality.

3 Recommendations for the Astronomy Discipline in 2023

In 2023, the astronomy discipline will continue to adhere to 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 balanced funding pattern across sub-disciplines while providing appropriate support for non-primary astronomical institutions and remote observatories. Under equivalent conditions, we will continue to favor female scholars and younger researchers.

Furthermore, we encourage researchers to utilize NSFC's original exploration project channels to conduct pioneering research; expand international cooperation channels to fully leverage international large-scale observational facilities and apply for international cooperative research projects through multiple channels; actively organize teams to distill major scientific questions and apply for major projects; and strengthen interdisciplinary research by actively engaging with cross-disciplinary research projects released by the Basic Science Division.

4 Conclusion

This paper summarizes the application and funding status of NSFC astronomy discipline regular projects (General, Young Scientists, Regional, and Key Programs) in 2022, identifies existing problems in applications, provides a brief analysis of funding patterns, and outlines upcoming changes for 2023. We hope these results will assist research management departments of host institutions and astronomers in future project applications.

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